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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

The Gaslight Company's Calorific Power Standard.

THE information conveyed through the last two issues of the "JOURNAL," that the Gaslight and Coke Company had accepted a calorific power standard, with penalties, as part of the price to be paid for obtaining their Bill without powerful opposition, has aroused considerable interest in gas circles. The position was discussed last week; and there appears to be general assent that the Company, under the circumstances, made a politic arrangement, though it could have been wished (as pointed out a week since) that the Company's gas was henceforth going to be sold, as has been the case ever since penalty testing was imposed on gas supply, under one standard instead of two. But the agreement that has been made by the Company need not be looked upon with any dismay, though dual penalty testing is involved. The more the matter is considered, the more it becomes clear that the Company have set a precedent that is fair, and is not to the disadvantage of the gas industry. It has not been a case of purely selfish agreement for the attainment of the Company's own ends; it was very distinctly recognized by them that there was a larger responsibility in the matter, in that the influence of what was being done would be cast far and wide in the future. The fight for the fullest liberty was carried, it will be seen from our report of the proceedings before Mr. Mooney's Committee last Thursday, right up to the clause stage of the Bill; but, although the final point was not gained, the Company have made it abundantly clear that the terms of the Bill must be regarded for a time as being in the nature of trial ones. Nevertheless, we do look upon the settlement with the London County Council and the City Corporation, as having done much to hasten the time when the illuminating power test, with all its familiar and persistent loopholes for dispute, will become extinct, and a calorific power standard will reign in its stead. Very few gas engineers in these days will be prepared to defend the illuminating power test as against the calorific power test. For, considering the uses to which the bulk of the gas sold is now put, the illuminating power test can only be properly described as a solecism; while in the calorific power test (as was the case once upon a time with the illuminating power test) there is expressed the use to which the great bulk of gas is applied. Test and use harmonize.

However, to the calorific power clause as it now stands in the Bill. It was discussed freely before Mr. Mooney's Committee on Thursday. But only on one point had the Company and the County Council failed to come to a settlement; and to that we will direct attention in its proper position in the sequence of details. As stated last week, the calorific standard is to be 125 calories net per cubic foot of 14-candle power gas, as tested by the "Metropolitan" No. 2 burner; but there is to be no liability incurred in the event of gas being supplied of a calorific power of not more than 10 per cent. below the standard—that is to say, 112½ calories—with a triennial appeal to the Board of Trade if either party desires modification. The figures represent 500 B.Th.U., with no penalty attaching if the returns do not fall below 450 B.Th.U.

In the sub-sections of the clause, the conditions applied to illuminating power testing in the Metropolis have, in a measure, been reproduced. If an examiner finds the heating power is below 112½ calories on any day, he is to make a second test in an interval of not less than an hour; and the average of the two testings is to be taken. Then if the gas on any day is of less calorific power than 112½ calories to an extent not exceeding 6 calories, the average of the testings for calorific power on that day, the day preceding, and the day following is to represent the calorific power of the gas on the day for the purpose of penalty. This is

the point—the 6 calories deficiency—on which there was contention. The Company desired that there should be no limitation; but the County Council representatives appeared to have some idea that the Company might have an excessive deficiency on one day, and would be able to make up for it by supplying gas of a high calorific power on the other two days. But, unfortunately for the Company, their power to deliberately make compensation is limited to one day, and is also trammelled by the largeness of their operations, in which conditions there is an abundant protection for the public against the escape of the Company from lapse in their calorific obligations. The calorific history of the "preceding" day will already have been written on the day the deficiency occurs; on the day the deficiency occurs, the Company will not be in a position, the test having ended, to make any amends that will find expression in the official returns for that day; and there is only the third day left on which to bring the average above the 112½ calories. The flexibility of gas supply is not such that the Company can, on the word of command being given, or by any clandestine operation, immediately change from a low to a high estate the calorific value of the gas being distributed.

We quite agree as to the wisdom of the calorific power of a gas supply being maintained as uniform as possible; but there are occasions when, through sudden demands on the Company owing to severe climatic changes and fogs, there might possibly be a lapse. Up to the present time, there has been no complaint, so far as our information goes, from manufacturers or others in regard to the calorific power of the gas sent out by the Company. There is no denying that the object the County Council representatives had in view is a good one; but, having regard to the convenience of the public in having a plentiful supply of gas (they will, of course, have it, calorific power test notwithstanding) when the flights of demand take the consumption temporarily up above the normal height of the season's peak load, the clause might have been left open—anyway, until three years' experience had been recorded. Past experience has not shown that there would be any disadvantage to the consumer by freedom in this respect; and the three days' average of 112½ calories standing without further condition would have been an ample protection for the public. The Committee, however, sided with the County Council; and the 6 calorie limitation is one of the conditions of the test. The penalties are: £5 where the deficiency (under the conditions mentioned above) does not exceed 3 calories; a sum not exceeding £10 where the deficiency is greater than 3 calories, but does not amount to 6 calories; and not less than £25, nor exceeding £100, for each complete 6 calories of deficiency.

These are the conditions applying to the first calorific power standard for penalty testing. The Company have entered into this fresh bond very reluctantly; but it was necessary to remove the jeopardy occasioned by a powerful hostility to their plans and policy. The reluctance was due to the feeling of the Governor and those associated with him that the acceptance of the new standard should have displaced the old one, and that the change should have been made by a General Act and not by a private one. Their action in the matter, under the circumstances of their situation, does not call for any apology.

Fires—Causes, Known and Unknown.

IF the Bill becomes law that Sir Henry Cotton introduced in the House of Commons yesterday week, and which was then read the first time, it will be a valuable addition to legislation providing for the protection of the public. The Bill proposes that the practice of holding fire inquests, as is now the case in the 673 acres known as the City of London, shall become general. Dr. Waldo, the City Coroner, has strenuously advocated the universal application of the system on all possible occasions, as from his experience in the

City, he is a confirmed believer in the usefulness of such inquests in unearthing the causes of fires and in detecting incendiarism. In the last report of the Chief Officer of the London Fire Brigade (Captain J. de C. Hamilton), as submitted to the Fire Brigade Committee of the London County Council, mention is made of no less than 291 fires the causes of which are returned as unknown; and there were 343 fires in 1907 the origins of which were not discovered. Dr. Waldo and Lieutenant Sladen (one of the Divisional Officers of the Brigade) have made no secret of their belief that electrical installations are the seats of a larger number of fires than is officially attributed to them. Circumstances have been disclosed that give ground for the suspicion that fires are often caused by electricity when no one is about, and on closed premises; and the fire, getting a good hold before being discovered, wipes out the cause of origin. Whether or not there is a fire inquest, this difficulty is a present one, and one that helps to shield electricity. Still the holding of inquiries, conducted systematically by competent men, would no doubt frequently be helpful in directing to this and other causes, now, from superficial examination, classified as unknown. There are also many fires—small, but damaging and disconcerting—caused by electrical installations, that do not come within the cognizance of the Fire Brigade; and private experience in this respect is confirmed by the recent definite statement of Mr. S. G. Castle Russell, the Chief Electrical Engineer of the Phoenix Fire Insurance Company, that not half the electrically-produced fires in this country are reported in the daily papers. There are very few fires occur to which the Fire Brigade is called that do not find publicity in the newspapers; so that those referred to by Mr. Russell are doubtless small ones, to extinguish which the services of the Fire Brigade are not requisitioned, but which occasion no small amount of sensation and alarm in the domestic circle, and end in claims for settlement by the insurance companies concerned. However, if the holding of fire inquests now becomes general, there may be, in the London Fire Brigade reports in future, a diminution in the figures representing fires the causes of which are labelled "unknown."

In one way or another, gas was concerned last year in 366 fires and electricity in 102, within the area of the operations of the London Fire Brigade. If the Grange Road, Bermondsey, explosion be excepted (the initial circumstances producing which were wholly external to the gas distribution system), no fires were produced by gas during the year which it was found necessary to mark as serious; and the only two fires to which Captain Hamilton thought it right to direct special attention in his report were those at the Drury Lane Theatre and on the City and South London Electric Railway. There is no question about the latter having had electrical origin; and all the evidence pointed to the Drury Lane Theatre fire having likewise been due to electricity. In fact, if we turn to the dissection that is made in the report of places and situations of fires, it is seen that theatres and music halls have set against them two fires from defective electric circuits, one from an escape of gas, and three are returned as "unknown." It was certain that an escape of gas was not at the bottom of the fire at Drury Lane; and we think it is fair to assume, recalling the evidence made public in March last year, that this destructive fire accounts for one of the two attributed to defective electric circuits. The fire is stated to have been burning some time before being discovered. While speaking of fires at places of entertainment, the year includes the terrible explosion at the Shepherd's Bush Exhibition, through using an electric fan for pumping hydrogen gas into an air-ship. Under the heading of "exhibitions," two fires are reported as having been due to defective electric circuits, and one to an escape of gas.

In making calculations to ascertain the relation that the 102 electrically-caused fires and the 366 gas-produced fires (irrespective of the particular manner in which the fire was occasioned) has to the numbers of consumers connected with the distribution systems, it must be remembered that the 29 electricity undertakings (whose total consumers are taken) cover a larger district than the London Fire Brigade, and the Brigade operates in a much larger district than the three London Gas Companies. If statistics could be compiled for coterminous areas, the comparison would be worse for electricity and much better for gas than the one about to be made. This year in the "Electrician" tables, we get nearer than ever before to the number of electricity consumers in the areas of the 29 electricity-distributing concerns in

London. A year ago only 24 of the undertakings made returns. Now there are 26, leaving only three omissions—the Charing Cross, the County of London, and the Westminster Companies. A pause may be made, to give some interesting figures. A year since, the 24 undertakings had 59,389 consumers; the same concerns now return 64,596 consumers, or an addition of about 5000 spread over the 24. Last year we estimated between 25,000 and 26,000 would about represent the connections of the five concerns not making returns; so giving 85,000 consumers over the large area supplied by the 29 undertakings. The 26 undertakings this year account for 81,356 consumers; so that it may be reckoned 100,000 consumers will cover the 29 undertakings. Twelve months since, we gave the London Gas Companies (with a much smaller aggregate supply area than the 29 electric undertakings) credit for 950,000 consumers. This was then rather above the mark, as at the close of last year their total was about 960,000; and the increase in connections during the year was much above the difference shown. Anyway, it will not be far out one way or the other to assume that, in the area covered by the 29 electricity undertakings, there are 1¼ million gas consumers. Without making deductions for external fires—fires on the distribution systems and outside premises—in which gas or electricity were concerned (the figures would much about balance), the whole of the fires attributed to electricity equal on the total number of consumers for the 29 electricity undertakings 1 to every 980 consumers; and fires caused by gas spread over the consumers of the three London Companies equal 1 in 2623 consumers, or spread over the estimated 1¼ million gas consumers in the areas that are served by the 29 electricity concerns, 1 in 3415 consumers.

We cannot avoid once again making the point that, in the case of the fires caused by the 97 defective electric circuits, the consumers had no means of detecting the defects; while, in the case of the 108 fires occasioned by gas escapes, neglect of the warning that gas gives was mainly responsible for what ensued, Captain Hamilton himself says in his report: "A large number of fires occur from easily preventable causes; and the public cannot be too frequently reminded of the dangers arising from carelessness, especially with matches and naked lights." The fires in some way or another connected with gas (other than the 108 escapes) numbered 258; and no less than 84 of these were due to curtains coming in contact with gas-lights. There were 102 such fires in 1907, so there was a diminution. This reduction suggests that the increasing use of incandescent gas-burners (globe enclosed) in bed-rooms is having an effect in lessening the number of fires from curtains blowing over to naked lights; but it also raises the question whether bedroom brackets are always well placed from the point of view of safety with loose curtains in proximity, though it cannot be disputed that, from the point of view of convenience for the dressing-table, they could not be better situated. The majority of the other fires in which gas was concerned are also of the preventable kind; and their very character suggests carelessness and neglect. Clothes coming in contact with lights and gas-stoves, defective appliances, and seeking for escapes with lights, are causes of fire that cannot find extenuation in any manner of excuse. It is noticed, however, that there were only 15 fires last year caused by the idiotic practice of trying to locate an escape with a light, as against 22 the previous year. It is observed, too, from the analysis of the fires, that no less than 49 occurred in rooms occupied by lodgers; but not one of these fires was serious. This speaks well for the safety of gas, when in poor quarters so few accidents occur. Much has been said lately about cheaper wiring installation; but it is not particularly reassuring to find that at electric light works seven fires were caused by defective electric circuits, and the same number occurred at the establishments of electrical and mechanical engineers, and through the same cause. If there are such occurrences at electricity stations and in electrical engineers' premises, then who can be free from similar mishaps? In contradistinction, at gas-works, only four fires took place—one being due to an escape of gas, two to lights thrown down, and one to a spark from a workman's tool.

Evidence confirmatory of the superior safety of gas is afforded by these statistics year after year. Electricians, with that splendid sophistry for which they have become renowned, say that the ratio of one electrically produced fire to between three and four fires caused by gas (or rather carelessness and negligence) represents the greater safety of electricity. They shun consideration of the greater use of

gas. Presently they will be saying that there is less scope for accident with a million vehicles on the roadways of London than when only 100,000 are scattered over them.

Foreign Patentees and Revocation.

AN industry, which aims at progressiveness in efficiency in the departments of manufacture, distribution, and use, such as the gas industry, must take full advantage of the product of the brains of originators and inventors of all countries; and the large expansion of the gas industry certainly makes it a very inviting one in which to exercise inventive talents and ingenuity. On all hands in the industry, we see the product not only of home inventors, but of those across the seas; and indeed we could not afford to allow insularity or native preference to hinder the use of the best offered, no matter its source. But we are among those who have a strong liking for what Mr. Justice Parker the other day termed "fair play" in connection with the protection and patronage that this country tenders to the foreign patentee; and which "fair play" is of the policy of the Patent Act of 1907. The Act gives to patentees a long period of grace—four years—within which to make the necessary arrangements to manufacture to an "adequate extent" in this country; but several patentees abroad have adopted courses that are preposterous and evasive of the terms on which protection is now granted to their patents. The law of this country, however, declines to be the dupe of craft or deceit. We do not specifically apply this remark to any case that has been heard in connection with the revoking of foreign patents, but recent judicial pronouncement has made the point abundantly clear, and the warning now stands out with excellent and persuasive prominence. The fact, too, is being impressed in a salutary manner by revocation, after full inquiry to ensure equitable decision.

The Comptroller-General of Patents (Sir C. M. Dalton), who has lately been succeeded by Mr. W. Temple Franks, has in recent months revoked several patents that, in his judgment, are being worked "mainly or exclusively" outside, and not to an "adequate extent" in, this country; and though every case must be considered on its merits, the principles guiding in the decided cases, when confirmed by the Court on appeal, must apply to all other exotic inventions that are brought up for revocation, on the charge of being inadequately manufactured here. One case that has produced some authoritative declarations from Mr. Justice Parker as to the meaning and intentions of the Act, is that in which judgment was delivered a few days ago; the appeal having relation to the revocation by the Comptroller-General of a patent for the manufacture of stone slabs and tiles granted to Ludwig Hatschek. The details of the case presented to the Court both for and against revocation have no particular claim on our consideration; the principles that were evolved by it in the judicial statement are the important matters here. There is no question as to the drastic nature of section 27 of the 1907 Act. But the conditions are plainly stated in it on which a patent is granted to an inventor abroad. He has the option of working his invention to an "adequate extent" in this country, or forfeit the patent and the protection, if anyone is sufficiently interested to raise the question. To an "adequate extent" is an open term, the meaning of which can only be determined by considering all the matters applying to cases individually. An attempt was made to get Mr. Justice Parker to put some numerical or proportional interpretation on the term; but he refused to be drawn, and showed the impossibility and unfairness of any definite declaration of the kind that might be hereafter regarded as a precedent and a guide. The policy of the Act, according to his Lordship, being one of "fair play," that is all the country desires from foreign patentees. But the interpretation that some patentees abroad have given to the words of the clause, is not in accord with British traditions and notions of fair play, nor is it in accord with the views of the Comptroller-General and after him Mr. Justice Parker, though we agree with his Lordship that those who make an application for revocation should supply some case requiring answer before the serious step of revocation is taken, otherwise a mere foreign infringer or common informer might set the law in motion.

In the case of Hatschek, the patentee appears to have devoted himself to establishing his industry abroad, and to granting licences to foreign traders to import and sell the goods here; but this is not a fair exercise of rights between this country and foreign countries. Considering, under such

a condition of affairs as this, the preference that is shown to the foreign licensees, considering, too, the fact that they have four years in which to establish business relations here and exploit the invention, no British manufacturer would be prepared, at the end of that period, to take from a foreign patentee a licence so handicapped. Nothing at all had been done, in this instance, to conform with the Act. In justification of this abstention, there was no evidence forthcoming of any economic or other cause which would have precluded this new industry being started and carried on here, nor was there any evidence that the profits would have been too small, or that the demand would not have been much greater if the monopoly had been properly exercised. On these grounds, the licence was revoked by the Comptroller-General, and Mr. Justice Parker confirmed the proceeding. There is another case in which the Comptroller-General has revoked a patent; but as this is also to be the subject of an appeal, we will only state the principal ground upon which the decision was arrived at. The Westinghouse Company are the registered proprietors of the Bremer arc lamp patent. In this country between 1905 and 1908, the Company manufactured 1308 lamps, of which 274 remained unsold. In 1906, a licence was granted to Messrs. Koerting and Mathieson, a company manufacturing in Germany; and in this country they are represented by the Union Electric Company. The Westinghouse Company, it is stated, receive a substantial royalty for every lamp imported here. Between 1906 and 1908, 9856 lamps were imported. The patentee contended that the manufacture at Trafford Park, Manchester, was carried on to an adequate extent; but the Comptroller's view was that the manufacture was "mainly" conducted outside this country. In other words, a small manufacture by a patentee in this country does not represent to the Comptroller's mind a proper degree of adequacy, while licensees are manufacturing to a greater extent abroad, and importing the goods to this country. From all which, it is seen that there are patentees who will do all possible to escape the leashes of section 27 of the Act; but the risk run by abuse of the terms on which patents are granted and held is revocation, and an open market in place of the monopoly allowed for several years by compliance.

"Robbing Gas Consumers."

ON London hoardings in letters 18 inches or more deep, and on placards exhibited by the kerb vendors of popular and more or less sensational literature, there appeared last week the words quoted above—attracting the eye of every passing gas consumer, and probably inducing many to part with a penny so as to ascertain whether they were among those who had been subject to the suggested predatory action. "John Bull"—which is conducted by no less a celebrity than Mr. Horatio Bottomley—was the paper making the startling announcement; and it would seem, from the reading of the article, that this paper, which aims at popularity for smartness and choice sensationalism, had been made the channel for giving publicity to a communication from (we suspect) a discharged collector of the Gaslight and Coke Company. There is no doubt a slight framework of truth about the article; but the filling-in is certainly, in the insinuation it conveys, somewhat extravagant. The "robbery" concerned a few prepayment meter consumers; and it was not the work of the Company, nor of any of the superior officials, but of certain prepayment-meter collectors for the sole purpose not, we fain believe, of enriching themselves, but of making their collections conform, without a showing of bad debt, with the meter registration. The imposture practised by these men—there are, we understand, only a few of them, and their operations have been restricted to very narrow limits, and to a class of meters which were designed before the whole range of possible difficulties had been recognized and provided against, but which are being altered as fast as opportunity permits to make such a thing hereafter impossible—has only been recently discovered; and discovery has led to due punitive action from headquarters. "John Bull" candidly confesses that the Directors, the General Manager, and the other highly-placed officials were not in any way cognizant of these wrongful proceedings; but the candour of the editor in this matter would, doubtless, have been much more appreciated if it had also found expression on the London hoardings and on the placards of the kerb vendors of the paper, and if there had not been insinuated complicity in head and cross lines in the article, such as "How a Great Company has

"Mulcted the Poor" and "Politically Blindness"—this being a reference to an assumption that some of the Company's ledger clerks must have been aware of what was happening.

It should be reiterated, for the purpose of emphasizing it, that what has been done by these three or four collectors to (so to speak) save their own skins, is not by any means widespread. The accusation is—and it is not denied that there is ground for it within quite close limits—that, in order to avoid the stigma of bad debts on their districts, arising principally from thefts, these men have been in the habit of altering the price-changing mechanism of a small number of meters that lent themselves to the trick, and, by under-setting, have retrieved monetary loss by ensuring a lessened consumption per coin inserted, until the debts have been wiped out. And this has relieved them of the necessity of reporting the debt to the head office. "John Bull's" informant does not, judging from the article, appear to have dropped into the receptive ear of the writer of the article the fact that this under-setting of prepayment mechanism by a collector is not possible with the majority of slot meters, without breaking a seal which the collector cannot replace, unless, of course, he is supplied with the necessary stamp and sealing wax; and this refers to the types of meters with the price-changer *in situ*. In the change-wheel system, the mechanism cannot be altered to give a consumer more or less gas for his penny, except by the substitution of new change-wheels, which are only obtainable by the Gas Company officially from the makers. It is not to be supposed that Mr. Bottomley, or any other member of his staff, has sufficient technical acquaintance with such meters as to know of these points. As a matter of fact, with the alterations now proceeding as opportunity allows, the meters that are at present susceptible to manipulation of the kind on the part of collectors will, in time, by the conversion, be things of the past. The article also states that other men have been dismissed from the Company's service for, instead of under-setting meters, altering the indices to also avoid showing debt. This is emphatic of the intention of the Company to put a stop to the iniquitous proceedings; but "John Bull" has shown ignorance by, in effect, spreading the suggestion that indices can be generally altered without inflicting some damage. There are indices of meters that have been accessible; but these again are now being provided with a preventive shield. The general experience, however, is that instances of collectors tampering with indices during the many years these slot meters have been in use have been few and far between.

Other minor points are dealt with in the article—such as the so-called "robbery" of ordinary consumers by meters registering fast. One would imagine that "John Bull" is of the opinion that the Company's officials are fully conscious of the fact when consumers' meters are running fast, and registering some trivial amount against the consumers. The Company are not invested with any occult power enabling them to penetrate the action of consumers' meters any more than is the editor of the paper which has given circulation, and perhaps unnecessarily disseminated an amount of mistrust thereby, to the story of presumably an aggrieved collector, suffering the penalty of his misdoings. Regarding the slow and fast working of meters, the editor of the paper in question is apparently not aware that, under the Sale of Gas Act, 1859, no meter is stamped that is more than 2 per cent. in favour of the seller of gas or 3 per cent. in favour of the buyer; nor that of meters taken out of consumers' houses for testing by the statutorily appointed authorities, certainly 50 per cent. are found to be correct, and the balance about equally divided between fast and slow registration. So that the Company do not get the pull out of incorrect registration of consumers' meters that is insinuated in the article. As a matter of fact, of the gas distributed by a gas company, it may be generally taken that they are not paid for more than 95 per cent.; and part of the amount that is unaccounted for is, to the consumers' advantage, due to slow meters.

"John Bull" is supposed to be the embodiment of fair play. He has on this occasion over-reached himself by, as is believed, giving ear to the grievances of one of the discharged men who have been detected committing irregularities so as to preserve themselves from trouble. To the failure of their machinations may be traced the publication in the paper in question. The article is full of oblique hints, suggestive of a greater knowledge by the Company's staff officials, and a greater prevalence of the pernicious system than is true. At any rate, "John Bull," and the

public it was desired to agitate, may rest assured that such pernicious procedure as has existed of the kind disclosed in the article has, following the detection of the offenders, already been stamped out. The publicity that has been given to the matter compels some notice being taken of it; for those who are inimical to the interests of the gas industry may be trusted to make the utmost use of disclosure—small though it be. At the same time, other gas undertakings will, by this notice of the matter, make inquiry to see that there are no opportunities for similar wrongdoing on the part of their slot-meter collectors, who are, generally speaking, a trustworthy class of men. It is not, however, a bad practice to periodically change the rounds of the collectors, though this has the effect of interrupting the friendly relationships between the Company's representatives and the customers.

Laindon's Annual.

The Laindon and District Gaslight, Coke, and Water Company, Limited, has made its annual appearance, in the form of a prospectus and an invitation for more money. The first prospectus came out in April, 1906, the second in June, 1907, the third in July, 1908, and the fourth in March of this year; and not a few of the recipients found the precious documents in their letter-boxes on April 1! This last prospectus is a *rechauffé* of those that have preceded, with a few significant omissions and additions. We will only run lightly over some of the points. The Directors are H. W. L. Way, W. B. Martin, and E. Eaton—Dr. Allan Maclean appears to have dropped out. Barclay and Co. are no longer the bankers; the London Trading Bank, Limited, has taken the place of the firm with such a reputable name in the world of finance. H. P. Davies is still the Secretary. The Directors invite applications for 300 6 per cent. preference shares of £5 each, 300 10 per cent. ordinary shares of £5 each, and 83 5 per cent. first mortgage debentures of £10 each. The holders of the preference shares are to have the right to a *non cumulative* dividend of 6 per cent.; and the holders of the ordinary capital, to 10 per cent. The vendors and contractors have not yet been satisfied, though the Company have been running about four years. The prospectus states that, among other things, the proceeds of this issue are required "on account of balance owing to the vendors and contractors under the contract." The contractors are, it appears, the Water-Works, Lighting, and Power Investment Corporation, Limited, of which Eaton (who is also a Director of the Laindon Company) is a Director. These "contractors" will be glad to get hold of more money; and so will guarantee for the space of two years interest of "at least" 6 per cent. on the preference shares and 7 per cent. on the ordinary shares. Laindon does not seem, according to the prospectus, to be making great headway in development. In March, 1909, it is stated that in the years 1892 to 1896, 2000 plots for building were disposed of, and since 1896 to the present time 7374 plots have been disposed of; but building operations have not taken place so rapidly as would otherwise have been the case in consequence of the want of a proper supply of water and gas. Precisely the same figures and statement have appeared in the Laindon prospectuses since 1906; so that no more plots have been sold, and the building business there is still languishing, notwithstanding the operations of the Company. Other statements in the present prospectus are merely repetitions, with slight modifications, of those in the one circulated last year, and dealt with at the time in our columns. According to the "Financial News," the Water and Gas Debenture and Share Investment Trust, Limited, are in the field offering £3000 6 per cent. fully-paid first mortgage debentures, and the name of Sir Charles B. H. Soame, Bart., Chairman, is made use of for all it is worth.

Gas and Electricity Supply in Dublin.

It is a matter for regret that Alderman Cotton, the Chairman of the Alliance and Dublin Consumers' Gas Company, had to open his remarks, when moving the adoption of the report at the half-yearly meeting of the Company last Wednesday (the proceedings at which are noticed elsewhere), with a reference to the paragraph announcing a decrease in the consumption of gas in the six months ended Dec. 31, compared with the corresponding period of the year 1907. At the same time, he was able to adduce very good reasons for the deficiency. Depression in

trade, which has adversely affected a number of gas undertakings (and, it may be added, very many others besides), and competitors for lighting and power were the principal causes; and there was no International Exhibition to lead to an unusually large consumption of gas, as was the case in the period with which the past half-year's output was compared. There was a falling-off in both the gas-rental and the receipts for residuals; and coal was dearer by 3s. per ton. These were adverse features in connection with the working. However, the Company have now, as the Chairman put it, "turned the corner," and have entered into contracts for their raw material at a considerable reduction in price. Moreover, the public in Dublin are beginning to appreciate the great advantages to be derived from cooking and heating by gas, as shown by the figures quoted by the Chairman. Though a draft upon the reserve fund to the extent of £9950 was necessary to pay the full dividends of 10 and 7 per cent. per annum, there was left the very substantial balance of £43,255. In addition to this there is a sum of £12,370 in the contingent and suspense account. The confidence of investors in the Company was shown on the occasion of the last sale of shares, when a premium of £12,394 was realized. Contrast this with the position of the electric light undertaking of the Corporation. Already £54,000 has been drawn from the rates to make up for its deficiencies; and they will be saddled with something like £11,000 more this year. There is no prospect of any profit for a long time to come. Meanwhile, the plant is wearing out, and nothing is being set aside for depreciation. Perhaps the ill-will which is being displayed towards the Company by the Corporation, and to which a proprietor referred, is prompted by jealousy. However this may be, the Company can afford to disregard it. The Bill they are promoting will bring them into line with other gas companies in regard to the quality and testing of gas, and will strengthen their financial position by giving them more capital. The proceedings at the meeting passed off satisfactorily; a pleasant feature being the recognition, by an addition to his salary, of the increased responsibility borne by Mr. Francis T. Cotton, the Company's able Secretary and Manager.

Municipal Undertakings and the Question of the Rates.

It is stated that owing to a drop in the receipts of the Ship Canal and to the growing demands of the Education Committee, a substantial increase in the Manchester rates for the coming financial year is regarded as inevitable. This is bad news for the citizens; but the worst point about it, of course, is that it comes just at a time when, owing to the severe trade depression from which the country is suffering, any additional burden will fall with greater heaviness on the shoulders of those who have to bear it than would be the case in a period of greater prosperity. In view of this unsatisfactory outlook, a deputation from the local Chamber of Commerce waited upon the Lord Mayor of Manchester last week, and represented to him that "the time had arrived when a fair restraint should be exercised in embarking upon any new municipal undertakings involving a heavy outlay and a consequent increase in the already oppressive city rates." It was pointed out that, from all appearances, the local commerce had to face a period of very lean years; that an increase in State taxation was inevitable; and that any serious additional charge on the city rates simultaneously must necessarily tend to check the development of existing industries and to restrain the initiation of any new enterprise. In his reply, the Lord Mayor admitted the truth of this argument; and said it was the general desire of the Council that economy should be practised. Touching upon the trading undertakings, he pointed out that, "with the exception of a very few things," the expenses were covered by the revenue; and in a great many instances there was a surplus besides. The concerns occupying the latter happy position were given as gas, electricity, tramways, and markets. Those undertakings on which there had been a loss, he said, ought to be regarded from the inside. Of course, there is some fairness in this; for it may well be that in certain directions municipalities feel themselves bound to embark upon schemes irrespective of any question of profit. This argument is one, however, that cannot be applied to all concerns. Among the instances of losses cited by the Lord Mayor were the cold-air stores, which were started for the benefit of the tenants of the different markets and of the abattoirs. But just as the Corporation had finished the scheme, there came along an opponent, "with the result that prices had to be reduced all round."

The Campfield Market also did not pay; "but it was a very difficult problem to get quit of an undertaking like that." These are two examples that would seem to point a moral; and it is fair to assume that they illustrate the kind of undertakings with regard to which the deputation prayed that fair restraint should be exercised in embarking on further risks. Doubtless the Lord Mayor was correct in saying the Corporation could not help the Ship Canal's decrease in receipts; but the unfortunate point with a concern of this character is that the failing off comes, as already remarked, just at the time (during trade depression) when such a result is least able to be borne by the citizens. To the Lord Mayor's final remark to the deputation: "You must bear in mind that people are always clamouring for something more—for new libraries, new baths, new parks, or something else"—a very simple answer will suggest itself to many people, particularly much-harassed ratepayers.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
March	29	Amount already acknowledged . .	8877	1 1
	30	Exeter Gaslight and Coke Company	25	0 0
		William Ford, Stockton-on-Tees	5	5 0
		William Langford, Longton	2	2 0
		Longton Corporation Gas and Electricity Committee	2	2 0
		Luton Gas Company	21	0 0
		Midland Gas Managers' Association	40	0 0
April	2	Vernon Harston, Norwich	0	10 6
		Uxbridge Gas Company	25	0 0
"	3	Doncaster Corporation Gas Committee	10	10 0
		P. C. Holmes Hunt, Melbourne	5	0 0
		W. E. Price, Hampton Court	2	2 0
		F. J. Ward, Knowle	1	0 0
"	5	Dr. Jamieson B. Hurry, Reading	1	1 0
		Daniel Irving, Bristol	2	2 0
Total		£9019	15	7

Hydraulic Coke-Pusher and Charging-Machines.

The patent hydraulic coke-pusher put on the market about two years ago is now being extensively adopted in leading gas-works in place of the old-style drawing-machine. This pusher is the joint invention of Messrs. Hunter and Barnett, of the South Metropolitan Gas Company, and is manufactured by Messrs. Sir William Arrol and Co., Limited. During the past twelve months, no less than six of these machines have been installed at the Gaslight and Coke Company's various works; and the orders in hand include a trial one for the Windsor Street works of the Birmingham Corporation. Numbers of the machines are at present in operation at the South Metropolitan Gas Company's different stations. The coke-pusher, as is well known, is capable of clearing retorts at one operation, and is suitable for retorts up to five tiers high. During the year 1908, Sir William Arrol and Co. executed orders for a number of their well-known hydraulic charging machines—among others, several for the South Metropolitan Gas Company and also for abroad.

Informal Meeting of Scottish Gas Managers.—We learn from Mr. W. B. M'Lusky, of Perth, the Convener, that the Twenty-Sixth Annual Informal Meeting of Scottish Gas Managers will be held in the Alexandra Hotel, Bath Street, Glasgow, to-morrow, under the presidency of Mr. David Vass, of Airdrie. Before the meeting, which is fixed for one o'clock, there will be a conference of the subscribers to the M'Gilchrist Memorial Fund, to arrange for the inauguration of the medal.

German Association of Gas and Water Engineers.—It is announced that this year's general meeting of the Association will be held at Frankfurt-on-the-Main from Monday, June 21, to Friday, June 25. The Association thus meets to celebrate its jubilee in the city in which it was founded, in May, 1859. The customary assembly and reception will take place on the evening of the Monday; the next three days will be devoted to the technical proceedings; and the Friday to an excursion. The detailed programme will be issued later.

Monazite in the Antarctic Regions.—The discovery of monazite in the Antarctic regions by Lieutenant Shackleton's party, of whose approach to the South Pole an account has just been published, is of more than usual interest, in view of the importance of this mineral in connection with the manufacture of gas-mantles. As is pointed out in the Engineering Supplement to "The Times," if important sources of monazite other than Brazil are found, and the extraction of the rare earths is undertaken by independent manufacturers, the incandescent mantle industry will be relieved of much anxiety; since at the present day it is almost entirely dependent upon the German supply of the earths.

OBITUARY.

JAMES SOPHRON EMILE DRORY.

IT is with much regret that we record the death of Mr. James Sophron Emile Drory, the Chief Engineer of the Aix-la-Chapelle Station of the Imperial Continental Gas Association, which took place last Wednesday from pneumonia following upon an attack of influenza. The sad event occurred with some suddenness; for as late as the end of the preceding week Mr. R. W. Wilson, the Secretary, received a letter stating that Mr. Drory and his wife hoped to be at the dinner in London which it had been arranged should follow the meeting of the Association next month. The next news that came to hand was that he was very ill; and this was followed on Thursday by the intimation that he had died the previous night. The station is just about to undergo complete transformation into a thoroughly up-to-date works, with vertical retorts and all the latest appliances; and in view of Mr. Drory's known keenness and enthusiasm, and of the terrible weather that has lately been experienced at Aix-la-Chapelle, it is conjectured that he may have caught cold while standing about looking after the levelling of the ground and so on. It seems particularly hard that he should have been thus cut off just at the time when he was entering upon the scheme of modernization of the works upon which he had set his heart. Mr. Drory, of course, was one of a family whose name has been connected with the Association ever since the year 1825. That is to say, he was one of eight brothers who have been in the Association's service, and of whom there are now only two left—the second eldest of the family, Mr. W. W. Drory, who is the Chief Engineer at Frankfort-on-Main, and Mr. Alfred Drory, head of the Association's Meter Works at Mariendorf. Mr. James Drory was born in 1850, and entered the service of the Association at Lille, at the age of 17, as a pupil. Some years later he was removed from Lille, and was appointed Assistant Engineer at Brussels, where he remained from 1873 to 1875; and after that he was made Assistant to his brother Leonard at Berlin, and stayed there until 1887. In that year, on the death of the then Engineer, Mr. Drory was sent to Aix-la-Chapelle to take charge of the station; and there he remained. It is a curious coincidence that he joined the Association on April 1, 1867, and died on March 31, 1909, after exactly forty-two years' service. The only members of the Drory family that the Association still have with them are Mr. William Drory, at Frankfort, who is in his fifty-third year of service, his son, Dr. Drory, who is engaged with him, and Mr. Alfred Drory. As to Mr. James Drory's personal attributes, those who were fortunate enough to know him will not need to be told he was a man of a most charming disposition. At the meetings of the German Association of Gas Engineers, he always set himself to assiduously look after any Englishmen present—showing them about, and generally making himself extremely amiable and most useful. Naturally, he enjoyed the utmost popularity among his colleagues, who keenly feel the loss they have sustained. Their deep sympathy also, and ours, is with Mrs. Drory in the terrible bereavement she has sustained.

The death occurred last Sunday, at Wilton Park, Beaconsfield, of SARAH, wife of Sir JOHN AIRD, Bart. The deceased lady, who was married to Sir John in 1855, had been ill for some time; and, as many of our readers are aware, her husband himself is lying in a serious condition.

Mr. GEORGE MALAM, the Gas Engineer and Manager to the Corporation of Dumfries, died there on Thursday last, as the result of an attack of erysipelas. Mr. Malam was fifty-two years of age. He is survived by a widow (his second wife), a son, and four daughters. His father, a native of Yorkshire, was appointed Manager of the Dumfries Gas-Works in 1850. In 1878, the gas undertaking was acquired by the Corporation. The deceased succeeded his father as Manager in 1884. Since then the gas-works have been almost entirely reconstructed; and they are at present in a thoroughly up-to-date condition. Two gasholders were erected in Mr. Malam's time—one in 1885, the other three years ago. A year and a half ago sulphate plant was laid down under his direction; and he was complimented upon it by the Government Inspector. Tidings of Mr. Malam's death reached the Town Council while that body was in session; and kindly references were made by Provost Lennon and Bailie Thomson, Convener of the Gas Committee—the former remarking that they all knew Mr. Malam as a capable and energetic Manager.

PERSONAL.

Mr. WILLIAM CASH, who has for the past eighteen years acted as Secretary of the Bournemouth Gas and Water Company, has resigned this position. His resignation was accepted by the Board; and Mr. HERBERT A. PLUMB, his partner, has been appointed Secretary of the Company in his place.

Mr. CHRISTOPHER SAINTY, Manager of the Corporation Water-Works, who is the oldest Corporation official in Windsor, completed his thirty years' service under the Council of the town on Saturday. He went to Windsor as Manager of the sewage works in 1879; and when the water-works were acquired by the Corporation in 1885, he became Manager, and has retained the post

ever since. In 1887, he celebrated his silver wedding. During his connection with the Royal Borough, he has won the esteem of all who have come in contact with him.

We are pleased to learn that Mr. D. MILNE WATSON, the General Manager of the Gaslight and Coke Company, has been selected to fill the position on the Board of the Brentford Gas Company rendered vacant by the death of Mr. Howard Charles Ward. In view of Mr. Watson's long experience with the Company in the management of which he has so large a share, and of its close connection with the one whose directorate he has now joined, we cannot but regard the appointment as other than a very good one; and we cordially wish him every success in his extended field of labour.

Congratulations to Mr. THOMAS BERRIDGE, the Engineer and Secretary of the Leamington Priors Gas Company, whose name has been placed on the Commission of the Peace for the borough. Mr. Berridge went to Leamington eleven years ago; and prior to that he was for eight years Manager of the Litchurch Gas-Works, Derby. He was articled to Mr. Chas. Taylor, M.Inst.C.E., Engineer to the Derby Gas-Works. Mr. Berridge is Secretary of the Town Improvement Association, a member of the Committee of the Warneford Hospital, and of the House and Finance Sub-Committees thereof. He is also a member of the Education Committee, and of the Higher Education and Elementary Sub-Committees. He is Chairman of the Chamber of Trade.

It has already been mentioned in the "JOURNAL" that Mr. ALEXANDER BELL is relinquishing his position as Manager of the Dalkeith Gas Company. Mr. Bell first went to the town at the age of 13, to serve an apprenticeship to the plumbing business. He there made himself familiar with the gas-works, and was eventually appointed to superintend the erection of those of the Bonnyrigg and Lasswade Gas Company. He was then for eighteen years at Gibraltair, where he largely reconstructed the gas-works. Returning to Scotland, he was appointed Assistant to the late Mr. William Young, who was building the extensive oil-works at Pentland; and when Mr. Young became Consulting Engineer, Mr. Bell was left to supervise the works. Nineteen years ago, he succeeded Mr. John Young as Gas Manager at Dalkeith. Since then many changes have been made; the works having been partly renewed on more up-to-date methods. Mr. Bell, who has all along taken great interest in his work, has during the latter portion of his professional career come to be regarded as an authority on the use of oil for enrichment purposes. He was President of the North British Association of Gas Managers in 1897.

In a report to be presented at the meeting of the Keighley Town Council to-day, the Gas Committee state that they have received a request from Mr. JOHN LAYCOCK, their Engineer and Manager, to be allowed to retire from the position he has held for 42 years; and it is with considerable regret that they have to recommend that such resignation be accepted, and that his engagement be terminated on June 30 next. They, however, recommend that he be engaged as Consulting Engineer for five years, at a salary of £150 per annum, to be afterwards terminable by three months' notice from either party. The Committee further recommend that Mr. WILLIAM BAILLIE, the present Assistant, be appointed Engineer and Manager on probation for twelve months, at a salary of £200; and that the Committee be empowered to renew the appointment at the end of this period, at a salary of £225, increasing by annual increments of £25 to £300 per annum, such appointments to be determinable by three months' notice. It was in 1860 that Mr. Laycock entered the gas-works office as a youth; and seven years later he had reached the position of Manager. In the meantime, he had been away to Bingley for a couple of years. Some particulars of the progress of the Keighley Gas-Works under Mr. Laycock's supervision will be found in our news columns to-day.

At the Queen's Restaurant, Ipswich, last Wednesday, there was a large gathering of the staff of the Ipswich Gas Company, under the chairmanship of Mr. J. T. Jolliffe, the Engineer, Manager, and Secretary, for the purpose of bidding farewell to Mr. WALTER PARKER, who has been in the service of the Company for fifty years. The occasion was celebrated by a dinner. After the toast of "Success to the Ipswich Gas Company," proposed by Mr. F. Prentice, the Works Manager, and responded to by Mr. F. Corder, a Director, had been honoured, Mr. H. Miller, another member of the Board, on behalf of the Directors and the staff, made a presentation to Mr. Parker. Doing so, he acknowledged the excellent service Mr. Parker had rendered to the Company during his fifty years' connection with it, and said the testimonial, which took the form of a handsome aneroid barometer, was an indication of the good feeling he had inspired among all who had been associated with him. Mr. W. A. Garrard also handed Mr. Parker a solid silver cigar-case; explaining that it had been purchased with the money left in hand after the principal gift had been obtained. Mr. Parker, in acknowledging the gifts, briefly sketched his career. Entering the service of the Company in 1859 as an apprentice, he passed into the office staff, and was appointed collector in 1883. The first slot-meter was fixed in 1892, and now there were 10,500 of them; while the number of ordinary consumers was 4425. "The Health of the Chairman" having been cordially honoured, Mr. Jolliffe, in responding, said he was proud of having been instrumental in starting the superannuation fund, and congratulated the members of the staff on its sound position; there being a sum of £6000 invested.

RETIREMENT OF MR. HENRY MORLEY.

THE numerous friends that Mr. Henry Morley, the Engineer and Manager of the Cardiff Gas Company, has made during his lengthy career in the gas industry will learn with regret that, in consequence of failing health, he has decided to resign his position.

About five years ago, he suffered from a serious illness; and he is in fear that any overstrain of work may bring on a repetition of the trouble. The resignation was accepted last Wednesday by the Directors of the Company, who exceedingly regret the step he has been compelled to take; and he will relinquish his appointment about the end of June, when he hopes to take up his residence in South Devon. Into his well-earned retirement, he will take with him the best wishes of his colleagues (who will greatly miss his advice and able assistance), and of all others who know him.

Mr. Morley has occupied his present post for twenty-seven years; having succeeded the late Alderman Bowen in 1882. Before that he spent six years as Assistant Engineer at the Salford Corporation Gas-Works. Born in Manchester in May, 1847, he is now close upon 62 years old. He is the son of Mr. Charles Morley, for many years Inspecting Engineer for the Manchester and Liverpool section of the London and North-Western Railway. It was in Manchester he was educated, and subsequently (in 1861) articulated to Messrs. Walter Mabon and Co., Gas Engineers. His name is to be found among the members of the Institution of Civil Engineers. Mr. Morley has been a quiet, but a thorough, worker. He has, of course, seen great changes in the business carried on by the Cardiff Gas Company, who have latterly made very rapid strides; the increase in the sale of gas last year having been nearly 7 per cent. The population has grown enormously during Mr. Morley's time at Cardiff; and, owing partly to the laying of mains in new areas, the increase in the number of consumers has been even greater in proportion. The make of gas has increased several times over; the output now amounting to about 1200 millions per annum, while there are 30,000 consumers.

Needless to say, this development in business has necessitated vast changes and extensions of the plant for the production of gas. It is less than two years (Oct. 15, 1907) since, in an article entitled "New Methods and Plant at Cardiff," we described a large installation of West's stoking machinery and coke-handling plant, which had just been completed at the Grangetown works, in accordance with a scheme propounded by Mr. Morley. It was shown there that in the twenty years between 1887 and 1906 the quantity of coal carbonized had gone up from 48,632 tons to 97,053 tons; while the gas made had increased from 470,991,000 cubic feet to 1,012,677,000 cubic feet. While therefore the coal carbonized was only 99.57 per cent. more, the make of gas had increased by no less than 115.09 per cent. Mr. Morley had an excellent opportunity—of which he made the best possible use—of proving his skill as an architect in the designing of the handsome offices which were erected on part of the site of the old works at Bute Terrace. These offices are the admiration of all who see them; and they will be a lasting credit to their designer as well as to the Company who occupy them. Since 1907, nothing of an important character in the way of constructional work has been undertaken, except that the Company have inaugurated a complete installation of Messrs. S. Cutler and Sons' carburetted water-gas plant, capable of producing 2 million cubic feet per day. At the present time, Messrs. Willey and Co., of Exeter, have a contract to erect six 40 feet luteless purifiers.

Mr. George Clarry, the Secretary of the Company, who has been appointed to the position of General Manager, has of late years been entrusted with the whole of the development business connected with the undertaking; and, as will have been gathered from the foregoing remarks, this has spread at a very rapid rate throughout the whole of the area of supply. Commencing about five years ago with the slot-meter system, the Company were enabled, by waiting a little, to take advantage of the very latest improvements and methods of working this business to the greatest advantage. At the present time there are nearly 11,000 slot-meters in use; and each installation includes a gas-cooker. The Company have also done an enormous trade in the hire-purchase of cookers, heating stoves, and fittings; and, in addition, they let out on simple hire hot-water circulators, gas-steam radiators, wash-boilers, and other domestic appliances of a similarly useful character. As will be readily understood, all this has had the effect of largely stimulating the demand for gas in the city. But great as has been the success already achieved, it is hoped that—with a progressive Board and energetic management—the future of the Company will improve still further upon the long reign of prosperity that has so far been experienced.

The appointment of Engineer to the Company has been placed in the capable hands of Mr. H. D. Madden, who has for the past two or three years been Works Manager at Grangetown, where he has given the Directors of the Cardiff Gas Company every satisfaction.

North of England Gas Managers' Association.—The half-yearly meeting of the Association will be held in Newcastle-on-Tyne on Saturday, the 1st prox., when Professor W. A. Bone, of Leeds, will deliver a lecture on "The Influence of Surface upon Gaseous Combustion."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 53.)

At last the patience of the Stock Exchange has been rewarded by the advent of a happier state of things, and business last week cheered up brightly. The assurance of the maintenance of peace in Eastern Europe (though some wry faces may have been made at the mode of insurance) coupled with the blessings of cheap money, at once set everything in great good humour. An excellent start was made on the opening day, though the increase in activity was not very large all at once. Prices all round had a nice rise. Consols gained $\frac{7}{16}$; and the Home Government list was strong. Railways and the Foreign Market were up; and the improvement extended sympathetically. Nothing came to mar progress on Tuesday; and the volume of business was increased, while the rise in prices proceeded merrily. The fortnightly account was light and promised to be easy. On Wednesday the cheerful tendency was still in full action; and in all the leading departments prices went from good to better. Thursday witnessed a continuation of the movement. But before the close the inevitable disposition to realize profits manifested itself, and the last prices were not the best of the day. Consols, however, were a fraction higher. Friday's movements were rather uneven and irregular—small advances and reverses alternating with not much result either way in the end. On Saturday, business was very limited, and practically there was no movement to speak of. In the Money Market, there was a strong demand for the month-end and Stock Exchange requirements. Discount rates eased away steadily. On Thursday, the Bank rate was lowered to $2\frac{1}{2}$ per cent., having stood for eleven weeks at 3 per cent. Business in the Gas Market was on a reduced scale; but the general tendency all round was quite buoyant, and a large number of issues made material improvement. In Gaslight and Coke, the passing of their Bill in Parliament through the Commons' Committee was greeted with a quotation rise of $2\frac{1}{2}$, marked prices advancing from par to $102\frac{3}{4}$. In the secured issues, the maximum made $88\frac{3}{4}$, the preference $104\frac{1}{4}$ and $104\frac{1}{2}$, and the debenture from $84\frac{1}{2}$ to $85\frac{1}{2}$ (a rise of $\frac{1}{2}$). South Metropolitan was strong and quiet; prices hardening from $121\frac{1}{4}$ to 123 —a rise of 1. In Commercial, there was no business. Among the Suburban and Provincial group, Alliance and Dublin old realized from $18\frac{1}{2}$ to $18\frac{3}{4}$, British $42\frac{5}{8}$, Ilford $133\frac{1}{2}$ (a rise of 3), ditto "B" 104 (a rise of 1), Lea Bridge $118\frac{1}{2}$, South Suburban debenture $124\frac{1}{2}$, West Ham from 116 to 119 (a rise of $\frac{1}{2}$), in view of the amalgamation terms being raised from 118 to 121 per cent. to counter-balance the reduction of 1d. in the standard price, and ditto debenture $106\frac{1}{4}$ and 107 . The Continental companies were very quiet. Imperial was steady at 182 free to $183\frac{7}{8}$, and Union at 101 and $101\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at 13 and $13\frac{1}{16}$, Monte Video at $12\frac{3}{8}$ and $12\frac{3}{4}$, Oriental at 140 free and 141, Primitiva at $6\frac{1}{16}$ and $6\frac{3}{8}$, ditto preference at $5\frac{1}{16}$, ditto debenture at $96\frac{1}{4}$ and $96\frac{1}{2}$, River Plate at $14\frac{1}{8}$, and ditto debenture at $96\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Slander Gas, if Progress Cannot be Made by Fair Means—Some Assertions at Newmarket, and a Few Questions—Boast and Result—Electricity for High-Pressure Gas Plants—Flouting the Local Government Board.

HARD put to it in effecting progress with the lighting business, the purveyors of electricity are making themselves the laughing-stock of thoughtful men by turning over the musty manuscripts of the past to find out what has been said as to the so-called poisonous and unhealthful characteristics of gas, and putting the result of research to use at shareholders' meetings and in advertising literature. A terrible list of evils arising from gas-burners was presented by Mr. F. E. Gripper, at the last meeting of the Newmarket Electric Supply Company; and we take this as an example of similar wild oratory at electrical shareholders' meetings. Mr. Gripper does not know much about the subject himself; but he takes as gospel some ancient statements by gentlemen whom he terms "eminent scientists," but who mostly paraded their views in days long since, before incandescent burners became the vogue, and who, when they published their extravagant declarations, shrunk into their shells when challenged for the proof. In the name of common sense, we ask these electrical publishers of the ancient sayings of more or less fanatical men to get their assertions proved, under modern conditions and by impartial scientists, before ignorantly holding themselves up to ridicule by an unqualified acceptance. Does it not occur to Mr. Gripper that if one-half what he says about gas lighting is true, that the Newmarket hospital ought to be full to overflowing, that the local doctors ought to be reaping a luxuriant harvest from the diseases set up and aggravated by the use of gas for lighting, and that, seeing the tremendous use of gas in excess of that of electricity for lighting, the country ought by this time to have become largely depopulated. There is little question that Mr. Gripper's forefathers were users of gas, and Mr. Gripper has doubtless himself been guilty of the same pernicious act; and if all he says is true, having lived in atmosphere "vitiated" by the "poisonous"

gases given off by gas-burners, he ought to be no longer among us. But what are the facts? Judging of the complaints of medical practitioners in many places, that they cannot all make a fair living, and bearing in mind that since 1882 (the date of the first General Electric Lighting Act) down to the date of the last Board of Trade returns (1906-7), the quantity of gas sold by statutory gas undertakings in this country has increased from 45,484,910,000 to 167,945,206,000 cubic feet—an advance of 122,460,296,000 cubic feet!—the daily growing use of gas appears to be having the contrary of a health-deteriorating effect; while, to give support to the electricians, the extending use ought to make the medical profession most attractive and lucrative. The facts do not support postulation.

We should like to know who is the "eminent medical scientist" who "recently" explained the many dangers of gas, as alleged by Mr. Gripper. This gentleman also quotes the late Professor Corfield, who used to make all sorts of random statements in the days of the old flat-flame burner; and the same may be said of his other "authority," Dr. George Carpenter. When Dr. Carpenter made the assertions quoted by Mr. Gripper, we put certain questions to him, and submitted to him certain matters for consideration, but he declined to be drawn into controversy. Professor Corfield was likewise challenged; but he was as quiet before as he is after death in regard to the challenge. However, Mr. Gripper is with us, and so, as he has adopted the statements of the "eminent scientists" of days gone by, we ask him to substantiate them. The modern scientific method of using gas for lighting is by the incandescent burner and a bunsen flame. We therefore ask him to describe the character of the vitiation of the atmosphere by gas-burners to which he refers; and to name the "poisons" given off by the incandescent gas-burner. He speaks of carbon monoxide. We should like him to explain how, with the free burning flame of the incandescent gas-burner, carbon monoxide is formed? He also adopts Dr. Carpenter's statement that, in burning, gas gives off "quantities of carbonic acid and sulphuretted hydrogen." There are few people who do not know the smell of sulphuretted hydrogen; and sulphuretted hydrogen is an impurity of gas that the Legislature compels gas suppliers to carefully remove, and it is removed—the operation being one of the simplest. If Mr. Gripper has come across that smell in a gas-lighted room, we should much like to know where and when.

As to the carbonic acid. Mr. Gripper accepts the old-fashioned statement that a gas-burner will poison the air to the same extent as two adults. We do not suppose he saw an article dealing with this very question in the "JOURNAL" for Feb. 9; and it will not do any harm to present him and others with a few extracts, on which they are invited to make any criticism they desire:

A cubic foot of gas on combustion yields approximately $\frac{1}{3}$ cubic foot of carbonic acid. A human being, except when sleeping, gives off about $\frac{1}{3}$ cubic foot of carbonic acid per hour—that is to say, a "Bijou" inverted gas-burner, consuming 1 to 1 $\frac{1}{2}$ cubic feet per hour, produces less carbonic acid than one human being. In a recent number of the "Archiv für Hygiene," Herr W. Weichardt gave an account of some investigations he had carried out on this point. In the air exhaled from the respiratory organs of human beings, he has found a high molecular poisonous product, of albuminous origin, of the character of a toxin. This discovery confirms, and affords an explanation of, Pettenkofer's observation that pure carbonic acid is far less injurious than the carbonic acid derived from respiration. Pettenkofer found that pure carbonic acid in the proportion of 100 parts per 10,000 parts of air was not injurious to human beings; while 10 parts of carbonic acid per 10,000, if derived from the respiration or perspiration of human beings, rendered the air unfit for a person to remain in it for any length of time. Recognizing this difference, Herr Weichardt points out that, in respect of harmfulness to the occupants, five incandescent gas-burners in a room are equivalent to one human being. These figures evidently refer to upturned incandescent burners. If modified to apply to the modern inverted burner, it may fairly be said that ten gas-burners in a room are not more harmful to the occupants than one adult person. Herr Weichardt goes on also to show that the gas-flames actually have a purifying influence, which electric lamps have not, on the atmosphere of rooms, by reason of their free combustion acting destructively upon the organic products of respiration.

If these remarks are not convincing, then Mr. Gripper may read up the authorities referred to by Mr. R. Stephenson, the Chairman of the Newmarket Gas Company, in a letter commenting on the ludicrous statements contained in Mr. Gripper's public utterances. These authorities are: Professor Frankland, Sir Henry Burdett, Dr. Whitelegge, Professor Frank Clowes, Dr. W. A. Aitken, and Professor Carlton Lambert. To this list we would add Professor Vivian B. Lewes, Dr. Samuel Rideal, and Mr. Otto Hehner. We shall look for Mr. Gripper's comments on these statements and replies to our questions with a great deal of interest. Shall we look in vain?

Where should electricity supply be more profitable than in a place where the cheapest electricity can be produced? It was the bold boast some time since of the Chairman of the Stalybridge, Hyde, Mossley, and Dukinfield Joint Electricity and Tramways Board that they were the people who could generate the cheapest. But the cold stubborn fact has to be faced that this year there has been an actual loss of £464 on the electricity department and of £10,000 on the tramways department. In the estimates for the year, nothing was shown on account of a deficit on the electricity department. But the fates seem to be against the concern. How is it? There is some incongruity between this position of affairs, the boast as to cheap production, and the untruths posted

on the interior of the tramcars, that electric lighting is cheaper than gas lighting. If this latter has been true as long as the statement has been in circulation, there should have been such an influx of business that the electricity department ought to show to-day a handsome profit. There is some talk now of extending the use of arc lighting in Hyde; and certain members of the Corporation are, or have been, interviewing the Engineer of the Joint Board on the subject. The Engineer of the Gas Company should also be interviewed if an economical improvement in the street lighting is desired, and not merely the performing of an act of charity to the Board by handing over additional business to them at the expense of the ratepayers. Hastings and other places ought to serve as lessons to the Hyde Corporation. It is recognized by the Chairman of the Finance Committee (Mr. Councillor Perrin) that the responsibilities of local authorities are increasing. That being so, it seems to us to be a senseless thing to unnecessarily add to them. Meanwhile, the electricity and the tramways undertakings are being looked upon with rueful countenance by the local ratepayers.

What appears to be a silly piece of long-sustained pettishness on the part of the Sunderland Corporation Electricity Department has lately been brought to a close. It all arose over high-pressure gas lighting. The green-eyed monster jealously suggested the putting of all possible difficulties in the way of electricity being made the handmaid of this system of lighting. We have heard of this in other places than Sunderland. In one instance, it was held that the small amount of current required to drive a little motor to operate the gas-compressor could not be taken off the lighting cables, and that some yards of cable would have to be specially laid. But generally electrical central station engineers do not make any trouble about the matter. There are a few who do; and, in our opinion, they do so in defiance of the General Electric Lighting Acts, which do not give them discretionary powers as to supply for any purpose, providing the conditions defined by the Act are observed. The trouble at Sunderland has been with Messrs. Craven and Speeding, Limited; and it refers to a small supply of electricity for starting a Diesel oil-engine, used for compressing purposes. Correspondence on the subject began in September, 1907, and continued at intervals until Jan. 6 this year. Mr. A. S. Blackman, the Engineer of the Corporation Electricity Department, originally, it appears, flatly refused to advise his Committee to give a supply for the purpose of starting this Diesel oil-engine; and Messrs. Craven and Speeding assert that afterwards the Town Clerk told their solicitor that, if they wanted the electricity, they would have to go to law to get it. We should like to know under what Act Mr. Blackman refused the supply in the first place, and why the Town Clerk declared that the only course to get the supply was by way of the law. But wiser counsels than these have prevailed; and the Electricity Department are now willing that the firm should have the supply. The firm have been very reasonable in the matter. They have a supply of electricity at the present time; and the small quantity required for the motor they suggested should be taken off their present installation, instead of putting in a special meter. Another question has issued from the high-pressure installation. The firm's assessment has been increased in respect of the Diesel engine and plant and the requisite buildings. The firm seem to be debating now whether it would not be a wise thing to put in a private electricity generating plant; and the scheme that they have before them is said to be a somewhat attractive one. The Electricity Department in this matter, it would seem, have taken imprudent action; and certainly the publicity that has been given to it has not put them in a favourable light in the eyes of the people of Sunderland.

The Local Government Board must feel somewhat humiliated at the ease with which municipal corporations flout their decisions, and reduce their inquiries to a farce. Overspending of loans and spending loans on matters for which they were not granted, are common proceedings; and now the Hastings Corporation, when loans are asked for, and after investigation the Board do not see fit to grant them, calmly tell the Board that they will, in defiance of them, do what they desire, and the rates must bear the cost. There was an inquiry the other day into an application for £5000 for the laying of new mains and house services; and on the occasion the Inspector (Mr. A. W. Brightmore, D.Sc., M.Inst.C.E.) was told point-blank that the Council had decided, through the refusal of the Board to the last application for a loan for the conversion of incandescent gas-lamps to electric ones, to go on with the work piecemeal, and charge the cost upon the rates. If recollection serves aright, this is the second time this has happened. The Corporation are continually applying for loans for electricity purposes; and the more money they borrow, the worse off they get, for the new capital has not the same earning power as the old, and the old has been productive of deficits. There has been reckless expenditure, estimates that have not come true, and a growth of deficiency since the undertaking has been under municipal management. As considerable ratepayers who have to contribute to the making up of losses, the Gas Company opposed the last application. It is a very good thing that Hastings has bodies within the borough in a position to bring these matters to public light. There seems no other way of stopping the "Rakes' Progress" than by pressure of public opinion. Yet there are some people in Hastings who still despise hard facts, who will not look at the situation fairly and squarely in the face, and who essay to defend the policy, the pursuit of which makes the financial position progressively blacker.

NOTES FROM WESTMINSTER.

TO-MORROW Parliament adjourns for the Easter Recess, and will re-assemble on April 19. The proceedings in the Committee rooms last week, save before the two sections of the Local Legislation Committee, were of small amount, though, from the gas industry's standpoint, there was importance in the discussion of certain clauses in the Gaslight and Coke Company's Bill. Concerning this measure, the labour members of the West Ham Borough Council are not at all satisfied with the amalgamation scheme, regarding it from their own narrow point of view; and therefore Mr. William Thorne, M.P.—a member of the West Ham Council, and Secretary of the Gas Workers' and General Labourers' Union—last week gave notice of his intention to make the last possible effort in the House to give the Bill its death-stroke, by moving, on the Bill being presented for third reading, that it be considered "this day six months." But as the Bill contains a clause inserted (true, in shortened form from that which they desired) at the instance of the West Ham Corporation, agreed to by a Select Committee of the House, and appearing now in terms suggested by the representatives of the West Ham Corporation, the House will recognize that Mr. Thorne does not convey the views of that body, but merely of a minority section. The Swinton and Mexborough Gas-Works Transfer Bill (which stood in the group of measures referred to Mr. Mooney's Committee, but was removed owing to agreement) has been before the Unopposed Bills Committee, and has made further progress. Several Water Bills have now also passed the first Committee stage. The water section of the Oldham Corporation Bill has been under the consideration of the Local Legislation Committee. The gas section it was expected last week would not be taken till after Easter. A great deal of local interest has been aroused by this measure, reference to which will be made in these Notes on another occasion. Among others observed in the Committee room in connection with the Bill were Mr. Arthur Andrew and Mr. Tim Duxbury. It is now announced that the Ammanford Bill will be before a Committee on April 27; and the issue of the measure will be watched with peculiar interest, in view of the direct connection it has with the ill-fated Amman Valley Gas Company—one of the miscarriages for the shareholders of the 99, Cannon Street promoting coterie. It is an altogether miserable tale that can be told in connection with this matter; and it is hoped that it will be unfolded in detail before the Committee. The Alliance and Dublin, the Aldershot, and the Yorktown Gas Companies' Bills will be coming before Committees soon after the recess. There is, even at the time of writing, practically a suspension of work until after Easter, and then more Committees of the House of Lords will set to work. Yesterday the Oldham Corporation Bill and the Llanelly Water Bill were under further consideration.

Gaslight Bill.

It will be a surprise, after the proceedings before Mr. Mooney's Committee last Thursday, and the preceding week, if the Bill of the Gaslight and Coke Company does not go through its remaining stages without further molestation. The agreements with the two most formidable opponents weakened the body of hostility generally; the chief of the remaining opponents—the West Ham Corporation—indicated their future attitude by appearing on clauses on Thursday; and several others who raised points have been satisfied. Therefore, if Mr. William Thorne does not succeed with his motion in the House of Commons, we cannot see any quarter from which contention should arise in the House of Lords. The question of the standard for calorific power, in the form embodied in the Bill, is dealt with in our editorial columns; and so may be dismissed from attention here. The only other clause that was discussed at any length before the Committee was the one accepted by the Company, and subsequently ordered by the Committee to be inserted to the extent of acceptance in the Bill, and which provides for the West Ham Gas-Works being substantially continued for a period of ten years from the date of transfer. To give some sort of definition to the word "substantially," the Company suggested that the works should be operated to a degree substantially that preceding the date of transfer; but the representatives of the West Ham Corporation apparently saw in this an opportunity for some collusive action between the Gaslight and Coke and the West Ham Companies, whereby the works would not be operated to their full during the months preceding the transfer. The idea is a humorous one; and the plan by which they circumvent any such action is a case of mistaken cleverness. They wanted the clause altered, and of course the Company allowed them to have their way (so that they cannot now complain), in a manner to ensure the determining year of the scope of working operation being the one "prior to the introduction of the Bill for this Act." The West Ham Company are obtaining good increases of business; and the Corporation have deliberately closed the door upon themselves in respect of the increase of consumption that has taken place during the past winter and since the introduction of the Bill, and of the increase which prospects suggest will be obtained, at the seasonal rates of recent years, during the remaining months preceding transfer. The Ilford Gas Company have also had gratified their desire for a definite outlining of the area of the West Ham Company; and the authorities south of the Thames have had expressed in black and white the assurance of the Gaslight and Coke Company that there shall be a reversion to

the conditions of charge existing in their area south of the Thames before the South Metropolitan Gas Company dropped their illuminating power to 14 candles. The price in the Gaslight and Coke Company's southern area is controlled by that of the South Metropolitan Company; but a difference of 2d. per 1000 cubic feet was made in favour of the Gaslight Company on the South Metropolitan Company receding to a 14-candle standard, and the Gaslight Company continuing to supply gas on a 16-candle standard. Now the Gaslight Company are coming down to the 14-candle standard. There was one other important matter to be adjusted, and this affected the West Ham proprietary; being raised by the relinquishing of 1d. by the Gaslight Company from the standard price—making it 3s. 2d. Of course, this altered the terms of transfer so far as the West Ham stockholders were concerned. But the matter has been satisfactorily adjusted, by the addition (to the £118 per cent.) of £3 of Gaslight stock per cent. of West Ham stock. The amount of stock required for this fresh purpose is to be obtained by the Gaslight Company purchasing in the open market out of their reserve fund. These are all the points of any general importance. Satisfaction has been given all round by mutual arrangement or, where the matter has been left to their judgment, by the decision of the Committee. All's well that ends well.

The "Doubtful Character" of Gas-Works.

We live and learn. Mr. Emmott (Chairman of Ways and Means of the House of Commons) and his colleagues of the Unopposed Bills Committee last Thursday were in a pessimistic mood, or perhaps their judgment had been upset by an electrician telling them of the wonderful hopes and prospects of the electrical industry in the matter of the herculean task of removing the gas industry from the face of the earth. Simultaneously with the utterance of the statement to which we are about to refer, in a neighbouring room, the first standard calorific clause in a town gas Bill was being discussed, which, in itself, speaks of a transition period in the history of the gas industry, and of expanded potentialities and spheres of usefulness. But perhaps Mr. Emmott and his colleagues have not studied the whole of the signs of the times in relation to the gas industry. Anyway, he made a very remarkable statement in the shape of a reason for a fresh inclination of mind on the part of the Committee. The Swinton and Mexborough Bill, which embodies a scheme for a Gas Board and the purchase by arbitration of the works of the Swinton and Mexborough Gas Company, was before the Committee. Originally, the promoters proposed a period of 40 years for the repayment of the purchase money; but they had, on a report by the Local Government Board, reduced the period to 35 years. The Committee allowed this period; but the decision was accompanied by this statement "for the assistance of anybody whom it may concern." "I ought to say," observed the Chairman, "the mind of the Committee is set against any increase, and, in fact, is rather set on a decrease, in the number of years they are likely to allow for the purchase of gas-works, *because of the somewhat doubtful character of the undertaking in the future.*" Of course, no one can tell what the future has in store for any enterprise; but the gas industry itself is very well satisfied with its outlook at the present time, and can see nothing more doubtful about it now than in past years. Of more immediate importance than the reason adduced for the future policy of the Committee is that policy itself. Local authorities contemplating possession of gas undertakings may make a note of the fact that, in considering the financial bearings of purchase, a reduced repayment period for the purchase loan is a contingency not to be neglected. It may usefully disturb the views of would-be municipalizers. If it does, the thanks of gas companies will be due to Mr. Emmott, no matter how much they may dissent from his opinion.

Water Bills before Committees.

There have been several Bills before Committees of both the House of Lords and the House of Commons. All that have reached the stage of decision at the time of writing have passed, with more or less amendment. Among them were the Clevedon and South Lincolnshire Water Bills proposing new works; and these have gone forward. The Workop Water Bill has raised some interesting points. Its principal objects were new works and additional capital. The Bill represents one of a group brought about by the decision (in the early part of last year) in the Frimley case of the Court of Appeal, holding that it is illegal for a water company to sink wells upon land, although within their statutory area, unless power is specifically obtained for it in an Act. The Company wanted power to obtain a new supply from described wells; but it was suggested, in the course of the proceedings, that a supply could be obtained from the Manton Colliery of the Wigan Coal and Iron Company. This seemed to appeal to Lord Kintore and to his fellow Committeemen, so much so that his Lordship adjourned the proceedings for the purpose of consulting Lord Onslow, the Lord Chairman, as to whether it was competent to substitute for the construction of a well the proposal to grant a supply of water to the Company from the Manton Colliery, and further giving power to the District Council to come to Parliament next year for authority to purchase the undertaking without the enhancement of its value. The Lord Chairman thought the course could be adopted. The purchase clause was thereupon inserted; but the Company were allowed power to spend money necessary for maintaining the undertaking, and carrying out their existing obligations and "works to be done in pursuance of this Act."

Yet another echo of a decision from the Law Courts was heard in connection with the West Gloucestershire Water Company's Bill, against which the Bristol Water Company were the principal opponents. The Bill is an important one, involving an additional capital of £90,000 and £30,000 borrowing powers. But the bone of contention had reference to the supply of water in bulk to persons and authorities outside the present area of supply. The Company in their operations have not in this respect strictly adhered to the terms of the Water-Works Clauses Act; and an infringement of the Bristol Water Company's rights brought the two Companies into the Law Courts—the Bristol Company gaining the day. The West Gloucestershire Company sought by the Bill to legalize their position; and, in a large measure, they have done so, but the Bristol Company have been protected. A disputed district—Charlton—has been excluded from the Bill; and the model clause as to supply in bulk has been allowed in place of one suggested by the promoters. Extension of limits has also been the principal point of discussion in connection with the Llanelly Water Bill, which has been before Mr. Rose's Committee. The interesting feature of the scheme, however, is that

referring to the filtration of the water. In this respect improvement is very much needed. Some 12 acres of land are to be taken for the purpose of ensuring purity, by the construction of filter-beds, and obtaining protection against the possibility of pollution. Five filter-beds are to be constructed as a start. The upper and lower storage reservoirs are to be separated—one being used for trade and the other for domestic supply. It is not proposed to filter the trade supply, this representing a large proportion of the whole. A great saving in capital and annual expenditure will result from this plan, though a system of duplicate mains will be required. The Northallerton Water Bill has been before the same Committee; and it was only opposed for the purpose of obtaining protection, and not from any objection to the designs of the Bill itself. The preamble was declared proved; but a clause was inserted providing for the better cleansing of the reservoirs than heretofore. There has not been much heard of the instruction, at the instance of Mr. Courthope, to Commons Committees, to consider whether the promoters have made adequate provision by their Bills for the supply of water at reasonable rates to agricultural communities within their areas of supply.

THE HIGH-PRESSURE INVERTED GAS-LAMPS IN FLEET STREET.

THE attention that the use of high-pressure inverted gas-lamps for illuminating Fleet Street has attracted in the lighting world is a sufficient reason for presenting our readers with two photographs taken in the dead of night, and by the light only of the lamps themselves. The lamps are of Keith's new high-pressure type, worked at a pressure of 54 inches, and giving an efficiency of 60 candles or upwards per cubic foot of gas consumed. The lamps being of 1500-candle power, the consumption of gas is therefore about 25 cubic feet per hour. The lamps are disposed on brackets affixed to premises bounding the roadway, on three refuge columns—Chancery Lane, Fetter Lane, and Ludgate Circus—and on one footpath standard by Bell Yard.

From the efficiency demonstrating point of view, the lamps suffer a disadvantage, in that the newspaper offices and shops of Fleet Street make such a lavish display of other external lights. It is only when night has far advanced, that these lights are extinguished and the public gas-lamps are left in sole possession; and it is merely for a short space of time before the vans arrive in the early hours to begin the work of distributing the morning

papers, that the street can be found fairly well deserted for photographic work. At two o'clock one morning, a time of quiet was snatched for these two photographs, when a comparatively long exposure could be given.

The first photograph shows a portion of the street looking in a westward direction from Bolt Court; and the second from the refuge by Fetter Lane looking eastward. Of course, photographic reproduction, and reproduction again from the photograph (by the aid of process blocks and the printing-machine), cause a considerable depreciation from the real lighting effects. Upon these as actually presented in the street both the Gaslight and Coke Company and the James Keith and Blackman Company, Limited, have received much commendation; but what we should like to see is a City street, devoid or practically devoid of shops, illuminated by lamps of this new type, so that, unaided and without obstruction from other lights, a proper manifestation might be made to the City Corporation and the public of the light-giving efficiency of the lamps. The City Fathers and the public cannot be expected to sit up until about two o'clock in the morning to judge of their sole effect in Fleet Street.



Fleet Street Under the Light of the New High-Pressure Inverted Gas-Lamps—Looking Westward.

GAS STANDS AT A TRADES EXHIBITION.

AN annual event at Birmingham—in which business, amusement, and philanthropy are combined—is the National Trades Exhibition at the Bingley Hall, which has already, by the handing over of a portion of the entrance fees, benefited the local Queen's Hospital to the extent of over £2000. It remains open for ten weeks, and is as attractive as good organization, enthusiastic exhibitors, and excellent music can make it. This year's show was opened about a week ago; and it is gratifying to be able to state that among the many branches that are represented the gas industry takes quite a prominent place. Electricity, of course, is also to be seen; and the lighting of the hall, which is a very large one, is divided between the two illuminants. It is, however, perfectly safe to assert that the extremely efficient general installation of high-pressure incandescent gas lighting on the Sale-Onslow system of Messrs. Thomas Glover and Co. does not suffer by comparison with the arc lights, nor do the individual gas-lighted stands when contrasted with those on which electricity is used.

Both gas and electrical appliances are exhibited by the Birmingham Corporation; but the latter we may leave to those who are specially interested in them. We must, however, congratulate the Gas Department on the first-rate display they make on their stands. Gas-fittings of the most tasteful patterns are there in plenty, as well as gas-cookers and fires and a slow combustion coke-stove. The Corporation supply and fix their own pattern gas-cookers free with penny-in-the-slot installations. In addition to this, they let out certain sizes at a quarterly rental; while larger patterns are supplied on the hire-purchase system. Returning to the gas-lights shown by the department, these are on both high and low pressure. The Sugg high-pressure lamps (for outside shop lighting, &c.) are supplied at 20 inches; the gas being taken from the general high-pressure installation at 60 inches pressure, and then lowered by means of an ordinary Sugg reducing governor. There is also on view a Sugg hot-air engine for use with high-pressure installations. The convenience of the automatic switching on and off of gas-lights is amply demonstrated by the employment of a number of pneumatic switches. A centre three-light cluster is so arranged that one of the lights can be turned up from a certain point (which in a room would be near the door), and the other two by pulling a cord attached to the gas-alier. There are also three furnished rooms—bedroom, dining-room, and drawing-room—in which the uses of gas are fully demonstrated.

A special feature is made at the Gas Department's stands of the "Forward" inverted burner, the sole manufacturers of which are Messrs. Ingram and Kemp, Limited. One of the features of this burner (which was described and illustrated in the "JOURNAL" for Sept. 15 last, p. 719) is the utilization of a closing disc on the top of the mantle, by means of which it is stated that all the heat generated by the flame within the mantle is forced to pass out through the fabric of the mantle, instead of creeping up the central tube. The result is that the burners do not light-back; and the gas can be lowered until only the tip of the mantle is incandescent. This perfect control in regard to turning the light down



Self-Intensive Lamp with "Forward" Burner.

has rendered the burner popular for use in churches, &c. There is no air or gas adjustment; and it is claimed that the bijou size burner gives a light equal to 20 candles with a consumption of 1½ cubic feet of gas per hour. The bijou size is largely used in machine shops, with an anti-vibrator, for the lighting of automatic lathes, &c. There is a larger size consuming 3 cubic feet per hour and giving proportionate results; and it may be pointed out that the burners are entirely made in England. The same type of burner has also been made into a self-intensive lamp, which is said to be giving excellent results; the candle power



Fleet Street Under the Light of the New High-Pressure Inverted Gas-Lamps—Looking Eastward,

being about 100, for a consumption of just under 3 cubic feet of gas per hour. The tops are of aluminium, and so always keep their colour.

Another exhibit of the Gas Department is a large glass case, which contains a complete collection of the chemical and dye products obtained from the distillation of gas tar, as well as some gas-testing apparatus, and selections of Messrs. Fletcher, Russell, and Co.'s furnaces for special uses, both for amateurs and professionals. One of these will melt 56 lbs. of brass in twenty minutes; while another is intended for melting scrap gold and running it into ingots. There are also annealing plates, and appliances for brazing brass and copper tube. Enamelling muffles, both large and small, are to be seen; and it is rumoured that with the aid of the latter several "amateurs" in Birmingham are enabled to add substantially to their incomes.

At the stand of Messrs. Thomas Glover and Co. and Messrs. R. & A. Main, there is to be seen the duplicate installation of Sale-Onslow high-pressure plant which, as already remarked, supplies the whole of the high-pressure lighting to the exhibition. The total lighting power that is furnished to the hall at 60 inches pressure by this installation is about 90,000 candles. A high-pressure tinmen's bolt heater is also shown in action; the feature of this being that the bolt always goes straight into the very centre of the heat. Then there is a high-pressure gas laundry iron, the manipulation of which is watched with interest by the visitors to the exhibition. In referring to this stand, mention must not be omitted of the attractive incandescent gas street-lamp made in accordance with the patent of Mr. T. Glover which was noticed in the "JOURNAL" for Jan. 26 last (p. 250). This lamp has a copper top, and is entirely seamed and riveted. On the front of the stall are to be seen a good selection of Messrs. Main's fires and cookers, &c. The use of gas for cooking and heating purposes is also well demonstrated on other stands—by the Parkinson Stove Company, who include numerous samples of the Maughan patent geysers; and by the Cannon Iron Foundries, who, in addition to cookers and fires, exhibit various other appliances of utility to the householder.

The mantle making industry is represented by the Plaissetty Manufacturing Company and Messrs. George Bray and Co. The former now pack their soft inverted mantles in boxes of three, with one ring, so as to economize in the use of rings, and consequently in cost; the mantles being easily attached to the ring by means of a registered arrangement somewhat in the form of a slip-knot. They have also on their stall a sample of the "Litz" oxy-petrol gas machine. Messrs. Bray and Co., in addition to mantles, show their various upright and inverted incandescent burners, and other well-known specialties. "Ironclad" mantles are to be seen at the stall of Messrs. Horrell and Bowman, of Birmingham. Mr. John Thacker, the Chairman of the Birmingham Master Gas-Fitters' Association, and Mr. Felix C. Bateman, also of Birmingham, show some general gas-fittings and appliances; and Messrs. Joseph Breeden and Sons, of the same city, exhibit the "Hands" English-made self-intensive shop lamp, with which very good results are said to be obtained.

The National Gas-Engine Company have an excellent display of their types of engines, which are, of course, suitable for use with either town gas or suction gas. Messrs. Tangyes Limited and Messrs. Davey, Paxman, and Co., are also well represented in the same line. All these firms show their engines in connection with producer plants; but in Birmingham the Corporation have met the competition of suction gas by reducing the price of their gas where used for power purposes to 1s. 6d. per 1000 cubic feet. The application of a gas-engine to a private house electric light installation is illustrated by the Walsall Electrical Company.

CLOSE OF THE "ROBERT HUNTER" FUND.

MANY of our readers will doubtless remember that rather more than ten years ago the Chester United Gas Company were suddenly deprived of the services of their Engineer, Mr. Robert Hunter, who succumbed to a paralytic seizure while sitting in his office. It will probably also be recalled that he left a widow and eight children, only one of whom was able to earn anything. With the view of assisting Mrs. Hunter in the distressing circumstances in which her bereavement had placed her, a number of her late husband's professional friends in the Manchester District Institution of Gas Engineers, of which he was one of the earliest members, and had filled the positions of Hon. Secretary and President, as well as his Masonic brethren (he was a member of the Evening Star Lodge up to within two years of his death), took steps to raise a fund to be devoted to the maintenance and education of the children. The co-operation of the "JOURNAL" was readily accorded, and in response to an appeal made in our columns a sum of £303 10s. was subscribed in about two months, in addition to which £131 18s. 11d. was raised by members of the Manchester Institution—making a total of £435 8s. 11d. After consultation with Mrs. Hunter, it was determined to place the entire amount under the control of Trustees; and three were accordingly appointed—one being Mr. W. S. Haddock, of Warrington, who was President of the Manchester Institution at the time the fund was started, and the others Mr. Donald D. Macpherson and Mr. Walter King—with absolute power to administer

the fund at their discretion. When recording, in the "JOURNAL" for Sept. 12, 1899, the decision which had been come to, we took the opportunity of conveying to all the subscribers to the fund Mrs. Hunter's "very sincere and heartfelt thanks for the great kindness extended to her and her children." She said she had "no desire to touch the principal," but felt great comfort in the assurance that all her children would be properly educated and helped forward in life, and that there was a very considerable sum for them to fall back upon should ill-health prevent her doing her share towards the bringing up of her family. Besides the sum named, Mr. W. W. Woodward of Bromley, who joined the gas profession under Mr. Hunter's management, undertook to bear half the cost of the education of one of the sons.

The amount standing to the credit of the fund at the end of 1899 was £439 9s. 5d.; and it was augmented by interest and additions, so that the Trustees have been able to hand over to Mrs. Hunter from time to time sums amounting in all to about £673—the payment of the final balance having been made on the 22nd of February. In her letter acknowledging it, Mrs. Hunter says: "The money has indeed been a great boon to me, as it has enabled me to educate, clothe, and maintain my children in a way that otherwise would have been quite impossible." With the exception of the two youngest children, who are still at school, and one boy, they have all succeeded in obtaining fairly good posts. Mrs. Hunter concludes by again expressing her deep gratitude to the many friends who so generously subscribed to the fund, which, she says, "has been so valuable to us during the struggles of the past ten years." She also tenders her sincere thanks to the Trustees of the fund, for kindly undertaking the large amount of work which its management entailed.

ANALYSIS OF SPENT OXIDE.

By A GAS-WORKS CHEMIST.

IN view of the difficulty of determining the sulphur in spent oxide, apart from tarry matters, some experiments begun some time ago, but only recently completed, are here recorded. They relate to a method in which the spent oxide is burned; the products of combustion being passed through an oxidizing mixture, and the sulphur estimated as barium sulphate. As spent oxide is mostly bought with the ultimate view of extracting its sulphur by burning, the method has the advantage of similarity between actual and laboratory practice.

A weighed quantity of spent oxide contained in a porcelain boat was placed at one end of a combustion tube; the other end of the latter being connected to a series of absorption vessels containing bromine water. On gently heating, the sulphur in the oxide burns; the products being absorbed by the bromine.

The first trials were unsatisfactory, owing to sulphur depositing in the cooler part of the combustion tube. This was overcome by maintaining the tube at a red heat throughout its length—this being more satisfactory than placing the oxide at the end nearer the absorption vessels. Even with this modification, the sulphur recovered was still too low; and it was found that some was passing through the bromine without being taken up. The few cubic centimetres of pure bromine were only placed in the first vessel—the others at the start contained water only; and although the bromine vapour is carried throughout the series of bottles, it was seen that this was not as effective as it should have been.

After many trials, the method as finally employed consists in heating 10 grains of the spent oxide in a porcelain boat in a combustion tube heated to a dull red throughout its length; the boat being placed two-thirds of the way down the tube, so that the incoming air is heated prior to reaching the oxide. The products of combustion are drawn by means of a pump through four absorption bottles, each containing 5 c.c. of pure bromine (free from sulphur) and sufficient distilled water to give a seal of about 4 inches. At the end of the combustion (the pump being kept working to clear the tube), the solutions are united (the last bottle, if tested separately, should be free from sulphur), the excess of bromine boiled off, barium chloride added, and the precipitated barium sulphate washed, ignited, and weighed as usual.

By this method, a test on 5 grains of pure flowers of sulphur gave 36.3 grains of barium sulphate, which equals 4.985 grains of sulphur—equivalent to 99.7 per cent. of the original quantity taken.

In connecting the absorption vessels, care must be exercised that the joints are glass to glass, so as to avoid any contact between the gases and the india-rubber tubing.

If the oxide contains any quantity of ammonium sulphate, this must be allowed for, as the heat volatilizes it, and it is consequently carried to the bromine solution. [One per cent. of ammonium sulphate contains 0.24 per cent. of sulphur.] Any sulphur in the tarry matters contained in the oxide may be neglected.

It is essential that the oxide be only gently heated, so that the combustion is gradual; and the gases must be aspirated slowly. The combustion takes about an hour.

THE CONDITIONS FAVOURABLE TO THE PRODUCTION OF METHANE.

By THOMAS HOLGATE, M.Inst.C.E., F.C.S.

THE great importance of methane in coal gas is allied to that of the unsaturated hydrocarbons; so that a thorough understanding of the former is likely to shed light on the formation and preservation of the latter. The interest is not diminished, but rather heightened, by the figures so far available as to the quantity and composition of the gas made in vertical retorts, whether operated intermittently or continuously. The diversity of the figures pertaining to these retorts and to horizontals (as shown in Table XXV., which appeared in Vol. CIV. of the "JOURNAL," p. 118), forms a sufficient justification for further inquiry as to the determining conditions with respect to methane.

The paper of Mr. I. Bond, of Southport, read before the Institution of Gas Engineers in 1905, furnishes some data of a valuable character for tracing the effect of temperature upon distillation in horizontal retorts; and for some additional information thereto, the present writer has to thank that gentleman. Mr. Bond mentioned an experiment upon a charge 12 inches thick; but his valuable details refer to two nearly parallel experiments, each with a charge 6 inches thick—the initial temperature thereof at the floor of the retort being 480° C. and 680° C. respectively. In the first of these two, there were obtained after removal of the carbonic acid, 9955 cubic feet per ton of 14.25-candle gas tested in an argand burner with a 3-inch flame. In the second, similarly, 11,486 cubic feet per ton of 13.47-candle gas were obtained. The candles per ton work out at 28,372 and 30,943 respectively—a gain of 2571 = 0.9 per cent. by the increased temperature of the retorts. The 12-inch charge was worked off in eight hours, the 6-inch charges in 360 and 320 minutes respectively; the corresponding figures for the first-named being 11,195 cubic feet \times 13.3 candles = 29,779 candles per ton. The incidence of heat in

this case was different to that in the other two; and, further, as the details for each interval of time are not given for this case, our lessons must, of necessity, be drawn from the others almost exclusively.

The above-named results represent the yield in illuminating value per ton deduced from the paper; but by taking the average illuminating and calorific values with the production in cubic feet for each interval of twenty minutes, the results are as follows: 480° C. test, 9954 cubic feet \times 15.18 = 30,228 candles per ton; 680° C. test, 11,486 \times 13.77 = 31,644 candles per ton—a gain of 1416 = 4.7 per cent. The gross and net calorific values per ton equal 6376 and 5751; 6825 and 6107 thousands respectively—a gain of 449 = 7 per cent. gross and 356 = 6.2 per cent. net. The two sets of figures of this and the preceding paragraph are not seriously divergent, and appear to be the inevitable difference due to experimental conditions; and the latter set is only given because it is necessary for the object of this article to deal in detail with each twenty minutes' interval.

When these are summarized, the figures just given ought to accord therewith. Table I., which gives the details, shows that, broadly, the higher temperature distillation gained up to 140 minutes from starting, after which the low temperature gained. This comparison applies to the quantity of gas and to the illuminating and calorific values. In these tests—but not in the 12-inch thick charge—the highest temperature was that of the coal in contact with the floor of the retort, and the lowest usually that of the middle of the coal mass. That these varied considerably is evident from the maximum and average given in the table. The conduction of heat through the coal would probably be lowest in the 480° C. test; and the figures for the quantity of gas produced therein, raise the question whether the gushes were coincident with the accession of the necessary distillation temperature to succeeding layers of coal. In both tests, the best returns are from the gas made during the first 140 minutes. But to gain an insight into the components thereof, an examination must be made of the respective illuminating and calorific figures.

TABLE I.

Twenty Minutes Intervals from the Start of Distillation.	Temperature Centigrade.		Gas in Retort Estimated Minutes.	Cubic Feet Produced During Twenty Minutes.	Gas Produced in Twenty Minutes.		Temperature Centigrade.		Gas in Retort Estimated Minutes.	Gas Produced During Twenty Minutes.			From Beginning of Distillation Minutes.
	At Bottom of Charge.	Average of Charge.			Candle Feet Value of Gas.	Gross Caloric Value B.Th.U.	At Bottom of Charge.	Average of Charge.		Cubic Feet.	Candle Feet Value.	Gross Caloric Value of Gas, B.Th.U.	
	480°						680°						
1	530°	348°	2.7	151.8	459	97.4	700	563	1.3	314.9	1195.4	246.6	20
2	565°	378°	3.3	121.6	519	101.5	720	623	1.6	254.8	903.6	174.0	40
3	600°	408°	3.0	133.1	570	111.8	740	680	2.0	204.8	714.0	136.4	60
4	633	444	3.0	133.8	566	105.4	760	726	2.3	174.5	563.7	108.0	80
5	667	482	2.6	152.7	562	110.2	780	751	2.0	194.8	606.2	117.5	100
6	700	520	3.0	133.4	467	90.7	800	777	2.2	181.3	534.5	110.8	120
7	720	540	2.4	163.5	565	111.0	830	810	1.9	205.5	568.4	122.3	140
8	740	610	3.0	989.9	3707	728.1	900	867	2.4	1533.6	5085.8	1015.6	160
9	760	640	2.3	133.2	444	88.2	930	900	2.3	164.3	421.9	95.1	180
10	778	693	2.6	154.7	521	110.2	956	916	2.0	175.5	427.5	59.5	200
11	800	740	2.3	174.0	482	106.3	984	932	2.6	195.6	453.0	108.0	220
12	815	760	2.8	143.5	390	86.2	1010	948	2.3	154.7	333.8	82.3	240
13	821	775	2.4	163.5	417	94.8	1020	964	2.6	174.2	369.3	88.5	260
14	828	808	2.8	144.5	353	81.2	1030	980	3.0	154.4	307.9	76.0	280
15	835	820	3.0	134.0	313	72.3	1020	1000	3.9	133.9	243.4	61.0	300
16	850	840	3.2	124.3	227	60.6	1015	1000	4.9	103.1	161.9	45.8	320
17	900	860	4.9	82.0	143	36.8	—	—	—	82.2	106.9	34.5	340
18	940	880	5.6	72.2	114	31.7	—	—	—	—	—	—	360
Produce after the 140th minute				1498.6	3,850	866	—	—	—	1337.9	2825.6	690.6	—
Produce of the whole distillation				2488.5	7,557	1594	—	—	—	2871.5	7911	1706.2	—

It is manifest from Table I. that the rate of gas production varies much more in the second, or high temperature test, than in the first. The ratio between the production during the first and sixteenth interval is, in the second case, $\frac{314.9}{82.2} = 3.8$, and in the first $\frac{151.8}{124.3} = 1.2$. This must have an important influence on the products of the distillation, causing the gas, for instance, in the last period of the second test to have a long time of contact with a retort and its contents at an undesirably high temperature, judged from the standpoint of methane preservation. To find out the average time of contact of the gas, it is first necessary to know the cubical capacity of the retort, which was of 20 in. by 15 in. internal cross section. The layer of coal, which was 6 inches thick, would leave a space barely one square foot, which, for a retort 20 feet long, would mean about 20 cubic feet. In the first test, the average production of gas was 6.91 cubic feet per minute, and in the second 8.97 cubic feet. The average time of contact of the gas would be $\frac{20}{6.9} = 2.9$ minutes, and $\frac{20}{8.97} = 2.23$ minutes. But this will be seen to vary in the intervals shown in Table I., from 2.7 to 5.6 minutes and from 1.3 to 4.9 minutes—a range notably different in the two instances, and, moreover, liable to a greater variation than these figures show. While the average time of contact is shown for each period of 20 minutes, yet the gas generated nearest the ascension pipe would presumably escape contact in a shorter period, and that farthest away in a longer period than the figure which represents the average. Possibly gas

in some part of the charge, or at some period in the distillation, may be some ten, fifteen, or more minutes in contact with heated surfaces.

It would appear that we are justified in attaching importance to this fact when we see, by Table I, how the gas falls off in quantity and quality in the second test compared with the first, at the time when the rate of gas generation has diminished and the temperature has risen, with the result that the hydrocarbon content is impoverished. It is doubtless risky to make minute comparisons between the details of these two tests; but the following observations may be made with such reservation being duly borne in mind. An instance of the effect of temperature alone, without alteration in time of contact, appears in line 11 for the first test contrasted with line 12 of the second test, where, with the same quantity of gas, the quality is 30 per cent. higher for lighting and 20 per cent. for heating—the average temperature in the one case being 740° C., and in the other 948°. Similarly line 17 of test No. 1 compared with line 16 of test No. 2 shows, with the same output of gas, 143 candle feet against 106.9—a gain of 33 per cent. for lighting and from 34.5 to 36.8, or only 6.6 per cent. for heating.

It is clear then that, even at the end of the distillation, there are hydrocarbons present that affect the illuminating value more notably than the calorific value. The chief consideration appears to be the combined effect of increased time contact along with increased temperature; for the period after 140 minutes shows that the quality suffers more from the high temperature than does the quantity—indeed, it would seem that the quantity was maintained

at the expense of the quality. The indications of the illuminating value are more sensitive than those of the heating value; and if they are followed in the table, it will be noticed where diminution in the production of lighting hydrocarbons has begun, or possibly decomposition in one part of the retort has immediately followed upon such production in another part. Although perhaps less marked, yet the influence can be traced in the heating values; and Diagram No. I. shows this. The gross calorific value of the gas produced from the 5 cwt. of coal during each 20 minutes is shown in thousands of B.Th.U., as in columns Nos. 7 and 13 of Table I.

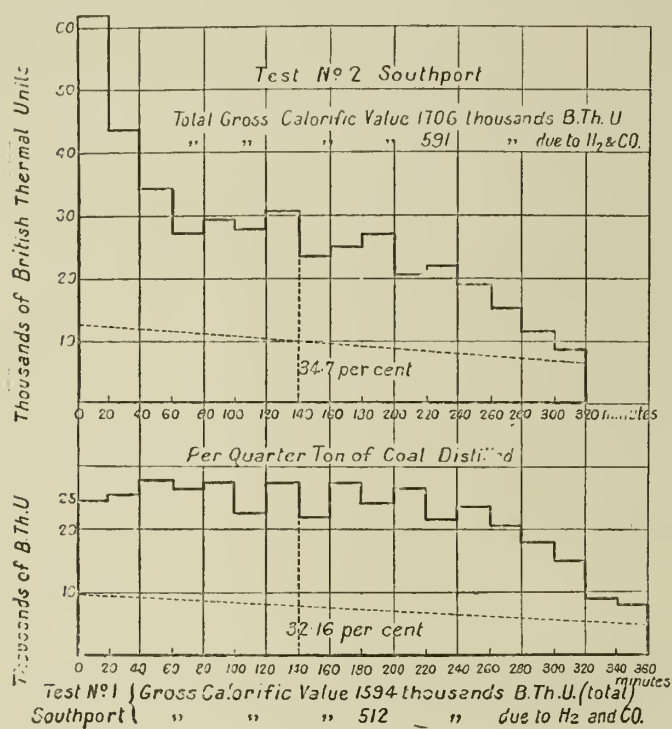


Diagram I.

The total amount is 1706 thousands for the second test and 1594 for the first test. Of this it is estimated that 591 thousands are probably due to hydrogen and carbon monoxide in the former and 512 thousands in the latter; leaving for hydrocarbons 1115 and 1082 respectively. The dotted line has been drawn to give an approximate idea of the energy due to hydrogen and carbon monoxide, allowing for a lower percentage in the mixed gases at the beginning and a higher percentage at the end of the distillation. The diagram shows that the gain in test No. 2 is entirely due to the temperature at the start being better suited to the requirements of the case, and that it loses a large proportion of the advantage gained by overheating in the latter stages. The more uniform line for the low temperature shows that probably a smaller percentage of the higher hydrocarbons were then being broken up.

The percentage of heating value due to hydrogen and carbon monoxide has been calculated by assuming the two to be equal to 60 per cent. by volume in both cases; but this must favour test No. 2. The figures thus assumed show 32.16 and 34.7 per cent. for tests Nos. 1 and 2 respectively; leaving 67.84 and 65.3 per cent. for the hydrocarbons respectively. Bringing together these computations of the Southport tests, and comparing the figures with those for typical cases recently investigated, we obtain the following table:—

TABLE II.

Place of Test.	Kind of Retort.	Total Heating Value of Gas.	Heating Value Due to Hydrocarbons.	Per Cent. of Total.
Nottingham	Horizontal, small test	7,734,881	5,178,426	67
Dessau (non-steaming)	vertical 4-metre	6,799,310	4,358,515	64
Nine Elms	vertical	7,411,562	5,137,335	69.3
Southport, low-temperature test	horizontal	6,376,015	4,325,491	67.84
Southport, high-temperature test	"	6,824,942	4,458,826	65.6

The first in Table II. represents Newcastle coal tested in an experimental iron retort, in which it is probable the gas was all liberated in twenty-five minutes, and that the time of contact would not exceed two minutes. It was one of a series of tests to find out the effect of an increase of temperature; and this, the highest of the series, gave distinctly the best results. May we infer that the pre-eminence is due to suitability of temperature and shortness of contact? And may the like inference be extended to the verticals at Nine Elms? The temperature of distillation at Dessau is not given—it is generally understood to be a high one—yet the total results are intermediate between the two Southport tests, and the percentage due to hydrocarbons the

lowest of the five. This relation would lead us to inquire whether the decomposition of the hydrocarbons had taken place through a proportion of the gas having to pass through a mass of coal that would act as a contact substance, facilitating the breaking-up of ethylene, and even of methane. The difference between the figures for illuminating power given by Mr. Körting in January last year for the Mariendorf results—viz., 10.7 candles—and the figures (15.87, Vol. CII., p. 798) given by Mr. Hayman in June is large. Is it an indication of an improvement effected by a more easy exit for the gas provided by charging the coal in two distinct streams with the round pieces in the centre? Again, while the theory advanced by Dr. H. G. Colman (see "JOURNAL" for March 17, 1908, p. 683) is, in the writer's opinion, inapplicable to the case there dealt with, yet it is not conceivable that such an action may occur in a minor degree in the Bournemouth retort when steam is not excluded, and may explain the low figure for the unsaturated hydrocarbons in the test at Nine Elms? For there is this important difference—the heavy hydrocarbons must have been nearly all driven off in the Dessau retort before steam was applied; whereas at Nine Elms the steam admission would be simultaneous with the generation of hydrocarbons.

Diagram II. shows the gross and net calorific values per cubic foot, and also the difference thereof, in the two Southport tests, and indicate the presence of more hydrocarbons in the low temperature test. From this, and the preceding information, the commercial problem appears to be to gain the advantage of the first half of the high temperature distillation without the disadvantages of the second half. How far these views are tenable will best be discussed after detailed consideration of the properties of methane and ethylene ascertained experimentally during recent years.

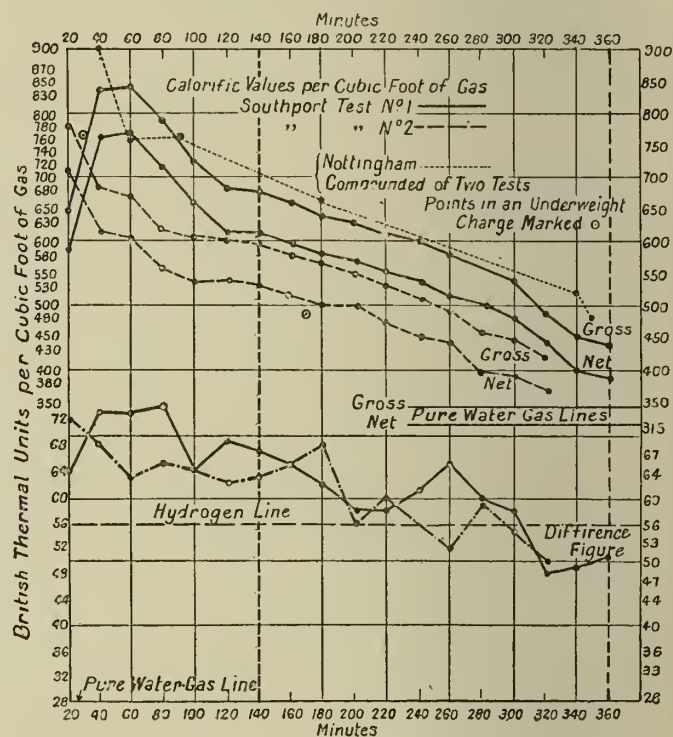


Diagram II.

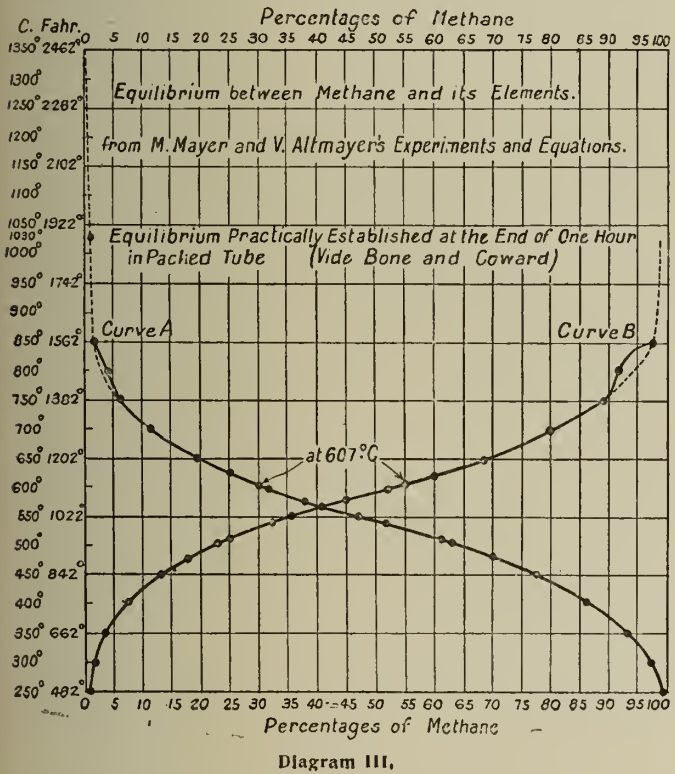
M. Mayer and V. Altmayer, of the Technical High School at Karlsruhe, have determined the conditions of equilibrium at successive temperatures between hydrogen and methane, under atmospheric pressure. They find that the percentages of methane, as shown in Table III., are stable in the presence of hydrogen according to the reversible reaction $C + 2H_2 \rightleftharpoons CH_4$. The thermodynamic expression for the equilibrium is $21.1 + \frac{18,507}{T}$

— $5.9934 \log_e T - 0.002936 T = R \log_e \frac{P_{CH_4}}{P_{H_2}^2}$, where T is the absolute temperature on the Centigrade scale, R is the gas constant expressed as 1.985 calories, and where P_{CH_4} is the pressure of the methane and P_{H_2} the pressure of hydrogen in the mixture. From the equation it will be seen that with decreasing hydrogen pressure the equilibrium pressure of CH_4 rapidly falls. Thus at $850^\circ = 1123^\circ C.$ absolute, where, at atmospheric pressure, 1.59 per cent. of methane is in equilibrium with hydrogen, whose pressure is that of 98.41 per cent. or 0.9841 atmospheres, a decrease of the pressure of the hydrogen to 0.1 atmosphere lowers the methane content to 0.016 per cent.

These figures, of course, mean that the percentages of methane and hydrogen given in the second and third columns would exist under atmospheric pressure at the temperatures named, provided sufficient time were allowed for equilibrium to be attained. In other words, these relations are those to which the gases are tending with a force and at a rate proportional to their distance from the point of equilibrium. Other things being equal, it is reasonable to expect these ratios to exist where the gases are reacting, as in the generation of methane from the hydrogen and carbon of coal. But we cannot predicate these figures precisely for the

Temperature Centigrade.	Percentages in Equilibrium.		Increment Per 50° C.	Per Cent. of Original CH ₄ Decom- posed.	Increment Per 50° C.
	CH ₄	H ₂			
250°	98·79	1·21	..	0·609	..
300°	96·90	3·10	1·89	1·57	0·96
350°	93·12	6·88	3·78	3·56	1·99
400°	86·16	13·84	6·96	7·43	3·87
450°	76·80	23·20	9·36	13·12	5·69
500°	62·53	37·47	14·27	23·05	9·93
550°	46·60	53·31	15·84*	36·37	13·32
600°	31·68	68·32	15·01	51·88	15·51
650°	19·03	80·97	12·65	68·02	16·14
700°	11·07	88·93	7·96	80·07	12·05
750°	6·08	93·92	4·99	88·53	8·46
800°	4·41	95·59	1·67	91·55	3·02
850°	1·59	98·41	2·82	96·87	5·32

interior of a gas-retort, because the reaction to which they apply $C + 2H_2 \rightleftharpoons CH_4$ is doubtless accompanied by the production of water gas $C + H_2O = CO + H_2$, and by two others $CO + 3H_2 \rightleftharpoons CH_4 + H_2O$ and $CO_2 + 4H_2 \rightleftharpoons CH_4 + 2H_2O$, and, further, because of the presence of heavy hydrocarbons and of the incombustibles, which affect the partial pressures of the hydrogen and methane. As, however, the two last-named gases frequently total 82 per cent., and sometimes 90 per cent., of the coal-gas product, the preceding data must be largely applicable, and for exact purposes can be recalculated for nine-tenths of an atmosphere or any other given condition. Notwithstanding these reservations, the figures of Mayer and Altmayer, from which the tables have been deduced, are of fundamental importance; and Diagram No. III. shows the behaviour of methane and hydrogen



under heat from 250° C. to 1030° C. The result at the last-named temperature is due to Professor Bone and Mr. H. F. Coward. The curve A... shows the percentage of methane in equilibrium with hydrogen in accord with the second and third columns of Table III. At 250° C., scarcely any methane will be decomposed; while at 1030° C. only 1 per cent. remains undecomposed. But the last equilibrium was only attained after heating for an hour in a tube containing quicklime as packing. About 607° C., it appears that the rate of decomposition of methane per degree rise of temperature is at its maximum; the maximum being shown both by the decrease of volume of methane per cent. (Curve A), and also by the increase in the percentage of the original methane decomposed (Curve B). These are not identical figures, and their relation is shown in the fourth and sixth columns of Table III., and in further detail for the maximum point as follows:—

Temperature. Centigrade.	Hydrogen Present. Per Cent.	Methane Percentage.		Percentage of the Original Methane De- composed.	
		Present.	Decrease Per Degree of Tempera- ture.	Amount.	Per Degree Increase of Tempera- ture.
577°	61·78	38·22	..	44·70	0·312
600°	68·32	31·68	0·2843	51·88	0·312
607°	70·60	29·40	0·3250	54·56	0·383
625°	75·25	24·75	0·2583	60·32	0·320
650°	80·97	19·03	0·2288	68·02	0·308

This important fact explains how it is that injury to hydrocarbons by high temperature in the retort is not so serious as might be expected from consideration of the effect of medium temperatures. The hydrogen liberated by the decomposition of the methane acts as a brake by its accumulation of partial pressure to prevent further decomposition of methane. Thus above 607° C. the retarding action of the square of the hydrogen pressure is greater than the effect of heat in driving the reaction; and as a result there is, at 800° C., a less increase in the rate of decomposition of methane per degree of temperature than there is at 400° C.

It may be well at this juncture to inquire whether these facts are not capable of explaining some of the phenomena that accompanied attempts a few years ago to improve coal carbonization by passing through the retort a quantity of water gas. The passage of such gas would help to take away the methane from the hot surfaces, and thus reduce the chances of its decomposition by heat. But so far as the water gas introduced had a less partial pressure of hydrogen than the coal gas from the last stage of a distillation, so would it reduce the retarding influence thereof; and, consequently, what would be gained by one influence might be partially or wholly lost by the other. It is quite conceivable that if hydrogen alone had been admitted, instead of water gas, the hopes of the experimentalists might have been realized.

So far as the writer knows, there is no available information sufficiently complete to be able to determine whether the relationship of methane to hydrogen in the gas-retort follows the law of their equilibrium; but in the absence thereof, he has examined data furnished by Mr. Lewis T. Wright of certain tests carried out on coals undergoing a six-hours' distillation, giving analyses, but no quantities of gas, and no temperatures. These he has compared with the two tests at Southport, which give quantities of gas at frequent intervals, with their calorific values, but no analyses. Such a comparison cannot be pressed very closely; but there is such concordance in the general results that Table V. has been compiled summarizing the result of a large number of calculations thereupon,

Nottingham Tests.				Southport Tests.				
Particulars of the Test Conditions.	Minutes from Starting Distillation.	Gross Calorific Power Calculated from Analysis.	Approximate Equilibrium Temperature Calculated from H ÷ by CH ₄ Percentage.	Minutes from Starting Distillation.	Gross Calorific Power Observed. B.Th.U.	Temperature by Pyrometer Centigrade.		Particulars of the Test Conditions.
						Average.	Maximum.	
Test A. Six hours' duration of charge.	80	788	444	633	Test No. 1, beginning at 480° C. 5 cwts. coal, 6 hours' charge.
	..	..	..	100	722	482	667
	90	761	520° C.	90	751	463	650	
	205	638	575° C.	180	638	640	760	
	335	526	620° C.	300	540	820	835	
Test B. Six hours' duration of charge.	40	905	475° C.	40	835	378	565	Test No. 1. Ditto.
	180	665	560° C.	160	662	610	740	
	345	476	660° C.	326	476	846	867	
Test C. One light-weight 4-hour charge.	20	783	563	700	No. 2 test, beginning at 680° C. 5 cwts. coal, 5½ hours' charge.
	..	..	..	40	683	623	720
	30	760	536° C.	30	733	593	710	
	165	487	635° C.	260	492	964	1020	

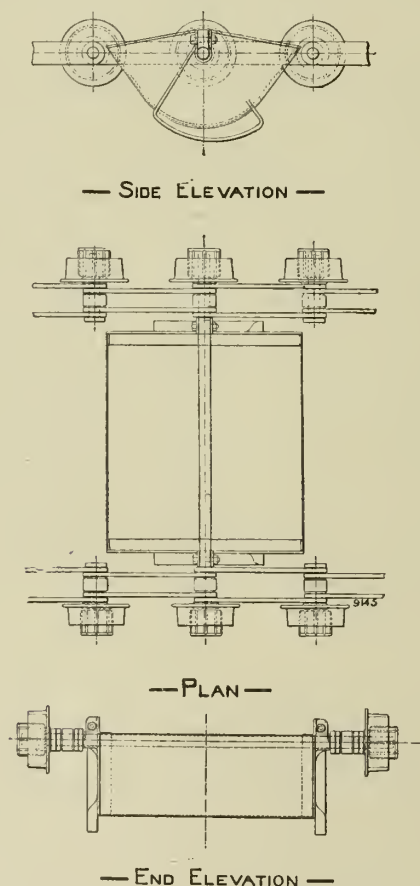
From these figures, it would appear that conformity with equilibrium is greatest at the lower temperatures. This is quite considerable in all the three comparisons; but in the higher temperatures all three show a higher content of methane than equilibrium between hydrogen and methane would lead us to expect. Of this divergence, there are at least two possible explanations. First, that while some parts of the coal are at a moderate temperature the methane produced there is not decomposed sufficiently rapidly during the time the gas is in the retort to reach the equilibrium proportions corresponding either to the maximum or average temperature.

This view necessarily relies for its soundness upon the slowness of decomposition of methane, observed by Professor W. A. Bone and Dr. F. Haber, whose experiments will be dealt with later. Secondly, the presence of hydrogen assists the decomposition of ethylene into methane; and this secondary formation of methane would go to swell the methane content, providing it were withdrawn from the retort with sufficient rapidity to delay the further decomposing effect of heat. Besides these two considerations, there is another, which, according to the balance of conditions, might add to the methane content, or, at a higher temperature, lower the methane with the production of hydrogen and carbon monoxide; the altered partial pressure of hydrogen again having a preserving effect upon the remaining methane. $\text{CH}_4 + \text{H}_2\text{O} \rightleftharpoons 3\text{H}_2 + \text{CO}$. When methane reacts with steam, it produces three times its own volume of hydrogen along with its own volume of carbon monoxide. The partial pressure of such a mixture would be 75 per cent. hydrogen; and from what we have seen before, this would lower the rate of decomposition of the remaining methane. Subsequent figures will show that there is a possibility of this reaction being of considerable magnitude in certain instances.

(To be continued.)

A NEW GRAVITY BUCKET CONVEYOR.

A new gravity bucket conveyor has recently been patented and introduced by Messrs. Graham, Morton, and Co., of Leeds; and the accompanying illustration will give readers an idea as to its construction.



The buckets are built up of mild-steel body-plates with cast-steel sides. The bucket side is so designed that it can be fitted after the chain is fixed, by means of chilled cast-iron pads, secured by bolts or pins. The chain used is of the firm's well-known standard design.

The advantages which are claimed for this bucket over those of ordinary type are that it may be fixed or disconnected without disturbing the chain; the buckets being mounted on the spindle connecting the two strands, the chain is not twisted, as in the case where a bucket is engaged with short pins projecting from each strand; and, further, the bearings are of the swivel type—thus making it impossible for the bucket to grip or tighten should the spindle for any reason get out of the square.

MANCHESTER JUNIOR GAS ASSOCIATION.

The Tenth Annual Meeting of the Association was held on Saturday, at the Exchange Hotel, Manchester. Mr. E. J. WELLENS (Hebden Bridge), the retiring President, occupied the chair at the commencement; and he was supported by Mr. J. Taylor (Mossley), the President-Elect, Mr. J. Alsop, the Hon. Secretary, and Mr. R. W. Garlick, the Hon. Treasurer.

During the first portion of the proceedings, the following visitors were present: Mr. J. Hewett, Past-President of the Midland Junior Association; Mr. S. W. Shepherd and Mr. C. T. B. Roper, of the Yorkshire Junior Association; and Mr. W. J. Liberty, of the London and Southern Junior Association. To these gentlemen, who had earlier in the day taken part in a conference of the Councils of the Junior Associations, Mr. WELLENS extended a cordial welcome on behalf of the members of the Manchester Association.

Mr. HEWETT, in responding, referred to the advantages to be derived from such conferences as that in which they had just taken part; and he, with Mr. Shepherd, brought greetings from their respective Associations to the Manchester Association, coupled with the best of wishes for its continued prosperity and usefulness.

ANNUAL REPORT AND ACCOUNTS.

The annual report of the Council was then presented. They recorded with satisfaction a largely increased membership of the Association; there being now 157 names on the roll, compared with 116 at the beginning of the session. Two of the members, having obtained appointments out of the district, had resigned. Having referred to the fact that by a special provisional rule the session had extended from September, 1907, to March, 1909, the Council added that the year had been remarkable for the following important innovations: For the first time in the history of the Association a definite syllabus had been printed and handed to the members in advance; the first united meeting of the English Junior Gas Associations was held in Manchester at the Gas Exhibition in November, 1907, the second taking place at the Franco-British Exhibition in London; a Joint Council had been formed of delegates from the Junior Gas Association Councils to meet annually to discuss how best to further the interests of juniors throughout the country; and the session had for the first time seen the publication of the Transactions of the Association. The Council also recorded with satisfaction the introduction of a series of "coffee meetings;" the success of these being demonstrated by the interest taken in them, and the papers submitted for discussion. Thanks were tendered to the following gentlemen for lectures delivered to members and papers given at meetings during the session: Dr. Harold G. Colman, M.Sc., of London; Mr. Isaac Carr, M.Inst.C.E., of Widnes; Mr. R. S. Gibson, Assoc. M. Inst.C.E., of Liverpool; Mr. H. Davis, of Blackburn; Mr. J. Alsop, of Stockport; Mr. J. E. Dudley, of Higginsshaw; Mr. F. Thorp, of Manchester; Mr. H. H. Mercer, of Widnes; and Mr. D. V. Hollingworth, of Salford. Thanks were also extended to Mr. Alsop for taking up the duties of Secretary to the Association, in succession to Mr. A. L. Holton, who, in recognition of his four years' service, was in November last presented with a handsome timepiece. Sixteen Council meetings had been held during the extended session.

The balance-sheet, certified by Mr. J. Robinson (Altrincham), showed that the year wound up with a sum on the right side. Subscriptions yielded an income of £45 15s.; and the principal item in the expenditure column was £28 12s. 6d. for printing and stationery.

No question arose on the report and accounts; and they were formally adopted.

ELECTION OF OFFICERS.

There were three nominations for the vice-presidency; and, on a ballot, the Scrutineers announced that Mr. F. Thorp, the Council's nominee, had been duly elected. The following other appointments were made:—

Hon. Treasurer.—Mr. R. W. Garlick.

Hon. Secretary.—Mr. J. Alsop, Stockport.

Auditor.—Mr. J. Robinson, Altrincham.

Members of the Council.—Messrs. R. B. Braddock, J. E. Dudley, C. E. Teasdale, C. Woodhead, and W. Buckley.

All were re-elections with the exception of the last-named, who takes the place of Mr. Thorp for the unexpired term.

Mr. THORP, in acknowledging his election as Vice-President, said he considered a great honour had been done him, because in due course he would succeed to the highest position the Association could offer to a member. He looked upon the Association as having done a very large amount of good.

On the motion of Mr. W. BUCKLEY (Manchester), seconded by Mr. S. CARTER (Garston), a hearty vote of thanks was accorded to the officers.

Mr. BRADDOCK having replied for his colleagues and himself,

INTRODUCTION OF THE NEW PRESIDENT.

Mr. WELLENS, in asking his successor to take the chair, expressed the hope that Mr. Taylor would have a very pleasant year of office, and that the membership of the Association might be increased during his presidency.

THANKS TO THE RETIRING PRESIDENT.

Mr. TAYLOR, on taking the chair, said his first duty was to move that the best thanks of the members be tendered to Mr. Wellens for the services he had rendered during his term of office. As they were no doubt aware, Mr. Wellens was one of the founders of the Association, and throughout its ten years' existence he had been among its most active members. A noticeable feature of the period during which Mr. Wellens had occupied the chair was the remarkable development of the Junior Gas Association movement; and he had the satisfaction of knowing that the Manchester Association had not only increased in membership, but in usefulness to those connected with it.

Mr. D. O. HOLLINGWORTH seconded the motion, which was carried with much enthusiasm.

Mr. WELLENS, in responding, said he desired to acknowledge the cordial support which had been given to him by the members of the Council and the executive officers.

INAUGURAL ADDRESS.

The PRESIDENT began by thanking the members for electing him to fill the position he was then occupying in the Association, and then paid a tribute to the excellent work done by their representatives on the Council. Referring to two recent innovations—the meeting in Liverpool and the Tuesday evening “coffee” meetings—he said the former was so successful that he hoped, in justice to those of the members who came from the neighbourhood, at least one meeting would be held there every session in future. With regard to the Tuesday evening meetings, they had been so useful in encouraging diffident members to freely express their views (the speeches being unreported), that they also would form an important portion of the future programmes. He thought the good attendance at these gatherings was evidence that the “JOURNAL” had been mistaken in saying the Junior Associations held too many meetings. Mr. Taylor next referred to the fact that he was the third of Mr. Tim Duxbury's one-time assistants who had occupied the presidential chair, and testified to that gentleman's interest in the junior movement. He expressed satisfaction at the success of nineteen of the members in obtaining senior positions, and alluded in appreciative terms to the two joint gatherings of Junior Associations held in Manchester and London, as showing the vigour of these organizations. He then dealt with the following topics.

Carbonizing systems have undergone great changes during the last twenty years, and undoubtedly even greater changes are in store. It is most important that members of Junior Associations should carefully study all the published information that they possibly can respecting vertical retort systems and coke-ovens. It is impossible to predict which of the two methods will finally yield the best and most economical results; but either of them will effect a considerable displacement of labour, a greater yield of gas per unit of coal, and consequently a decrease in manufacturing costs. I am very pleased to find we have a Lancashire Gas Engineer and a Lancashire Town Council who are prepared, after careful consideration, to erect the first large installation of vertical retorts in this country on Messrs. Woodall and Duckham's system—I refer to Burnley. This system effects what has always been the dream of gas engineers—that is, continuous carbonization. More than ninety years ago, Clegg was engaged on this problem; but, unlike so many of his other inventions, his process yielded no very successful results. Mr. Leather, in his admirable report, points out that, taking a not too favourable estimate, the cost of producing 1,350,000 cubic feet of gas in vertical retorts will be £24 per day, against £36 per day in inclined retorts. When to this is added the saving in money, not to speak of trouble and anxiety, due to the absolute freedom from stopped ascension-pipes, pitched hydraulics, and last, but not least, naphthalene, the advantages in favour of verticals appear very considerable. I hope, and with considerable confidence, that Mr. Leather's decision will be thoroughly justified, and also that when the plant is working with the success anticipated he will not forget the juniors in the gas profession, but will invite our Association to Burnley to inspect and admire the plant. Sunderland has decided to instal Dessau vertical retorts; and a comparison of the results obtained by them and by the Burnley retorts will be keenly looked forward to by the whole of the gas industry. I would once again emphasize the necessity to our members of studying these systems as thoroughly as possible.

I have had some little experience with retort-house governors, and can confirm, to some extent, the good opinions which have been so freely expressed about them. At the same time, I believe the most important work they have done has been to render more practicable the reduction of the amount of seal in the hydraulic mains, and also to direct so much attention to the question of careful and equal adjustment of dip-pipes. The statements that as much as 2000 cubic feet additional gas per ton of coal, together with a higher candle power, have been obtained by the use of these governors, should be taken “with a grain of salt.” These figures certainly have been obtained where bad working existed in the past; but they are due to three principal reasons—viz., governor + equal dips + lessened dips; and it is very difficult to say which of the three is the most important factor in obtaining the great benefits which have been obtained. Attention to these points has enabled me to increase the production of gas at Mossley by upwards of 800 cubic feet per ton, with the maintenance of the

same illuminating power. As this means a saving of about 1000 tons of coal per year, together with reduced working expenses, it forms no inconsiderable item for a comparatively small works such as ours.

Many gas managers are occasioned considerable anxiety and trouble by excessive back-pressure from their purifiers. As a very great sufferer for the last eight years from this trouble, which was caused principally by the small capacity of the purifying plant, I can very strongly recommend the system first adopted, I believe, by Mr. Ogden at Blackburn. It consists in taking the inlet-pipe in the purifier half-way up the box, and sending the gas in two streams—one passing upwards and one downwards—each through equal thicknesses of material. I have been able to run the purifiers longer at Mossley, and have reduced the back-pressure no less than 8 inches, by the introduction of this system. I can specially recommend it for use in lime purifiers, as no form of “hurdle” or other special grid with which I am acquainted can be used for lime; whereas this simple method gives excellent results. At Hollinwood, I was able to use about 25 per cent. more material in the lime purifiers, and at the same time obtained a reduction in the maximum back-pressure of about 9 inches. The cost of altering a purifier is trifling, and it can easily be effected between the times of emptying and refilling.

Owing to some trouble with a holder continually “sticking” when supplying the governors, and the consequent risk to the town's supply of gas, I obtained a pressure alarm to make a contact on an electric bell circuit whenever the pressure fell below a minimum amount on the governor inlet-main. As I was unable to throw the holder out of action for the necessary repairs, this alarm has proved invaluable, as it gives the attendant warning in ample time to turn on the other gasholder. In fact, I am so satisfied with it, that I now consider it quite unnecessary to obtain a safety governor, which previously I had considered an essential portion of all gas-works plant. Its cost is inconsiderable compared with that of a safety governor, and with a trifling amount of attention its reliability is, I think, even greater.

A matter which has assumed very great importance of recent years is the liability for accidents, particularly in the form of workmen's compensation; and it appeared to me not inadvisable to bring before you a few elementary precautions which are, in my opinion, too often neglected, possibly through being so very elementary. As a gas-works employs labour during the night as well as the day, it seems essential that the place should be well lighted. But in many towns the gas-works are about the most miserably lighted works in the town, and can very seldom be compared with the electricity works for efficient lighting. But it may be said that the one has a single building or block of buildings only to illuminate, while the other has detached, scattered buildings, filled with grimy apparatus, and streets, passages, yards, and large spaces within its boundary walls. These, however, are the very places which need good lighting, to aid good workmanship, to avoid accidents to men and plant, and also to demonstrate that gas can easily overcome such trivial difficulties and give a more satisfactory light than any of its rivals. Though gas engineers often recommend owners of mills, workshops, and similar places to improve their lighting by high-pressure installations, they are not merely content with low-pressure lighting for their own works, but in many places use most inefficient flat-flame burners, and even open pipe ends. There are few gas-works where the gas used for lighting them could not be reduced very considerably by the introduction of modern systems, with at the same time an increase of two or three times the total amount of light. What wasted opportunities there are of advertising the effectiveness and efficiency of modern gas lighting.

A large number of accidents on gas-works arise through defective scaffolding; and these are seldom due to faulty design, but generally to carelessness in construction or to weakness of the materials employed. Overhanging planks forming traps have caused the loss of many a good workman's life; and a look-out should always be kept for these traps, which are, of course, formed by planks being used which are of too great length, and are not fastened by any means. All timber intended for scaffolding and all ladders should be carefully examined; and if any unusual weight is to be carried, they should be properly tested before use. If there is any doubt about the safety of any ladder, plank, putlog, or any other material for scaffolding, a gas manager should never “chance it,” but have the doubtful portion immediately cut off. Ladders are easily replaced; and it is better to condemn a score of ladders than run the risk of losing a workman's life.

It seems astonishing how many accidents, and often serious ones, occur through a barrow, a piece of coal, or a weight of some description falling upon and injuring the workmen's toes. And it is equally astonishing how few are the accidents caused by inhaling large quantities of gas, more particularly as mainlayers and other workmen who are exposed to escaping gas always treat the matter so carelessly. It is very seldom one can get a mainlayer, for example, to look upon the bladdering of a gas-main as at all dangerous, unless he has once been thoroughly gassed, and especially by a mixture containing water gas. The only precaution that can often be taken is to insist upon the men leaving the gas-charged atmosphere to get a breath of fresh air before they feel even the slightest effects; and to this end there should be plenty of men to deal with any job involving the possibility of gassing.

Too much carelessness exists in many gas-works regarding lights in what may be called the “danger areas.” Unprotected

flames should not be allowed near gasholders or scrubbers, or inside purifier-houses, governor-houses, meter-houses, carburettor-houses, and all similar places. The use of miners' oil-lamps is not advisable, as the gauze speedily becomes defective in gas-works. Electric hand lamps should be provided for works purposes; and it is also advisable, I consider, to supply meter inspectors with pocket electric lamps. This latter precaution is one which is particularly advisable in visiting cotton-mills and many other works, where matches or unprotected lights are in many rooms not permissible.

I do not pretend to have done other than briefly mention a few common-sense safeguards which any gas-works manager or assistant would do well to bear in mind. They are all points which, seemingly trivial and elementary in themselves, have, when neglected, resulted in the loss of a valuable life, or even in a serious disaster such as has too often occurred, involving, it may be, a score of lives. I do not wish to encourage timidity, as the timid man causes far more accidents than even the careless one; but a careful man will endeavour to prevent all that ordinary human foresight can prevent.

I have spent some little time in looking through the excellent "Analyses of Accounts" for the past year published by the "Gas World;" and I would strongly recommend others to do the same. Though it may at first sight appear a rather dry exercise, it is undoubtedly a very profitable one; and, moreover, it becomes exceedingly interesting. The figures I wish to call your attention to are some comparisons between gas undertakings in various towns in Lancashire and Yorkshire of similar size to that at Mossley. The gas made in these towns varies from about 90 million cubic feet per annum to about 150 millions; the make at Mossley being 126 millions. The figures are mostly concerning distribution statistics. The unaccounted-for gas varies in these towns from 3.5 to 12.6 per cent.; Mossley's figure being 9.4 per cent. The figures are no more in Mossley's favour when the leakage per mile of main is observed; the highest being 313,700 cubic feet, the lowest 101,200 cubic feet, and Mossley 268,636 cubic feet. The consumers per mile of main vary from 218 to 115; the latter figure referring to Mossley, and thus accounting, to some extent, for the figures obtained in the previous comparisons. The consumption per consumer is very much in Mossley's favour; the variation being from 15,200 to 22,300 cubic feet—the latter figure referring to Mossley. The distribution costs range from 1.94d. to 5.66d. per 1000 cubic feet of gas sold; the latter figure again referring to Mossley. Manufacturing costs range from 1.119d. to 15.6d. per 1000 cubic feet; Mossley's figure being 15.04d. Capital charges range from 8.64d. to 32.19d. per 1000 cubic feet; the lower figure being Mossley's. One cannot but feel considerable compassion for a gas undertaking which is compelled to pay 2s. 8d. per 1000 cubic feet on account of capital charges; and the manager of it is to be congratulated on the fact that he is able to sell gas at 3s. 9d.

The calculations I have made as a result of the preceding comparisons are shortly these: The Mossley gas undertaking supplies the borough of Mossley and the urban district of Saddleworth. Of its 48 miles of mains, upwards of 30 miles are in the latter district. From the gas-works there is a line of main for a distance of eight miles in one direction through Saddleworth, while branch mains extend to as much as three miles from this trunk. It follows that the cost of the maintenance of the Saddleworth mains is a very considerable proportion of the total, as almost all the Mossley mains are within two miles of the works. Unaccounted-for gas is heavy in the Saddleworth district; meter inspection is expensive; and repairs are costly and difficult to effect as promptly as is desirable—these things being due entirely to the straggling character of the district. The heavy distribution costs are two to three times as much as would be considered reasonable under different conditions, but were rather inflated by some special expenditure during the year. The consumption per consumer for the separate districts is: Mossley, 20,080 cubic feet; Saddleworth, 25,921 cubic feet. The higher figure is due to the number of mills using gas in Saddleworth. In Mossley, many of the mills use electricity, generated chiefly by their own plant. As I showed by the table of costs obtained for the discussion with the electrical students, these mills actually pay much more for lighting with their own electric plant than do the mills which use gas. To return to the figures. The consumption per mile of main in the two districts is: Mossley, 3,408,061 cubic feet; Saddleworth, 1,760,913 cubic feet—the latter being an exceptionally low figure for so large an area. The unaccounted-for gas, based on mileage of mains, I estimate as 4,435,000 cubic feet in Mossley and 7,392,000 cubic feet in Saddleworth. As I have taken no account of the heavier pressures in the greater portion of the Saddleworth mains, it is probable that the latter figure would be found too low.

The President said he regretted that, owing to want of time, he had only been able to touch the fringe of the subjects he had dealt; and he concluded by expressing the hope that the Association would have a most prosperous year in every way that could further the interests of the members.

Mr. C. WOODHEAD (Manchester) in proposing a vote of thanks to the President, said he thought Mr. Taylor had nothing to apologize for, as he had certainly given the members some very good ideas and points to reflect upon, especially in the matter of retort-house governors and the results of experiments in dealing with the trouble arising from back-pressure from the purifiers.

He agreed with Mr. Taylor that, generally speaking, the lighting of gas-works was bad, and the cause of many accidents.

Mr. C. BERRY (Hyde) seconded the motion; and it was carried unanimously.

The best wishes of the meeting were offered to Mr. Taylor for success in his new sphere at Mossley.

The PRESIDENT, in reply, said he desired to emphasize what he had stated about retort-house governors and the lighting of gas works. At Mossley, by paying attention to the lighting, they had reduced the cost—taking gas at the selling price—by £60 in a quarter. If this could be done at a small place like Mossley by attention to this apparently trivial point, what would be the saving in the case of larger works?

The business of the meeting then concluded; and a smoking concert followed.

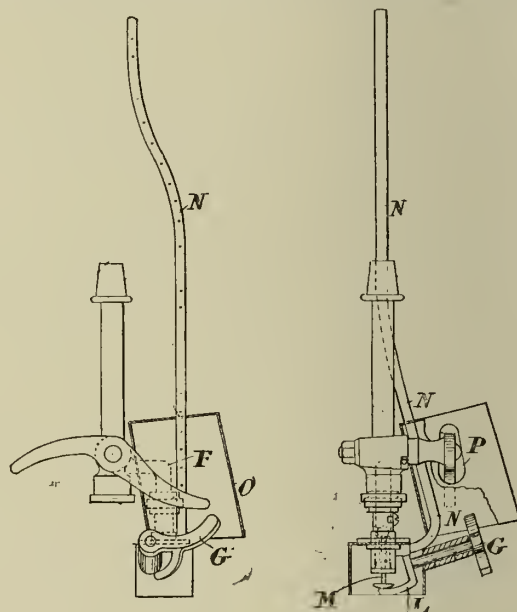
REGISTER OF PATENTS.

Lighting Incandescent Gas-Burners.

LEWIS, JOHN, of Newcastle-upon-Tyne.

No. 18,424 (of 1907); March 16, 1908.

This invention is particularly applicable for lighting street-lamps—the object being to provide a combination of known parts which "render the lighting of the main burner more easy, more rapid, and less wasteful of gas and mantles than heretofore." The invention is distinguished by the fact that, upon the application of the lighting torch to the operative parts the latter are of such a nature and so arranged that first the bye-pass valve is fully opened quickly, and during the remainder of the application the main valve is gradually opened to its fullest extent. Upon the withdrawal of the torch, the bye-pass valve is closed, just as is the case in the known arrangements wherein the main and bye-pass valves are simultaneously opened during the application of the torch.



Lewis's Street-Lamp Lighter.

The gas-supply pipe is connected to the main gas-supply cock; and the latter is surmounted by the gas-nipple on which is mounted a bunsen tube and burner. The main cock is provided with a plug having mounted on it a double-armed lever, the right-hand end of which is adapted to be raised by the torch of the lamp-lighter to open the cock to the burner. The bye-pass valve consists of a ball mounted within a casing connected to the casing or barrel of the main cock by a pipe F. The bye-pass valve is operated by a weighted lever G, the fulcrum of which is mounted in a bearing or bracket forming part of a casing surrounding the lower part of the bye-pass valve casing. Within the casing is a lever arm L, adapted to come into contact with the weighted push-rod M, which (when raised by the action of raising the lever G by means of the lamp-lighter's torch) causes the ball in the bye-pass valve casing to be raised off its seat and permits gas to flow from the main cock, by the pipe F, to the climbing pilot burner, or the bye-pass N to the main burner. The torch, when inserted in the guiding and flame-protecting casing O, after raising the lever G and opening the gas-supply valve, also raises the lever of the main valve (which projects through a slot P in the casing O), with the result that the gas issuing from the small holes all the way up the climbing bye-pass or pilot burner is ignited and finally ignites the main burner. On withdrawing the torch, the lever G falls and the bye-pass valve is automatically closed.

Prepayment Gas-Meters.

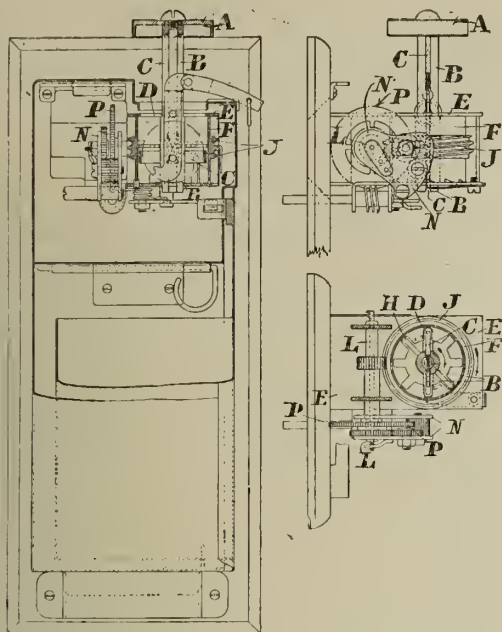
PARNHAM, A. E., of Wavertree, Liverpool.

No. 5171; March 7, 1908.

This invention has reference primarily to prepayment gas-meters with the object of providing means for locking the coin receptacle by hand-operated mechanism.

The mechanism for automatically controlling the meter valve is shown in part sectional elevation and side elevation and plan.

The hand-actuated part comprises a handle A and a stem portion B



Parnham's Prepayment Gas-Meter.

having a slot C formed in its length. When in its normal position, the slot C coincides with a slot D in a plate E, through which the stem portion passes. Below the plate E, and concentric with the stem B, is a barrel or cage F, having teeth or serrations in it, adapted to engage with a coin after the latter has been inserted in the slot C and dropped through the slot D into the barrel, and to effect engagement between the stem and barrel and lock the two together. The partial revolution of the hand-operated part also partially rotates the barrel until the slot in the stem B coincides with a slot H in a lower plate. When this is effected, the coin is allowed to fall into a drawer arranged in the lower part of the casing.

The barrel is provided with a worm J, which engages with a worm wheel on a hollow shaft L, and encloses a spindle which is preferably disposed concentrically therein. On the shaft L is mounted a setting mechanism, which comprises plates N and a train of gearing (part of which is interchangeable) carried thereby; the plates being free to rotate on the shaft and serving to support part of the gearing thereon. To these plates is connected the supply valve of the meter, through the medium of a rod or its equivalent (not shown).

A toothed wheel, forming part of the train of gearing, is fixed to the hollow shaft, and another toothed wheel P, mounted concentrically to it, is free to rotate relatively of the shaft; the respective wheels being adapted to operate the plates N, through the other part of the gearing carried between them, for opening and closing the supply valve.

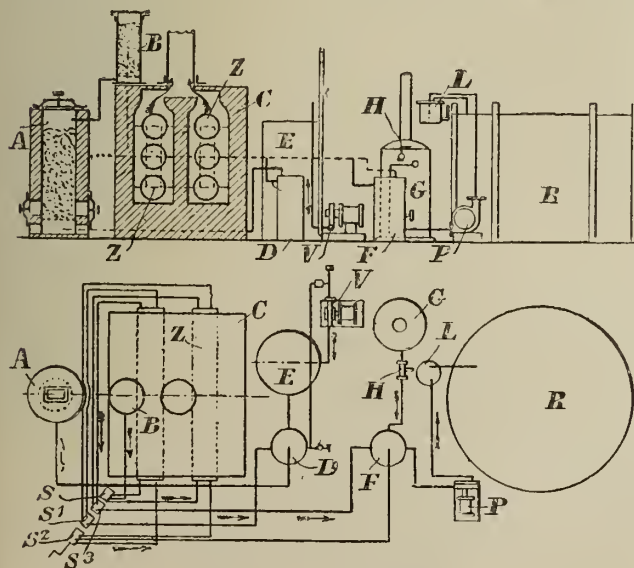
The mechanism is enclosed in a casing provided with a removable lid or cover having a receptacle for the coins placed in the machine, and adapted to engage with a spring-controlled toothed plate pivotally mounted to the under surface of the lower plate. The disengagement of the cover from this toothed plate is effected by means of a key adapted to be inserted in the coin-receiving slot of the stem.

Production of Hydrogen.

VIGNON, L., of Lyons, France.

No. 6347; March 21, 1908.

This apparatus is for the manufacture of hydrogen for lighting, heating, and other purposes, by a method based on separate and alternate reactions simultaneously carried out in separate retorts at suitable tem-



Vignon's Hydrogen Plant.

peratures and in suitable proportions—on the one hand, of steam upon divided iron to form hydrogen, and, on the other hand, of a reducing

gas or poor gas upon the oxide of iron (the iron being regenerated and utilized in another operation).

The apparatus comprises a generator A supplied with air alone and serving to produce the poor gas without hydrogen ($\text{CO} + \text{N}$). The generator is charged with coke through the top. The gas produced passes off to a purifier B filled with a mixture of iron and oxide of iron capable of arresting sulphurous gas and dust. The purified gas passes from B to a distributing valve S, for the poor gas produced in the generator. The furnaces C contain the retorts Z. The carbonic oxide acts in the retorts which contain oxide of iron (Fe_2O_3) to effect the above reaction and regenerate the iron, liberating carbonic acid. The poor gas, composed largely of carbon monoxide, is distributed to these retorts in which the reduction is to take place, by means of pipes shown in the plan. The carbonic acid formed in the retorts is led away to the distributing valve S¹, whence it passes to a heat interchanger D. The carbonic acid thence passes into a pipe fitted with a regulating valve and serving for discharging or leading the gas away.

The heat interchanger serves for heating the air to be supplied to the generator; the delivery of air being regulated by the gasholder E which forms an air-reservoir, to which air is supplied by a fan V driven by an electric or other motor.

Steam, produced in a boiler G, is led to a reducing-valve H, or other suitable device, which considerably reduces its pressure; and thence it passes into a heater F, where it is heated by the hydrogen generated (as about to be described) in the series of retorts in which the oxidation is effected. The steam passes on from the heater F to the valve S², and thence by pipes to the retorts, in which oxidation is effected.

In these retorts hydrogen is liberated and passes away to the hydrogen distributing valve S³. From this valve the gas is led through the heater F to the exhauster P. In the heater F it heats the steam from the reducing valve H, as before explained. From the exhauster the hydrogen passes to the seal-chamber L and holder R, after passing, if necessary, through a washer (not shown). The seal-chamber L serves to prevent the return of the hydrogen from the holder to the apparatus. From the holder R the hydrogen is sent into the supply main; but, if necessary, it may first be enriched by benzene vapour to give it illuminating power.

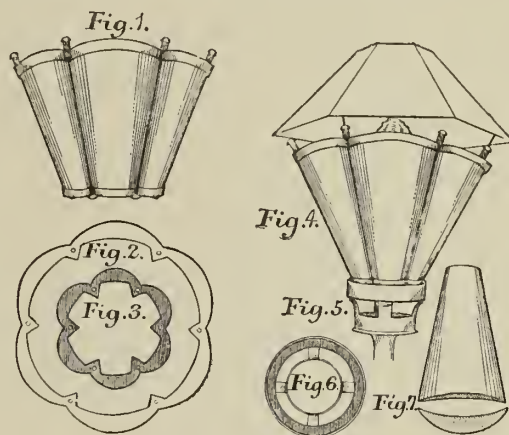
Street Lamps or Lanterns.

SPARKS, H., of Hastings.

No. 7240; Sept. 22, 1908.

The inventor proposes to employ a number of separate periscopic or concavo-convex lenses (of which the sides may be either straight or tapered) so mounted in a frame or holder that any one of the lenses may, in the event of breakage, be replaced.

In the case of inverted incandescent gas-lamps, the receptacle or cup is dispensed with, and a disc-shaped lens, either concavo-convex or plano-convex, is substituted where necessary, so as to give a downward light—thus forming a combination of lenses. The upper part of the holder or frame is clamped to the already existing fitting. With incandescent gas-lamps, the tapered lenses (as shown) are said to extend the light of an ordinary mantle to double the width, and are fully the length of the mantle, "the light fully filling each lens."



Sparks' Lamp Lenses.

Fig. 1 shows a side elevation of the body of a lantern formed by arranging a series of periscopic lenses in a frame or holder. Figs. 2 and 3 show plans of the upper and lower lens holders, which are turned over outwardly to secure the lenses, and bolted top and bottom with rods or bands. Fig. 4 shows a complete lamp or lantern with all its component parts at a greater angle—the lenses being decreased at the lower ends. Fig. 5 shows a side elevation of the receptacle or cup which keeps the lenses in position, and is permanently lodged and grips on the projection of the burner. The upper band encircles the lenses, which can be lifted off bodily for cleaning purposes. By using cups having wider or narrower openings, the light can be regulated to the required angle of the lenses. Fig. 6 shows a plan of the cup. Fig. 7 illustrates a periscopic tapered lens.

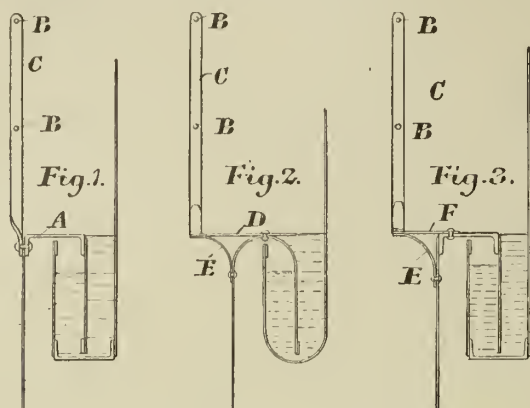
Spiral-Guided Telescopic Gasholders.

CUTLER, SAMUEL, of Millwall.

No. 9570; May 2, 1908.

In a telescopic gasholder, the patentee points out, the several cylindrical sections or lifts of which it is composed are connected together by water-sealed joints; and it is very desirable that these should be reasonably accessible for examination and clearing from ice or other obstructions. Also the guide-carriages are arranged at this part of the structure, and ready access to them for adjustment, oiling, &c., is desirable. In holders having external guide-framing, this framing

forms a suitable basis for the attachment of ladders or other devices by means of which the cups and grips and the guide-carriages may be reached. But in spiral-guided holders there is no external guide-frame, and to obtain access to the water-joints and guide-carriages when the holder is inflated is "difficult and often dangerous."



Cutler's Railed Platform for Spiral-Guided Gasholders.

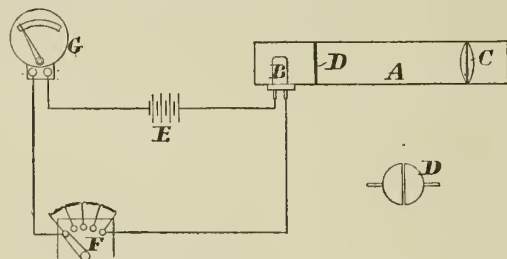
The inventor proposes to encircle the entire circumference of each water-joint with a platform and guard-rail, as shown. A (fig. 1) is the grip-channel utilized as a platform, and B the guard-rail supported by the standards C. Where the grips are of bent plate instead of channel bar, a separate platform (fig. 2) is provided, carried on brackets E. In some cases, the width of the "walking-way" upon the channel grip may be extended by affixing a platform F (fig. 3). The platforms may be reached by the permanently-attached vertical ladders usually provided on such holders, or by a spiral stair or lift, or other equivalent device, arranged adjacently to the holder.

Pyrometers.

DIXON, A. W., and MIDDLETON, E. (Messrs. John Brown and Co., Limited), of Sheffield.

No. 13,360; June 23, 1908.

The object of this invention is to provide apparatus by which high temperatures of glowing bodies can be very accurately ascertained or measured—of the kind in which the radiation from the hot body is focussed by means of a lens upon the indicating element. The patentees use a cell of selenium or other light-sensitive substance as the indicating element in their pyrometer.



Dixon and Middleton's Pyrometer.

The apparatus consists of a tube A provided with a sensitive cell B of selenium, a collimating lens C, and a slotted diaphragm D (shown separately) for the direction of the projected rays on to the selenium. A current of electricity is passed from the battery E through the cell, and in the circuit is included a switch and rheostat F and a galvanometer G (or other suitable indicating or recording instrument) acting to indicate or record the resistance of the selenium, and, consequently, the temperature of the body from which emanate the rays of light which enter the tube A.

Spirally Guided Gasholders.

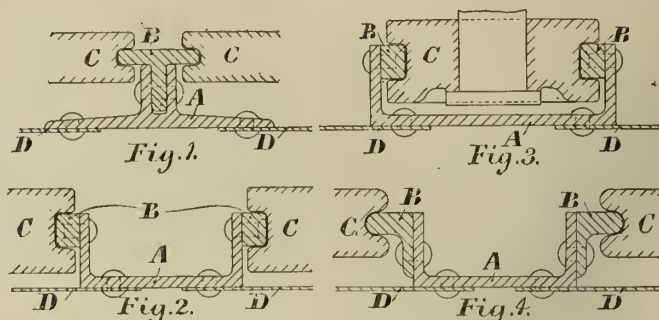
HENRY BALFOUR and CO., LTD., BARKER, J., and HUNTER, J., all of Leven, N.B.

No. 14,884; July 14, 1908.

This invention "has for its object to employ improved guides whose foundation flanges are directly attached to the gasholder plates."

Fig. 1 is a section of a spiral guide rolled with an opening in which a T-iron can be placed between the jaws and riveted to it. Fig. 2 is a spiral guide formed of ordinary channel iron with two flats riveted to it, to take the guide-wheels. Fig. 3 shows a guide similar to fig. 2, but having the flats on the inside—being for use with a single guide-wheel. Fig. 4 is a guide similar to fig. 2, but having angle irons on the outside.

The holder would be made in the usual manner, with the guides riveted to it at an angle of 45°. In fig. 1, the guide is formed of two parts—viz., the foundation A and the T-iron B riveted to it. The guide-wheels C bear against the edges of the T-iron, as shown. The plates D of the holder are riveted to the foundation. In fig. 2, the foundation A consists of an ordinary channel to which flats B are riveted on the outside; the guide-wheels C engaging with such flats. In fig. 3, the flats are riveted to the inside of the channel—thus allowing of one guide-roller C being used, instead of two. In fig. 4, angle irons B are used instead of flats; these being riveted on the outside, as shown. Sometimes, instead of riveting angle irons to the channel, it may be rolled with projecting lips, so that the section will be approximately like fig. 4, but in one piece instead of three.



Balfour, Barker, and Hunter's Spiral-Guided Holders.

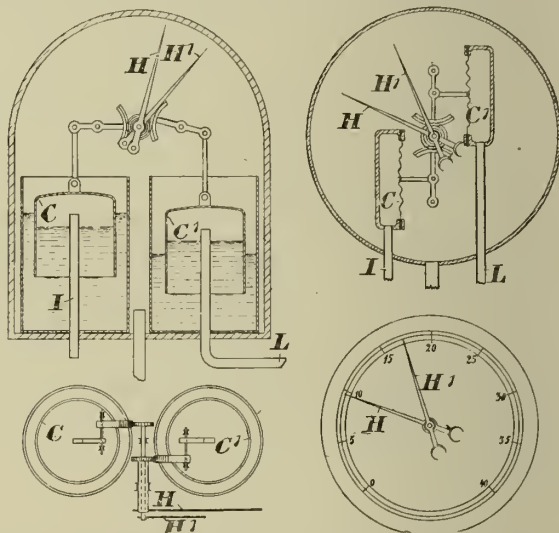
It has already been proposed to use spiral guides of various types. One form of spiral guide consists of diagonal or spiral plates, by preference of greater thickness than the ordinary gasholder plates; and to these plates are attached the spiral guide-rails, while the whole is strengthened by internal upright stiffening rails. In another type, the roller guide-rails have been made of trough formation with inwardly projecting parts, so as to retain the rollers which have plain faces. These guide-rails may be made of a section in one piece, to which the holder plates are directly attached, or in two pieces riveted to a foundation plate; and an external protuberance may be attached to it for the purpose of carrying away water. In yet another type which is used with two adjacent grooved pulleys, the rail consists of a combination of a T or H iron supported by two angle irons to which the gasholder plates are attached; the T-irons and the angle-irons being further strengthened by a back-plate or T-iron attached to the two angle-irons.

Gas-Pressure Indicators.

SCHULTZE, P., GAEHDE, T., and DOSCH, A., of Charlottenburg.

No. 17,116; Aug. 14, 1908.

According to the present invention, gas pressures above or below a standard are indicated by only one scale. The construction shown represents two inverted glass bells C and C', which dip into a fluid.



Schultze, Gaehde, and Dosch's Pressure-Indicators.

The movement produced by the pressure exerted on these bells is transmitted to the hands H H' by a system of links. The hands rotate around the same spindle or axis. The casing is hermetically closed and connected with a source of any desired standard pressure. For instance, the gas-tube I of one bell is brought into connection with a higher pressure, while the other bell is connected through L with a lower pressure than that existing in the casing. The bells or membranes will, therefore, make contrary movements. The arrangement is made in such manner that the different coloured or otherwise distinguished hands which rotate around the common axle centre turn in the same direction, and show on the same scale the absolute pressure below or above the standard pressure.

Feeder for Bucket-Conveyors.

WEST, J., of Manchester.

No. 10,798; May 18, 1908.

This invention relates to a mechanical feeder for supplying materials in measured quantities from hoppers or stores to bucket-conveyors, elevators, and the like. It has for its object the regulation of the supply, and ensures the maximum quantity being supplied "without incurring the risk of overloading the conveyor or elevator;" and, further, "as this regulation of the supply permits of the conveyor being supplied with the maximum quantity of material that may be safely transported, a given quantity of material may be conveyed or elevated in a shorter period of time than would be the case if the elevator was irregularly fed—as, for example, from hoppers having a hand regulated, or even a mechanically operated, slide-door which increases or decreases the area of the opening through which the material flows." Such sliding-doors, the patentee remarks, require constant attention to regulate the size of the opening to suit the varying classes of material—as, for instance, coal, which may be fine, wet, or dusty, large or small, "each kind requiring the area of the opening

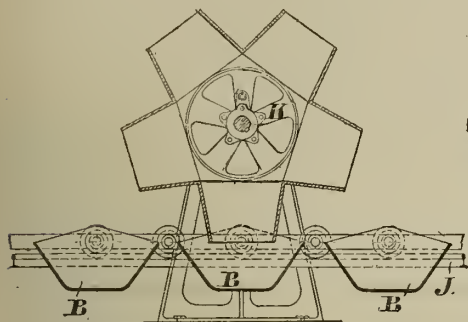


Fig. 1.

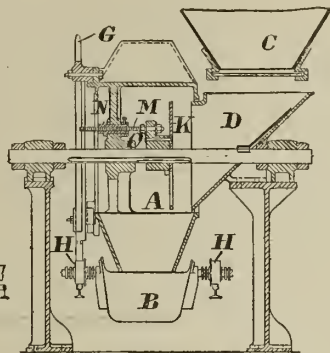


Fig. 2.

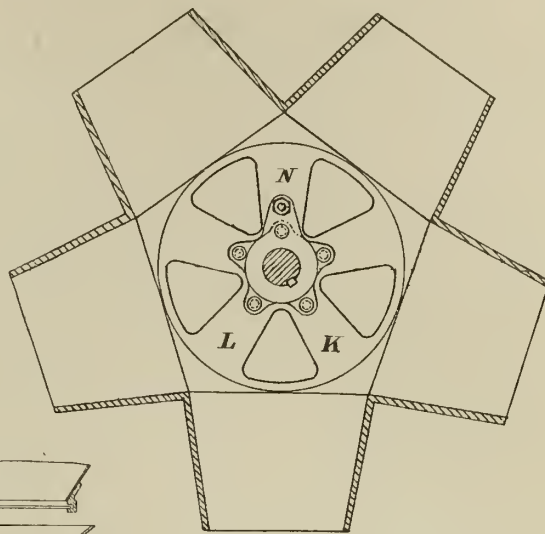


Fig. 5.

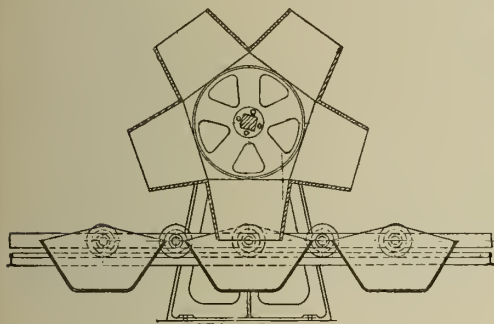


Fig. 3.

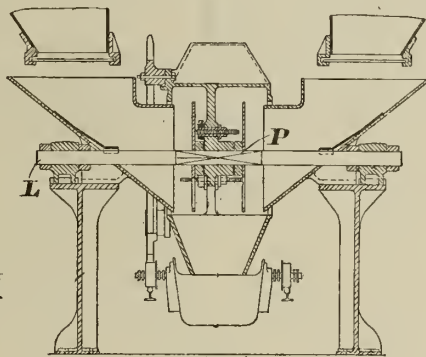


Fig. 4.

West's Feeder for Bucket-Conveyors.

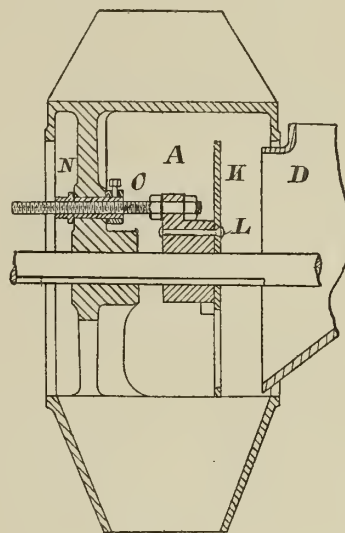


Fig. 6.

to be varied unless the opening is set at such an area that it will only permit of the passage of such quantities of the easiest flowing material as will not choke or overflow the conveyor."

The invention consists of the application to a rotary filler of a plate or plates with openings through which the material passes on its way from the hopper supply to the conveyor buckets; the plate or plates being attached to the shaft of the filler and rotating it. Consequently, the material is kept in motion when the conveyor is working. The area of the opening in the plate or plates is constant; but the total area through which the material passes may be increased or decreased by the amount of space between the side or face of the plate and the face or edge of the feeding-shoot from the hopper—this space being increased or decreased by adjusting the plate laterally along the shaft by adjusting screws and nuts, so arranged that the length of the screw outside the adjusting nuts will correspond with the space between the plate and the shoot, and thus indicate the amount of space between the edge or face of the shoot and the plate.

Figs. 1 and 2 are sectional elevations of a rotary filler for a gravity-bucket conveyor, fitted with one adjustable regulating plate or disc, arranged to be fed from a receiving hopper at one side only. Figs. 3 and 4 are sectional elevations of a rotary filler for a gravity-bucket conveyor, fitted with two adjustable regulating plates or discs, and arranged for being fed from receiving hoppers on both sides. Figs. 5 and 6 are enlarged sections of a rotary filler body showing the plate or disc with regulating screw and nut.

Referring to figs. 1, 2, 5, and 6, A is a rotary filler with spouts for filling the gravity buckets B; the material being fed to the filler from the hopper C through the shoot D. The filler is fixed to the shaft L and rotated, in bearings supported on stands, by the sprocket wheel G driven from the conveyor chain rollers H, which run on rails. K is the adjustable plate or disc with openings whose centres are arranged for preference to come on the centres of the filler spouts. The plate K is provided with a boss having a feather-way, which enables the plate to be adjusted laterally along the shaft L on a feather fitted into the shaft and causing the plate to revolve with the filler and the shaft. The plate K is adjusted laterally on the shaft L by means of the screw M fixed to the plate and operated by means of the nut N which is fitted into one of the filler arms. It is free to revolve, but is held in position by the collar O; the plate being moved by this means either towards or away from the edge of the shoot D to suit the required flow of material through the filler. It is so arranged that the amount of opening can be readily measured by making the screw of such a length that the amount protruding beyond the nut will correspond with the space between the plate K and the edge of the shoot D.

Figs. 3 and 4 show an arrangement of filler with two adjustable plates or discs arranged for being fed from either hopper through shoots. The filler body is fastened on a square P on the shaft L, and the adjustable plates or discs are moved laterally along the square by means of screws operated by nuts fitted into the arms of the filler body and free to turn in it, being held in position by collars. The length of the screws projecting on the side remote from the discs is made equal to the distance between the discs and the vertical faces of the shoots.

Incandescent Gas Lighting Bodies.

UNRUH, MAX VON, of Charlottenburg.

No. 17,596; Aug. 21, 1908.

The lighting power of bodies made according to this invention is based on the use of "the known mixture of the oxides of thorium and cerium;" and the object of the invention is "to produce incandescing

bodies which are of high porosity and of high lighting power, and which are very resistant to shocks and are very durable."

The patentee remarks that many propositions for the production of such incandescing bodies have been made. It has, for example, been proposed to add to the mixture of thorium oxide and cerium oxide, fire-proof substances, such as asbestos powder (Patent No. 27,269 of 1896), or kaolin, silicium oxide, zirconium oxide, lanthanum oxide, or baryta, admixed with cellulose or fibrous vegetable substances (Patent Nos. 12,105 and 13,638 of 1895). These methods have, it is said, the disadvantage that the masses trickle or run in the burning process and lose their porosity; so that the surface of the incandescing bodies diminishes, and their lighting power is lessened. It has also been proposed to mix organic substances of cellular structure with lighting salts, and to burn the mixture and then add the ashes thereof—preferably after having been sifted—to a solution of lighting salts (Patent No. 14,191 of 1898). In this process no organic substance is present in the formed incandescing bodies, because the organic substances are burned, or reduced to ash, before the solutions of refractory earth are added; and therefore incandescing bodies made in accordance with the patent named "do not contain any organic substances before the final burning, and the consequence is that the incandescing bodies are not porous and are wanting in stability, because they did not contain fire-proof substance."

The process for manufacturing the incandescing bodies according to the present invention is as follows: An organic fibrous substance—such, for instance, as wool, cotton, ramie, cellulose, filtering paper, or fabric—is impregnated with a solution of lighting salts, preferably a mixture of the nitrates of thorium and cerium. The fibrous substance is saturated with the solution and then dried, and afterwards comminuted as thoroughly as possible. Then the comminuted mass is mixed with a fire-proofing material, such as oxide of magnesium (to render the incandescing body stable) and with oxide of thorium (to prevent running or trickling in the incandescing body), and is moistened with water, or preferably with the solution named, and thoroughly mixed. In order to give the mixture binding power, organic binding material, such as sugar (preferably invert sugar), or a gum, or starch, is added and thoroughly mixed with it. The incandescing bodies are then pressed, moulded, or otherwise formed, in filamentary, or other required, form from the mass. Fabrics may be made in the required form, of mantles for instance, from the filamentary material so produced. The mantles or other incandescing bodies are then subjected to sufficient heat to destroy the organic matter and transform the lighting salts into oxides—"thus producing an incandescing body consisting of oxides of thorium and cerium together with a fire-proof material, such as magnesia, but no carbon."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Figures of Coke Sales.

SIR,—I am pleased to find that Mr. Watson's challenge as to coke sales has been taken up, even though the writer hides his identity under the style of a communicated article.

He proceeds to join issue with me on my assertion that it is impossible to sell 13 cwt. or more of "dry" coke, and then goes on to give figures only relating to the possibility of selling 12 cwt. of coke and breeze per ton, in which the average percentage of moisture is somewhere in the neighbourhood of 11, which in this district would be referred to as "drowned" coke. If the writer of the article would for six or twelve months keep a record of the actual quantity of coke, &c., used in his furnaces—including stoppages, gaiting, and slow fires—he would find that his consumption per 100 lbs. of fuel would average very much more than he allows, and that the difference between "dry" and "wet" coke for sale is even more than the 11 per cent. he allows. If, again, he deducts, as he should do, the fuel used for steam-raising and other works' purposes, the quantity for sale even on his figures would not exceed 10½ cwt. to 10¾ cwt. per ton, or if sold on the dry basis of (say) not exceeding 4 to 5 per cent. of moisture would not be very much higher than the figure I gave in my remarks on Mr. Watson's paper—viz., 9·87 cwt. per ton of coal.

In taking his coke at 9·28 per cent. of moisture, your correspondent is very much below a great many gas undertakings; and I am aware of several where the percentage would be much nearer 20. A sample that came into my hands a few months ago was, bulk for bulk, 42 per cent. heavier than Stretford coke, which is practically dry, containing on the average less than 5 per cent. of moisture.

In computing the coke available for sale at Stretford, that used on the carburetted water-gas plant is included, but only for comparison; and I am of opinion that this can be justified, as the coke will be available for sale if the plant is shut down, whereas that used for boiler fuel, &c., is not so.

I am quite agreed with the writer of the article that it is impossible to ascertain the absolutely correct make of coke; but it can be obtained with sufficient accuracy if a record of all used in the retort-house, boilers, and other plant is kept. Such figures are invaluable in checking the fuel used, and have during the past twelve months at Stretford resulted in a marked improvement in the actual quantity of coke sold. I am also agreed with the writer of the article that it would be better if the coke breeze and pan breeze were kept separate in the returns; but I suggest that the figures should be the quantities actually sold, with separate columns for the quantities used in carburetted water-gas plant. We should then have a basis of comparison that would be useful, instead of the present most unreliable method; and the huge sales of over 13 cwt. per ton would for ever disappear from all returns.

We in the North are not envious of our brethren in the South, with their big sales, because our position is that these returns are not actual sales; and if they should be, it is because the coke is so saturated with moisture as to be largely useless for firing purposes, except at a low price. It would be interesting to have, in parallel columns, the weight of coke and breeze sold per ton, and the average price per ton received, of all companies in and around London. I think we should find that the undertakings that returned the largest makes would be in receipt of the lowest average price.

Stretford, April 3, 1909.

H. KENDRICK.

Testings for Calorific Power.

SIR,—With reference to the calorific value of town gas, it may be of interest to state that testing for forfeiture has been regularly carried out by the writer since October, 1906, on behalf of the District Councils whose areas are supplied with gas by the Tottenham and Edmonton Company.

The standard of calorific value was fixed, by agreement, without statutory enactment; and the penalty for non-fulfilment is recoverable without recourse to a Court of Summary Jurisdiction.

Tottenham, March 31, 1909.

ARTHUR E. BROWN.

A Disclaimer.

SIR,—With reference to the paragraph in your issue of March 30, under the heading of "A Tempting Letter," which you state is signed by P. Williams, Secretary, as I was for some years Secretary to the late Toddington Gas Company, Limited, and seeing the striking similarity in the two names, I should be glad if you would kindly spare a line in your next issue to state that I am in no way whatever connected with either of the undertakings now in question.

21, Wharf Road, City Road, N., April 1, 1909.

F. WILLIAMS.

Town Gas v. Suction Gas for Power.

SIR,—I notice in your issues for the 2nd and 23rd of March you report from the proceedings of the Maldon Town Council the adoption of a suction-gas plant at their Spital Road station, owing to the results achieved by replacing a steam plant by a suction-gas plant at their Wantz Road station. I should like to point out that the results referred to were achieved by town gas supplied by my Company at 2s. per 1000 cubic feet, and not by suction gas as you state, and they were obtained by an engine of 15 B.H.P. running 12 hours a day for 2s. 1½d. per day. The repairs to this engine have been practically nil; and the attendant locks up and goes away for hours together, to attend to his other duties of turncock, main and service layer, &c.

In face of these results, the Maldon Town Council have decided to put in a suction-gas plant at their Spital Road station, apparently on

the advice of one of the firms who were unsuccessfully tendering for the supply of this plant, which firm guaranteed a saving to the Council of 50 per cent. over the cost of town gas at 2s. per 1000 cubic feet, though they recommend an engine of 17 or 18 B.H.P., when one of 12 H.P. running with town gas would do the necessary work. This is, of course, utterly absurd; and I only mention it to show the kind of influences which are brought to bear on authorities of this sort. What I really complain of is that my Company were not even invited to state their case; and the whole thing was settled before we knew anything about it. I need not say that, in face of Mr. Paterson's Presidential Address to the Southern Association, in which he quotes Mr. T. Duxbury as saying that "gas at 2s. per 1000 cubic feet should be in no fear of being ousted by producer gas," we are a little disappointed.

A. L. CLARKE,

March 25, 1909. Engineer, Maldon Gaslight Company, Limited.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Conway Gas Bill, Eastbourne Gas Bill, Littlehampton Gas Bill.

Bills read a second time and committed: Alliance and Dublin Consumers' Gas Bill, Leyland and Farington Gas Bill.

Bills reported, with amendments: Bungay Water Bill, Donington Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Wells Gas Bill.

Bills read the third time and passed: Clevedon Water Bill, Heckmondwike and Liversedge Gas Bill, South Lincolnshire Water Bill.

The Salford Corporation Bill has been referred to a Select Committee, consisting of the Duke of Devonshire (Chairman), Viscount Hill, Lord Ramsay, Lord Hindlip, and Lord Monk Bretton; to meet on Tuesday, the 27th inst.

The Lisburn Gas Bill, Lisburn Urban District Council Bill, Pontypool Gas and Water Bill, and South Staffordshire Water Bill have been referred to a Select Committee, consisting of Lord Ribblesdale (Chairman), the Marquis of Bath, Lord Saltoun, Lord Kenyon, and Lord Weardale; to meet on Tuesday, the 27th inst.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords' Bills read the first time and referred to the Examiners: Clevedon Water Bill, Heckmondwike and Liversedge Gas Bill, South Lincolnshire Water Bill.

Bills reported, with amendments: Gaslight and Coke Company Bill, Northallerton Water Bill, Swinton and Mexborough Gas Board Bill, West Gloucestershire Water Bill.

Bills read the third time and passed: Conway Gas Bill, Eastbourne Gas Bill, Littlehampton Gas Bill.

Mr. W. Thorne has given notice, on the consideration of the Gaslight and Coke Company Bill, to move its rejection.

The Cardiff Corporation Bill, Glamorgan Water Board Bill, and Pontypridd Water Bill have been referred to a Select Committee, consisting of Sir Luke White (Chairman), Mr. Fell, Mr. Alden, and Mr. Nolan; to meet on Thursday, the 22nd inst.

The Ammanford Gas Bill and the Derwent Valley Water Board Bill have been referred to a Select Committee consisting of Mr. Arthur Stanley (Chairman), Mr. A. G. C. Harvey, Mr. Du Cros, and Mr. Glover; to meet on Tuesday, the 27th inst.

Sir William Holland has brought in a Bill "to confer the municipal franchise upon mercantile corporations and companies." It is backed by Sir Clifford Cory, Sir Henry Kimber, Mr. Robert Balfour, and Mr. Holden.

Mr. Armitage asked the Chancellor of the Exchequer last Wednesday whether, seeing that co-operative societies are exempt from income-tax because the individual incomes of the shareholders rarely exceed £165 per annum, he will extend the same privilege to the trading profits of municipal corporations, seeing that the bulk of the ratepayers, for whose benefit the profits are made, have incomes below the income-tax minimum; but Mr. Lloyd George replied that he did not see his way to taking the course suggested.

The next day, Mr. Carr-Gomm asked the President of the Local Government Board whether his attention had been drawn to the protracted delay in repairing the roadway of Grange Road, Bermondsey, which was damaged by the sewer explosion in December last, and whether he had communicated with the Borough Council on this subject. If so, could he state what had been the cause of the delay. Mr. Burns, in reply, said his attention had not been previously called to any alleged delay in repairing the road in question, but he would make inquiry on the subject.

Last Friday Captain Morrison-Bell asked the President of the Local Government Board whether he would amend the Water-Works Clauses Acts so that an Urban District Council whose water supply is purchased in bulk from another urban district might be able to enforce conditions as to size of flushing-cisterns, &c., in existing houses that would prevent waste or misuse, and so protect the ratepayer from unnecessary expense. Mr. Burns replied that he had not at present in contemplation the amendment of the Acts named with the object suggested.

The Directors of the Imperial Continental Gas Association recommend a dividend of 4 per cent. for the half year ended Dec. 31, tax free; being the same as last year.

THE GASLIGHT AND COKE COMPANY'S BILL.

House of Commons Committee.—Thursday, April 1.

(Before Mr. J. J. MOONEY, Chairman, Mr. CARLILE, Mr. J. TAYLOR, and Mr. ALFRED KING.)

The Committee to-day had this Bill (see last week, p. 917) before them for the consideration of clauses.

Mr. C. E. C. BROWNE (of Messrs. Dyson and Co., the Parliamentary Agents for the Bill) stated that the only question upon the clauses which he thought would be left for the decision of the Committee, as a matter not settled between the parties, was on a comparatively small point arising upon the clauses which they had agreed with the London County Council. The principal matter, that had been agreed with the Council was that there should be a standard of the calorific power of the gas supplied by the Gaslight and Coke Company. Except as regarded drafting amendments, as to which both the London County Council and themselves desired to reserve their position, in case documentary evidence should be necessary to give effect to what they both meant, the clause they had before them was the exact one that had been agreed.

Mr. FREEMAN, K.C., who appeared for the London County Council and the West Ham Corporation, said he quite agreed with the statement with regard to the rest of the clause. It had been an extremely difficult matter to get it into exact technical form; and they proposed that the wording should be open to either side as to the slight amendments between the House of Commons and the House of Lords.

Mr. BROWNE: The first sub-section will be:

As from the 1st day of January, 1910, the standard calorific power of the gas supplied by the Gaslight Company within the Administrative County of London shall be 125 calories net per cubic foot; but the Gaslight Company shall not incur any liability in the event of their supplying gas of a calorific power of not less than 112½ calories. Provided that if within one month after the expiration of a period of three years from 1st January, 1910, or after the expiration of any subsequent period of three years, either the Gaslight Company or the controlling authority shall desire that such standard calorific power shall be reduced or increased, and shall give to the other party and to the Board of Trade notice in writing of such desire, it shall be lawful for the Board of Trade, after hearing the parties and considering any representations made to them by either of the said parties, by order, to reduce or increase the amount of the said standard calorific power, and of the deficiency below such standard within which to such extent as to the said Board may seem fit, and the Board may by such order make all such modifications of this section as may be necessary in consequence of any such reduction or increase as aforesaid, and may also direct the manner in which the costs, charges, and expenses of the said parties and of the said Board of and incidental to any such application, and any inquiry held by or under the direction of the said Board in connection therewith, shall be borne. The standard calorific power prescribed by the said order, if made by the Board of Trade, shall, for the purposes of this section, be deemed to be the standard calorific power prescribed by this Act.

Sub-section 2 was as follows:

As from the said 1st day of January, 1910, sub-sections (2), (3), and (5) of section 5 (as to testing for calorific power, sulphur impurities, and illuminating power with flat-flame burners) of the Act of 1905 shall cease to apply or have effect so far only as such sub-sections relate to the calorific power of the gas supplied by the Gaslight Company within the county.

Replying to Mr. Carlile, Mr. BROWNE explained, with regard to sub-section (1), that there was contained in the London Gas Act, 1905, a section requiring the London Gas Examiner to test for calorific power and for certain other purposes the gas supplied by the three Metropolitan Companies; but under that section no standard was fixed, and no penalties were prescribed, so that they adopted that section 5 as the foundation of the new clause, and made use of the testings which were made under that section, imposing now a standard and now a forfeiture for deficiency. Sub-section (3) was:

One testing only for calorific power shall be made at each testing-place daily; but in the event of the calorific power being on any testing ascertained to be below 112½ calories, the Gas Examiner shall forthwith give notice thereof to the Gaslight Company, and a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at that testing-place on that day.

Sub-section 4 was:

Section 10 (Company may be Represented at Testings) of the Act of 1880 shall, with respect to the Gaslight Company, be read and have effect as if calorific power were therein referred to in addition to illuminating power, purity, and pressure.

Sub-section 5 was:

Section 13 (Quarterly Report of Chief Gas Examiner) of the Act of 1880 shall, in relation to the Gaslight Company, be read and have effect as if there were added at the end thereof "(4) the calorific power on each day at each testing-place of the controlling authority."

Section 6 read:

Section 11 (Daily Reports and Access to Books) of the Act of 1880 shall, in relation to the testings for calorific power under the said section 5 of the Act of 1905, as amended by this section, apply to, and with respect to, such testings. (7) If on any one day the gas supplied by the Gaslight Company at any testing-place is of less calorific power to an extent not exceeding six calories than 112½ calories, the average of the testings for calorific power made at such testing-place on that day, and on the preceding day, and on the following day, shall, for the purposes of sub-section (8) of this section, be deemed to represent the calorific power of the gas on such one day at such testing-place. (8) The Gaslight Company shall not be liable to any forfeiture for defective calorific power where the calorific power on any day of the gas supplied by them is not less than 112½ calories; but where the calorific power on any day of such gas is less than such last-mentioned quantity, the Gaslight Company shall be liable to the following forfeitures in respect of such deficiency: Where the deficiency does not exceed 3 calories, £5; where the deficiency exceeds 3 calories but does not amount to 6 calories, a sum not exceeding £10; for each complete 6 calories of defective power, a sum not less than £25 and not exceeding £100.

Answering the Chairman, Mr. BROWNE said that in the second sub-section the words "net per cubic foot" went out:

Provided always that the controlling authority of any testing-place, having

recovered one forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at one testing-place on any day, shall not be entitled to any further forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at any other testing-place of such controlling authority on the same day. Provided also that no forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of calorific power was occasioned by an unavoidable cause or accident.

Sub-section 9 was struck out, and 10 became 9:

The provisions of section 19 (Forfeitures and Losses from Fraud, &c.), and section 20 (Recovery of Forfeiture, &c., 23 and 24 Vic., Chap. 125) of the Act of 1880 shall extend and apply to forfeitures under this section and to the recovery thereof.

Mr. BROWNE remarked that, dealing with the point upon sub-section 7, it would be seen that this sub-clause provided that in the case of a deficiency of calorific power on any day, the Company might have the advantage of remedying the defect by taking an average of three days—the day before and the day after on which the defect arose. A similar provision with regard to three days' average applied in the case of testing for illuminating power. This was already in the Bill; it was not altered. They left this as it was with regard to illuminating power. This clause represented the result of negotiations which took place with the London County Council; and at a meeting at which the matter was finally arranged between representatives of the Company and of the London County Council, this question of the three days' average was raised. At the meeting he did not think it would be disputed that no question was raised as to whether the three days' average might be resorted to, whatever the deficiency of calorific power might be; and his clients, the representatives of the Company, came away from the meeting with the clear understanding that the County Council were prepared to assent to the proposition that, whatever the deficiency might be on any one day, the Company might resort to the three days' average. He was informed that the point was specifically raised.

Mr. FREEMAN: My instructions are that it was not raised.

Mr. BROWNE said that their impression was, when they left the meeting—he was not present at the interview—that the question of the amount of the deficiency would not arise. After the meeting, and when the draft clauses were submitted to the London County Council, they raised the point that if the deficiency were excessive beyond a certain specified quantity, the Company ought not to have the right to resort to the three days' average, and their ground for putting this proposition forward they would, of course, explain. But the point, as he understood it, raised by the County Council was that it would enable the Company to supply gas of extremely deficient calorific power on one day, and make good their defects by supplying gas of higher calorific power on the other two days. As against this aspect of the matter, they would represent to the Committee that if each day stood by itself, where the deficiency exceeded a specified quantity there would be no incentive to the Company to put right on the following day a defect which had occurred on a particular day. The amount of the deficiency was proposed to be 6 calories; so that if on any one day the deficiency amounted to 7 calories, if that day was to stand by itself, and they were not to be entitled to average it on other days, there would be no incentive to the Company to supply higher calorific power in order to bring up the average to the even penalty amount, and they therefore suggested that the clause should be left as it was before the Committee now, and that there should be no limit put as to the amount of deficiency beyond which they might not be entitled to have the advantage, and to give the consumer the advantage of the three days' average.

Mr. FREEMAN desired to make the matter quite clear on a point which was rather a personal matter. He wished it to be understood that the three days was agreed between both the parties. The question of the limitation was not expressly raised in so many words; but the whole discussion was understood by his clients to be subject to the general provisions of the 1905 Act. He wished to state it so that it should not be supposed that he was in any way doubting the statement of the Chairman of the Company. The position was this: They desired that the same limitations, or the same limitations in principle, should be applied to calorific power as had already, after mature consideration, been applied to illuminating power in the Act of 1905. Their argument was this, that there would be a grave inconvenience to the commercial world of London unless some limitation in the variations of the calorific power was introduced, because it was much more likely to upset the workings of engines if suddenly variations in the calorific power took place, and there would be much stronger reasons for the varying calorific power than for varying illuminating power. The provisions of the Act of 1905 were contained in section 4, sub-section 3: "If on any one day the gas supplied by the Company at any testing-place is of less illuminating power to an extent not exceeding 1 candle than it ought to be, the average of all the testings made at such testing-place on that day and on the preceding day and on the following day shall be deemed to represent the illuminating power of the gas on such one day at such testing-place." They saw there the words "to an extent not exceeding 1 candle." They substituted for these in this Bill: "To any extent not exceeding 6 calories." This was translating the illuminating standard as near as they could into calorific standard; and when the Bill was argued on both sides before the Committee, the Chairman, in giving his decision, used these words: "The Committee propose to leave in sub-section 3 of clause 4 in the Bill; but they think there should be a proviso that the deficiency of quality in any one day shall not exceed a certain limit—say, a candle. Obviously it would be inconvenient to customers that it should be entirely unlimited. It would not, of course, be the same thing if strong gas was supplied on one day to make up for very weak gas another day. We think there should be some steadiness in the supply." It was on the words "some steadiness in the supply" that they mainly relied as a justification for what they were asking now. In that case, the 1 candle was given. They were giving far more favourable terms than were given in the Act of 1905; and he asked the Committee, in the public interest, to support the principle that was laid down in the Act of 1905, and apply it to exactly similar things—namely, the calorific standard, which was now being introduced for the first time. He did not think he need say anything more.

After the Committee had consulted in private,

The CHAIRMAN said they were of opinion that the words ought to be inserted.

Mr. BROWNE said he was requested by the Gaslight Company to make a statement with regard to the standard of 125 calories which was fixed under the clause, and he would prefer, without any comment, to make it in the form which he had submitted to the representatives of the County Council.

The CHAIRMAN: When you speak of 125 calories, where does that come in?

Mr. BROWNE replied that it was a sort of theoretical standard; but not a standard below which any penalty arose.

Mr. CARLILE: That is a standard upon which the margin of 6 is calculated?

Mr. BROWNE: No; the standard of 125 is really, for practical purposes, in the clause ineffective so far as the clause goes.

Mr. CARLILE: The 6 is "below 112½?"

Mr. BROWNE replied in the affirmative. He went on to say that, under the decision of the Committee, they would not be entitled to take the three days' average if they went below 106½ calories.

Mr. CARLILE: That is equal to about 7 per cent.; and 7 per cent. is the margin already existing so far as illuminating power is concerned?

Mr. BROWNE said that was, in the view of the County Council, approximately the case—that about 6 calories represented about one candle.

Mr. FREEMAN: As near as we can get it.

Mr. BROWNE said the statement he had to make was in these terms: The Company agreed to the imposition of a test of calorific value reluctantly. They objected to the introduction of any test for calorific value, on the ground that such a new departure was one that should be effected by a General Act—say, by amending the Gas-Works Clauses Act—rather than by dealing with an individual company. They objected, further, to the standard fixed—viz., 125 calories per cubic foot—on the ground that such a value could not be obtained with any degree of certainty from 14-candle gas. They only accepted the standard on the condition that there should be a margin of 10 per cent. below the 125 calories before any penalties were imposed, and on the understanding that it was not to be expected of them that the standard would be regularly maintained.

Mr. FREEMAN asked that the West Ham clause should be brought up.

Mr. BROWNE said the other matter as to which Mr. Freeman was concerned was the clause that was inserted at the instance of the West Ham Corporation, with regard to the keeping open of the West Ham Gas-Works, which was as follows: "The Gaslight Company shall, for a period of ten years from the date of transfer, continue to use the gas-works of the West Ham Company, in the county borough of West Ham, to an extent substantially as great as that to which such gas-works shall have been used during the year immediately preceding such date." If the Chairman would refer to the words of his decision, he thought it would be found that this gave effect to his requirements; and he did not know that any point was raised upon it.

Mr. FREEMAN referred to the words: "The Committee find the preamble of the Bill proved; but they will require a clause to be inserted for the benefit of West Ham with regard to keeping open the present works for a period of ten years, on substantially the same scale as at present." He contended that the clause brought up failed in two respects. In the first place, it did not profess to be a clause for the protection of West Ham; and, in the second, and far more important, point, it started by saying: "To an extent substantially as great as that to which such gas-works shall have been used during the year immediately preceding such date." That was the date of transfer. This was not at all a satisfactory time, because it would be a period during which the gas-works might not have been kept up to anything like the extent they were when the Company were relying entirely upon themselves; and it was not the decision the Committee gave, because it was "at the present time." What he proposed was this: "For the protection of the Mayor, Aldermen, and Burgesses of the County Borough of West Ham, the following provisions shall have effect: The Gaslight Company shall not close the existing works of the West Ham Company situate within the borough for the period of ten years from the date of transfer; but during such period the said Company shall continue the manufacture of gas at such works and carry on the same as a manufacturing gas-works substantially on the same scale as they were carried on by the West Ham Company immediately prior to the introduction of the Bill for this Act." That was to say, that they should carry them on in the same way as they were carrying them on before the Gaslight Company appeared upon the scene and proposed to take over the works. He submitted that this carried out the decision of the Committee.

Mr. BROWNE stated that, with regard to the first point, prefacing it as a clause for the protection of the Corporation of West Ham, they had no objection whatsoever—in fact, he would have put the words in but that he understood West Ham were not present that day. With regard to the remainder of the clause, he submitted that his clause gave effect to the decision quite as fully as that of the West Ham Corporation. It was for them really to bring up a clause to give effect to the decision, though he did not wish to say that the West Ham Corporation were not entitled to submit an alternative one. The effect of the clause as proposed for the West Ham Corporation would be that the standard of the extent to which the gas-works should be used should be that immediately prior to the introduction of the Bill. This would be December last. At that time, of course, the working load of the gas would be at its very highest; and the effect of the clause would be that for ten years, summer and winter, they would have to keep the works open and manufacture, unnecessarily, of course, during the summer substantially for as great an amount of gas as was manufactured in the very darkest month in the winter.

Mr. FREEMAN: Then I will meet that point by putting in the word "year" before "immediately."

Mr. BROWNE asked what was objected to in his clause.

Mr. FREEMAN said they brought it at a period other than that which was the legitimate test—namely, the period when the works were taking it or selling the Gaslight Company the undertaking as a separate concern. They had now introduced the time when they knew that the works were coming in; and then there was not the same inducement to keep it up.

Mr. BROWNE: We have no choice with regard to the matter of the year. We will take it the year—

Mr. FREEMAN: Before the introduction of the Bill?

Mr. BROWNE agreed.

Mr. FREEMAN: That will satisfy me. We should have one year.

Mr. BROWNE said he would strike out the words "such date," and put in "before the introduction of this Act."

The CHAIRMAN: I think if you put the words "carried on by the West Ham Gas Company," and leave out the words "immediately prior," and insert the amendment of Mr. Freeman, the Committee would be disposed to give you that clause.

Mr. FREEMAN then read the clause as follows:

The Gaslight Company shall not close the existing works of the West Ham Company situate within the borough for the period of ten years from the date of transfer; but during such period the said Company shall continue the manufacture of gas at such works, and carry on the same as a manufacturing gas-works substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill for this Act.

The CHAIRMAN agreed.

Mr. BROWNE remarked, with regard to the expression "existing works," it had appeared before the Committee in evidence that the plant at present in the gas-works of the West Ham Company was not of a very satisfactory character; and if he agreed to the expression "existing works," it must not be understood that they were going to keep in the West Ham works precisely the plant that was there to-day. Subject to this, he had no objection to the clause.

The CHAIRMAN: I should not think West Ham would be anxious to keep the plant if it were not good.

The Ilford portion of the Bill was next considered.

Mr. BROWNE observed that, with regard to the opposition of the Ilford Gas Company, the decision of the Committee was that they would require an alteration in clause 3 as to the limits of supply. The point was that the definition in section 12 of the West Ham Gas Act of 1856 contained certain general words under which it was contended by the Ilford Company that they might claim to supply even within their area. The West Ham Company had not, in virtue of these general words, exercised any powers of supply except in one portion of Chigwell. It was thought at the time when they were before the Committee last that it was an insignificant area; but they now found that, by agreement with the Chigwell Gas Company, the area was not inconsiderable. Therefore they did not like to strike out the general words in reliance on which that supply was given with the consent of the Chigwell Company. So they proposed to delete altogether the definition of the West Ham district as in the Bill originally laid before them, and to substitute for it a schedule containing a specific description of the area of the West Ham Company. The words introducing the schedule would be: "The expression 'the West Ham district' means the several areas specified in the first schedule to this Act." If they looked at the West Ham Gas Act of 1856, he thought they would agree that the promoters had really given effect to the decision of the Committee in this way: "Definition of West Ham district. The several parishes, wards, districts, hamlets, and places following in the county of Essex—West Ham." He then brought up these words at the end of the clause: "West Ham (except so much thereof as is comprised within a segment of a circle of which the radius is a straight line 1000 yards in length measured from any point of the Essex extremity of the bridge known as the Iron Bridge over the River Lea in the Barking Road, Plaistow), Stratford-Langthorne, Plaistow, Upton, Forest Gate, Hudson Town, East Ham, Wanstead, Holloway, Down, Leytonstone, Little Ilford, Woodford, Snarebrook, and (a) so much of the parish of Leyton as is not comprised within the limits of supply of the Lea Bridge District Gas Company, as defined by 'the Lea Bridge District Gas Act, 1878,' and (b) that portion of the parish of Chigwell in which the West Ham Company are at the passing of this Act supplying gas." With regard to the first—"a) so much of the parish of Leyton"—it would be seen that in the area of West Ham, under section 12, that the parishes of Walthamstow and Leyton were included. It had been pointed out by the Lea Bridge Gas Company that the whole of the parish of Walthamstow, and part of the parish of Leyton, were within their statutory limits, and the West Ham Gas Company were debarred from supplying within those areas. They therefore altogether omitted Walthamstow from the schedule, and included in it only so much of Leyton as was not completely within the Lea Bridge District Gas Company's area. They also included the portion of the parish of Chigwell which the West Ham Company were supplying by virtue of the general words contained in section 12. So far as the Ilford Gas Company were concerned, he thought there could be no question but that their area was clearly excepted.

Mr. LEWIS COWARD, for the Ilford Gas Company, said he thought he could save any further trouble. That would carry out the decision of the Committee.

Mr. BROWNE stated, with respect to this amendment, that it was in substitution for an amendment which they had previously agreed with the Barking Gas Company, whose circumstances were practically identical with those of the Ilford Company. The representative of the Barking Company was there, and he had explained to him the amendment he proposed to make; but he was not able to put the amendment before him until that morning. Therefore it was agreed between them that if he wanted any drafting amendment to make his position more secure than it was, they should give it to him between now and the House of Lords stage. As to the last part of the Committee's decision, they had not been able to bring up an amendment, because they did not quite know what the further point was.

Mr. COWARD said the words "whether statutory or not" went out in clause 3; so that it would read: "The undertaking of the West Ham Company includes all rights of making, distributing, and supplying gas and all other the rights, powers, authorities, and privileges whatsoever of the West Ham Company."

Mr. BROWNE subsequently mentioned that the amendment arranged with the County Council was that the promoters should reduce their standard price from 3s. 3d., as proposed, to 3s. 2d. It was represented to them by the West Ham Company, whose undertaking they were purchasing, that this was a material alteration of the terms on which

they agreed to the amendment; and in order to meet their objections, they agreed that an amount additional to the £118 per £100 worth of stock that was to be paid to them should be paid, and that the additional sum should be £3 of Gaslight stock. But in order not in any way to injure or affect the consumer, the Gaslight and Coke Company agreed with the County Council that the amount of stock should be provided by the Gaslight Company purchasing in the open market, out of their reserve fund, the amount required. With regard to clause 34c, he explained that the point was raised by two local authorities on the south of the river—by the Wandsworth and the Lambeth Borough Councils. The position was that, under the scheme of 1883, referred to in this clause, a provision was inserted that in so much of the Gaslight Company's area as was south of the river, they should not charge for 16-candle gas any higher price than was charged by the South Metropolitan Gas Company for gas of the same illuminating power. The effect of this was that the price of gas south of the river was considerably less than it was on the north. When the South Metropolitan Company's illuminating power was reduced to 14 candles, the provision ceased to be operative, of course. Notwithstanding this, however, the Gaslight Company still continued to supply at a less price on the south side than on the north side of the river. Now they were reducing to the same illuminating power as the South Metropolitan Company; and it was represented to them that this provision should revive. They agreed to this; but the terms on which he agreed it with the other two authorities—Lambeth and Wandsworth—were not precisely these terms. He submitted the amendment to both the parties on the previous day; and he had heard from Wandsworth that they had no objection. He should, of course, have retained the amendment that he had undertaken to put in; but they were considerably pressed by the County Council to adopt this form of amendment in lieu of that which they had suggested. Inasmuch as the County Council's only object was identical with that of the Lambeth Borough Council, he could not conceive that they would raise any objection to the substitution of the amendment; but having undertaken with them to insert it in another form, he had felt obliged to save himself in the matter.

The clauses of the Bill were read, and agreed to, with amendments. The preamble was then passed; and the Bill was ordered to be reported, as amended, to the House.

HECKMONDWIKE AND LIVERSEDGE GAS BILL.

House of Lords Committee.—Tuesday, March 23.

(Before the Earl of KINTORE, Chairman, Viscount IVEAGH, the Earl of LOVELACE, Lord POLTIMORE, and Lord TEMPLEMORE.)

To-day their Lordships commenced the consideration of the Heckmondwike and Liversedge Gas Bill, which is to enable the Heckmondwike Gas Company to extend their works, convert and consolidate their capital, and for other purposes.

Mr. HONORATUS LLOYD, K.C., and Mr. CLEAVE appeared for the promoters; Mr. BALFOUR BROWNE, K.C., and Mr. C. C. HUTCHINSON represented the Heckmondwike and Liversedge Urban District Councils, the only petitioners against the Bill.

Mr. HONORATUS LLOYD, in opening the case, said the objects of the Bill were to enable the Heckmondwike Gas Company to add to their works, raise additional capital, purchase by agreement the mains of another Company within a portion of the district where hitherto there had been competitive powers, close and divert two footpaths, consolidate and convert the different classes of capital, replace the present maximum price arrangement by a sliding-scale (the standard price being 3s. 3d. and the dividend 5 per cent.), apply the modern testing provisions, change the name of the Company, and generate and supply power gas. The old Heckmondwike Gas Company had existed since 1843, and it was made a statutory undertaking in 1862. The maximum price was 4s. 6d. per 1000 cubic feet; but the actual price now was 3s. 4d., less a discount which reduced it to 2s. 6d. to private consumers—the charge for public lighting being 2s. 4d. The Company had been supplying at too low a price, and therefore had had to draw upon their reserve fund the last few years in order to pay maximum dividends. The capital amounted to £63,000, bearing maximum interest varying from 4 to 10 per cent. The capital powers, together with borrowing powers as to £13,500 more, had practically all been exercised. The demand for gas had very largely increased of recent years, and was still growing. The quantity supplied had, on some days, exceeded the storage capacity; and in case of fogs, to which the district was subject, the Company had been put to dire straits. On some occasions, in fact, the supply had run short. With regard to power gas, the Company desired to be in a position to supply it, the district being an industrial one; though Counsel said he did not know that at the moment there was any special demand for it. The two Councils suggested in their petition that the Committee should convert the Bill into one for purchase, and complained that they had not had sufficient time to enable them to promote such a Bill themselves. They said a gas undertaking should be in the hands of the local authority, and that they should be allowed to purchase, or, at any rate, that the powers of the Bill should be suspended. They alleged that there had been considerable waste in the manufacture and distribution of gas within the Company's limits of supply. In 1901, when they unsuccessfully promoted a Bill for the compulsory acquisition of the undertaking, they made a similar allegation; and there was some truth in the allegation—the district being a colliery one. But since then the leakage had been seriously dealt with, and the proportion of unaccounted-for gas compared very favourably with that of any other similar district. The Councils asserted that the Company had spent money out of revenue for many purposes to which capital was properly applicable. No doubt this was so in the early days; but that was all gone into in connection with one of the Company's Acts of Parliament. It was also said that, without statutory authority, they had placed large sums to a depreciation fund. Though he represented the Company, he did not know what this meant. There was nothing in the complaints; on the contrary, the

Company's undertaking was admirably managed. When the suggestion of purchase was made, he was rather provoked to contrast the Company with the Local Authority. The Heckmondwike District Council had recently been the subject of inquiry by a Local Government Board Inspector; and a more condemnatory report than that which was issued last September he (Counsel) had never read. The Inspector reported that the rates had increased from 6s. to 7s. 8d. in the pound between 1898 and 1907; that in most respects "sanitary administration in Heckmondwike is almost in abeyance;" and that he was "not able to obtain any satisfactory explanation of the Council's omissions in this respect, beyond the statement that the financial conditions of the district rendered it inexpedient to spend more money on paving streets at present." Here was an authority who said they were not in a financial position to pave their streets, and yet asked to be put in a position to spend the ratepayers' money on the purchase of a gas undertaking. The report concluded: "It is clear that the Heckmondwike Urban District Council have in many directions grossly neglected their duties as a sanitary authority, and that, notwithstanding their ineffective administration, they have not succeeded in keeping down the rates." The Council had embarked on an electrical undertaking; and though they had been authorized to spend only £20,000, they had laid out £40,000 on it. This was the authority who had the impertinence to suggest that the Gas Company could not carry on their undertaking, and that they (the Council) could do it better. They asked for a provision enacting that there should be no enhancement of the value of the undertaking as a consequence of the Bill being passed. That was to say, they wanted some little encouragement to come again next year to Parliament.

Evidence was then given in support of the Bill.

Mr. F. D. Richmond, examined by Mr. CLEAVE, said he was appointed Manager and Engineer of the Company in August, 1904; and in January last year he became Secretary. The area comprised the two urban districts of Heckmondwike and Liversedge; but part of the latter place was supplied, by arrangement, by the Cleckheaton Urban District Council. The Company would have had to go into Cleckheaton parish to get to this portion of their area; and to avoid doing this, they arranged with the Council to supply about 1700 houses there. The Company also supplied by request, but without statutory powers, the village of Hartshead, in the rural district of Halifax. The plant of the Company comprised six beds of inclined retorts capable of producing 700,000 cubic feet of gas per day, which was the maximum consumption of the Company; one set of condensers, which had been in use for some fifty years, and would require enlargement in the near future; exhausters which would be equal to the demand for the next few years; scrubbing and washing plant which would allow for an increase of 25 per cent. in the make of gas; purifying plant which was only just equal to dealing with the present make of gas; and a meter and governor large enough for the next few years. The storage was absolutely insufficient; and one of the main objects of the Bill was to provide an adequate gasholder. The valve-house and holder connections would have to be remodelled when the new gasholder was erected. There was an old retort-house fitted with ten beds of direct-fired retorts, which were obsolete, and of very little use. There were two holders; the capacity of one being 350,000 cubic feet and of the other 100,000 cubic feet. The latter was of very little value, and could not be used at all at night. In the Company's area fog often lasted two or three days, so that the storage capacity must be ample. On such occasions, they experienced the greatest trouble in meeting the demand for gas. Besides the difficulty of maintaining a proper supply, there was considerable waste in keeping the retorts always ready to go into action. They proposed to erect a holder with a capacity of a million cubic feet. The consumption of gas had steadily increased for many years. It had risen from 79 million cubic feet in 1896 to 103 millions last year. The increase was accounted for by the consumers being given facilities to utilize gas, and being allowed to obtain appliances from the Company on very reasonable terms. Since he had been Manager, he had done a good deal to develop the use of penny-in-the-slot meters, as well as apparatus for heating and cooking in working-class houses. The total number of consumers in the district on Dec. 31 last was 5991. The quantity of gas now being consumed through prepayment meters was 13,400,000 cubic feet. Of the total gas sold, 24 per cent. was for trade purposes, and 4½ per cent. for public lighting. The population of Heckmondwike was estimated at 10,000, and of Liversedge 15,000. There were about 6400 houses, including shops, mills, and workshops, in the two areas; and on Dec. 31 last 5991 meters were in use. The ecclesiastical parish of All Saints, Roberttown, in Liversedge, was supplied by the Mirfield Gas Company jointly with the promoters; the Mirfield Company having 230 customers in this area. Terms had been arranged for the acquisition by the promoters of the rights of the Mirfield Company in the area. Customers were supplied with service-pipes up to 20 yards, and in some cases of greater length, free. The standard illuminating power of the Company's gas was 14 candles; and they had supplied gas of from 15 to 15½ candle power. The maximum price under the Act of 1875 was 4s. 6d. per 1000 cubic feet; but since 1895 they had been selling at 2s. 6d. for lighting, heating, and cooking—the figure for gas consumed through prepayment meters being 3s. 4d. The Company's price compared very favourably with that of other gas companies in the district. The leakage amounted to 8·6 per cent., which also compared well with that of any other district similarly situated. The mains ran, to a very large extent, over coal measures, which sometimes meant a fracture, and consequent leakage. The District Council's last complaint was in the winter of 1904; and it related to the supply and quality of the gas. It arose out of trouble with the stokers. It was put right, and they had never complained since. The supply of gas was adequate throughout the district, except in times of fog, when the demand was as much as the Company could cope with. They did not receive complaints generally, and those which came to hand were not of a serious character. Not quite sufficient money had been spent on repairs and renewals of plant in the past. The Company obtained 9497 cubic feet of gas per ton of coal carbonized in 1901, and 10,724 cubic feet in 1908, which was an extremely good yield. The percentage of gas unaccounted for on the make was 9·57 in 1901; it rose to 19·5 in 1904, under the late Manager; and had since steadily declined to 8·6 in 1908. Authority was sought to raise £60,000 by shares and £27,500

by borrowing. The Mirfield Company were to be paid £2407. A sum of £1196 from the reserve fund had been put into the works, and it was proposed to replace it. When the Company had met these and other items, the balance for future requirements would be £68,000, which would last about fifteen years. The capital raised at Dec. 31 last was £72,588, which worked out at £703 per million cubic feet of gas sold. This figure would probably be greater in future, owing to the development of the prepayment meter system. The increase in consumption was estimated at 83 millions, which at £750 per million came to £62,250; so that the Company would have about £7000 for working capital. They had been selling gas for some years at 2s. 6d. per 1000 cubic feet; but this had not yielded quite sufficient profit to enable them to pay maximum dividends. There was every reason to believe that the cost of coal would increase by 1s. 6d. to 2s. per ton, having regard to the fact that there was a thin seam in the district, and that the Coal Mines Regulation Act would soon be in operation. In addition, wages and other expenses were increasing in the district. In these circumstances, the Company asked for a standard price of 9d. in excess of the present charge.

In cross-examination by Mr. HUTCHINSON, witness said the standard price of 3s. 3d. for which the Company were asking would at present leave them a margin of 9d.; and taking it on the basis of the old capital, it would, he believed, give them an increase in dividend of 2½ per cent. all round. He could not deny that for the last 45 or 47 years there was not a year in which the Company had not paid maximum dividend.

Mr. HUTCHINSON: So that the effect of your proposed sliding-scale would be not to go on paying, as you have been paying, 10, 7½, and 7 per cent. for 45 years, but 12½, 9½, and 9½ per cent.?

Witness: Yes; if it could be done.

In further cross-examination, witness said if the undertaking were purchased, the shareholders would be compensated on the basis that for 45 years they had been getting maximum dividends, and they would get top price. The shareholders would receive an amount of capital which would provide them with the same income that they had been receiving. Asked what injustice would be done to them by the purchase of the undertaking, witness said they had a secure investment now, and they would have to seek a fresh one. He did not know that it was the common practice of arbitrators to provide for the cost of re-investment. He did not think the Local Authorities could manage the undertaking. He thought places were much better off, from the consumers' point of view, with gas undertakings in the hands of companies than in those of local authorities. Possibly they could borrow money more cheaply; but the profit they made went to pay off the cost of the works. They very seldom lowered the price of gas. He did not say that £1084 debited to the revenue account in respect of payments for stoves, prepayment meters, cookers, &c., in 1907 and 1908 should have gone in reduction of the price of gas. Stoves and fittings had a very short life, when once they had been fixed. The capital value deteriorated at once. He was aware that in the past history of the Company considerable sums were debited against the revenue account which should have been expended out of capital; and he accepted as correct the amount of £14,000 which appeared in the capital account. There were 1095 slot-meters in use in the Company's district; the total number of supplies being about 6000. During the last five years he had reduced the leakage and the waste in the coal carbonized; the benefit to the consumer being a better supply of gas than formerly. Questioned as to whether the consumer obtained the better supply at less price, witness said they could not give the consumer much benefit when they were supplying him at so low a figure as they were doing. There must be a limit somewhere. The cost of production per 1000 cubic feet of gas in 1904 was 23'7d.; in 1905, 23'9d.; in 1906, 3d. less; in 1907, 17d.; and in 1908, 18'63d. These figures were not abnormally high. Asked to point to a place in the immediate neighbourhood, furnishing a supply of gas under similar circumstances in comparable amounts, where the total cost of production, manufacture, maintenance, and distribution, including all charges, was nearly as high as that of the Heckmondwike Company, witness named Cleckheaton and Longwood. The reserve fund of the Company was not quite full.

Re-examined by Mr. CLEAVE: There was a considerable difference between the proposed standard price and that at which gas was actually sold. He had never known a gas company increase their price to the amount of the standard, when one was granted. If they were to do so, they would lose trade. The Heckmondwike Company were very strong in their desire to retain possession of the undertaking. The dividends they paid were certain; but there would be great uncertainty as to the amount which an arbitrator would award if they had to sell their undertaking compulsorily. The premiums obtained when shares of the Company were sold were such that the yield to the purchaser was only 4 per cent. If the Local Authorities did not make a larger profit out of the concern than the Heckmondwike District Council made out of their electric light undertaking, the rates would not benefit. With regard to the purchase of stoves, cookers, fittings, pipes, and so forth out of revenue, as soon as ordinary fittings were put into a house their capital value was gone. The life of ordinary cookers, and things of this sort, was about five years; and it was the universal practice to pay for them at once, either out of revenue or out of a suspense account formed from revenue, in order that they might not have as capital in their books that which at the end of five years was not capital. As to the £14,000 referred to by Mr. Hutchinson, the Company paid dividends on the amount of capital authorized by Parliament, not that amount plus the £14,000. Though, as a result of better management in the past few years, the consumers had not had a reduction in price, there had been no increase, though the cost of coal and labour had risen. There had, however, been a reduction in the price of gas for power purposes.

Mr. J. J. Stead, the Chairman of the Company, stated that the plant and works generally were in good condition. No trouble was experienced in getting purchasers for the shares. It had been suggested that some members of the two Local Authorities did not, as shareholders in the Company, receive an intimation of the promotion of the Bill; but, as a fact, witness, at the last annual meeting held in August, announced that the Bill would be brought forward. He did not think

the opposition of the Heckmondwike District Council was approved of in the district; nor did he consider any advantage would accrue if the proposed transfer took place. For years neither of the two opposing Councils had complained with regard to anything connected with the Company; and therefore there were no grounds which would justify the compulsory transfer of the undertaking. The Company were doing all they could to push the supply of gas, and to comply with the requirements of the district.

In cross-examination by Mr. HUTCHINSON, witness said the Company now just about paid their way.

Wednesday, March 24.

On the resumption of the proceedings to-day, several witnesses expressed their disapproval of the proposed compulsory transfer of the Company's undertaking, and spoke to their satisfaction with the existing supply.

Mr. E. H. Stevenson was then called. In reply to Mr. CLEAVE, he said the condition of a great portion of the Company's works was good, but that there were parts which showed that in the past sufficient money had not been spent on maintenance and repair. These parts, however, would soon have to be enlarged, in consequence of the growth of the undertaking. The leakage, though at the high figure in 1901 of 19½ per cent., was now only 8·6 per cent., which was very satisfactory, having regard to the fact that this was a colliery district. The gas-holder capacity was very much below what it ought to be. In time of fog, the gas consumption (this being a manufacturing area) increased very rapidly; and proper pressure could not be maintained unless there was a very large excess of storage capacity. He had often advised gas companies and local authorities in similar districts to have storage at least equal to 150 per cent. of their maximum daily output. The price charged by the promoters compared very favourably with that paid by consumers in places of approximately the same size in the West Riding of York. He approved of the proposed purchase of the Mirfield Company's mains, as it was a mistake to have two gas companies in the same area. The conversion of the Company's shares was a purely domestic matter which would not affect the amount to be paid in the shape of dividends. The additional capital asked for was necessary. The rate of increase in the business had been very satisfactory, and until the latter part of last year it had been maintained. Bad trade towards the close of 1908 affected the Company as it did others in manufacturing districts. Assuming the rate of increase to be 4 per cent. per annum, the proposed amount of new capital would be just about sufficient for the next fifteen years. In connection with the fixing of the standard price at 3s. 3d., whereas the Company were actually charging 2s. 6d., it was to be remembered that they had been living on past balances and the reserve fund. In the years 1901 to 1906, there was a net deficiency of £5390 on their dividends, which represented 1½d. per 1000 cubic feet of gas sold; and during most of these years sufficient money was not expended on maintenance and repairs. In consequence of the seam of coal in the district being thin, and of the operation of the Miners' Eight Hours Act, an increase in the cost of coal would almost certainly occur. In the adjoining district, there was a similar margin—viz., 9d.—to that proposed in the Company's area. A standard price might be higher or lower than the price actually charged; and in this case it should be higher.

Mr. CLEAVE: Do you consider authority should be given to these Local Authorities to purchase?

Witness: No; I am perfectly certain they cannot manage better, and probably they cannot manage as well. They have not shown that they are capable of managing the things which Parliament has already given over to them.

Bearing in mind the fact that Parliament refused to allow them to purchase in 1901, and that the complaints alleged then have since been remedied, you think there is no reason for the transfer?—That is so. There is no change except in the betterment of the Company and in the gas supplied to the consumers.

In further examination, witness said it was quite proper to pay for the cookers, &c., out of revenue year by year.

Cross-examined by Mr. BALFOUR BROWNE, witness said that since 1901 there had been certain years in which the Company had not earned enough to pay full dividends. The deficiency was due partly to payment out of revenue of the cost of replacing a retort-house by another, which was maintenance of works, and partly to the payment from the same source of the cost of slot-meters and stoves. The Company acted quite legally in defraying the cost of these things in this way. Questioned as to whether, assuming that the money should have been taken from capital, there would have been no deficiency, and that the Company would have been able to pay full dividends out of revenue, witness answered that anything could be proved by an assumption. The cost of replacing things swept away must be borne by revenue. It was usual to apply for authority with regard to the supply of power gas.

Mr. BALFOUR BROWNE: In this case, there is no condition put in with regard to the quality, composition, or price of the gas?

Witness: There are clauses which cover all that.

Will you give me a case in which powers have been granted to a company to supply power gas without restriction as to quality, composition, or price?—Yes, the Matlock Bath case.

In that case, all those things were stipulated for?—I had forgotten that. It may be so.

Does the laying of pipes for power gas involve a very large trench; the pipes being much larger than those required for ordinary gas?—No; because power gas is generally supplied under pressure.

If your maximum dividend is paid by your present revenue, you will, if you have this margin of 9d., be able to divide extra dividends. How much, in addition to the nominal 5 per cent. over all your capital, would that 9d. enable you to divide?—Nothing, unless we can earn it; and we cannot earn it with our present price of gas.

If you do earn it, how much will it increase the 5 per cent.?—By nine half-crowns, or £1 2s. 6d. per cent.

All that comes out of the pockets of the consumers if you earn it?—Yes; but we cannot earn it.

In further examination, witness said the Company were at the end of

their tether so far as their present capital was concerned. It was not usual in such circumstances for Parliament, whether or not there was complaint of the Company, to sanction a transfer of the undertaking.

Re-examined: He had never known a Committee of Parliament authorize the transfer of a gas undertaking to a local authority who, like the Heckmondwike Council, had absolutely failed in carrying out their sanitary duties.

This concluded the case for the Bill. No evidence was called for the petitioners.

Mr. BALFOUR BROWNE then addressed the Committee on behalf of the Heckmondwike and Liversedge Urban District Councils. He maintained that the prepayment meters and stoves, &c., should have been paid for out of capital; and therefore the pretence of the Company that they could not pay dividends without drawing on their reserves had really no foundation. The Company had been well able to pay their dividends; and, if the Committee passed the Bill as it stood, they would be able to pay much larger ones. It was always an ungracious thing for a local authority who sought to purchase to try to cripple the undertaking it had in view. If the purchase was sanctioned, all their incapacities, all their illegal acts would have to be considered at the arbitration; and that would be the time to see whether they had or had not done their duty. He did not propose therefore to go into questions of past management. At the same time, it was ungracious and improper of Mr. Lloyd to make an attack, which had absolutely nothing to do with the present inquiry, on the Heckmondwike Council. The Committee could not inquire into the sanitary affairs of the Heckmondwike Council. If these were not satisfactory, they must be dealt with by the Local Government Board. The question was not whether Heckmondwike had done its duty as a sanitary authority, but whether, if the Committee allowed the Bill to proceed, they would give the Local Authority an opportunity of promoting a Bill for the purchase of the undertaking. If a local authority and a company were applying for the first time for power to supply in the local authority's district, there was no doubt that the company would not be allowed to have a footing, and that the local authority would. The Heckmondwike Company were practically no longer a statutory Company supplying gas. They were asking to be a new Company on the back of the old one. The Company were, by confession, at the end of their tether; they could not go on any longer. This being so, the right of the petitioners, as the Local Authority, to supply themselves absolutely arose, unless the Committee passed the Bill. In 1901, the Local Authorities promoted a Bill to purchase the undertaking of the Company. Mr. Baggallay, on behalf of the Company on that occasion, resisted the proposal on the ground that they had a prospective value, inasmuch as they had still £31,000 to spend; and he added that if they were at the end of their tether, the matter would be entirely different. Mr. Baggallay went on to mention rules which appeared to govern Parliament in taking action in cases of proposed transfer, and remarked that if the concession had run out, if the Company had spent all the capital Parliament had allowed them, and if they then applied again to Parliament, the Local Authority might ask for transfer. This was the case here. No injustice would be done. Future capital would have to be sold by auction; and it would be bought by the public. The existing shareholders would receive the full value of their shares. If the Company were at the end of their tether, what harm would be done by the transfer? In a great number of cases, local authorities were supplying more cheaply than companies. He did not ask the Committee to throw out the Bill. This might be an injustice to the Company. He did, however, ask them to suspend the measure, as had been done in a great number of other cases, in order to give the Local Authorities an opportunity of promoting a transfer Bill. If this were done, and the ratepayers refused to allow the Local Authorities to promote such a measure, the Company would still have their Bill in the form in which they wanted it. If the Bill were promoted and Parliament said the Local Authorities were not such that the gas undertaking should be transferred to them, then, again, the Company would still have their Bill. The Company stole a march on the Local Authorities. They never heard of the Bill until the formal notice was issued; it being then too late for the Councils to promote a Bill in the present session. But for this fact, there would be another Bill before Parliament. Mr. Lloyd, merely for prejudice sake, brought in a report, and mentioned certain things, against the Heckmondwike Council which were absolutely irrelevant. The Batley Council, against whom there was an equally bad report, had their own gas-works. Was it fair that the Company should, by this Bill, take away the chance of the Local Authorities? The Bill would enhance the value of the concern to an enormous extent, because it would establish the sliding-scale arrangement with a standard price, giving them a margin of 9d. Surely this would not be fair to the people of the district. He would not criticize the clauses of the Bill as he might do. He proposed that the Committee should pass the Bill, but leave his clients for another year in exactly the same position as that in which they were to-day.

The CHAIRMAN, after a brief consultation with his colleagues: We all agree that Mr. Balfour Browne should have his suspensory clause; and we pass the Bill.

Mr. CLEASE asked the Committee to adopt the Merthyr Tydfil form of suspensory clause, with a provision that the Company should be empowered to expend money on the erection of the gasholder.

Mr. BALFOUR BROWNE said his instructions were that it was not necessary to provide the proposed gasholder in the next year, and that, even if it was necessary, the one proposed was far too large. If the Company were going to spend anything on capital account in the year, it should only be with the consent of the Local Authorities. These Authorities would not object to anything reasonably necessary to increase the supply.

Mr. CLEASE said there was no evidence that the Local Authorities would promote a Bill next year.

Mr. BALFOUR BROWNE: My instructions are that this gasholder is entirely unnecessary.

Mr. CLEASE: You have given no evidence on the point. We have; and I think we have shown it is necessary.

Mr. BALFOUR BROWNE: We are willing to have an arbitration as to whether it is necessary; and if the arbitrator says it is, we will give our consent.

Mr. CLEASE: In the Merthyr case, they recognized that a gasholder was necessary, and gave the Company power to spend money on it.

The CHAIRMAN: I think that is fair.

The clause was accordingly altered; and the other clauses having been adjusted, the Bill passed the Committee.

MUSSELBURGH GAS ORDER.

On Friday, a Parliamentary Commission, consisting of Sir Henry Craik, K.C.B. (Chairman), the Earl of Glasgow, Lord Saye and Sele, and Mr. Dundas White, sitting in Edinburgh, considered the application of the Musselburgh Gas Company for a Provisional Order.

The Company was formed in 1831, and carried on business as the Musselburgh and Portobello Gaslight Company till 1884, and thereafter as the Musselburgh Gaslight Company. In 1837, the Musselburgh Gas Order was obtained, which conferred statutory powers. The authorized capital was £20,000, with power to borrow to the extent of £15,000. All the capital has been issued, and the borrowing powers have been exhausted. The demand for gas has increased, and is still increasing. By the present Order the Company is dissolved and re-incorporated under the name of the Musselburgh Gas Company. The capital is fixed at £55,000, in shares of £1, fully paid-up, of which £30,000 is regarded as original, and £25,000 as additional capital; and £4000 of preference stock, in shares of £10 each. The dividend upon both classes is fixed at 5 per cent. Borrowing powers are conferred, not to exceed, including the £5000 borrowed by the old Company, one-third of the capital. Power is given to create reserve and special purposes funds; the annual contribution to the latter of which is not to exceed 1 per cent. of the paid-up capital, and the fund not to exceed one-tenth of the capital. The price of gas is fixed on a sliding-scale; 3s. 9d. being the standard, and the variations being 2s. 6d. on the dividend for every penny on the price of gas, up or down. Differential charges are allowed for gas consumed for other purposes than lighting. Discounts are allowed, not to exceed 10 per cent. to ordinary consumers, for prompt payment, and 15 per cent. to large consumers. For the hire of prepayment meters and fittings, the maximum charge is to be 10d. per 1000 cubic feet. The minimum illuminating power is fixed at 14 candles, to be tested in the Company's station, by a "Metropolitan" argand No. 2 burner. The pressure is to be not less than 8-10ths. There is a saving clause as to penalties for insufficiency of pressure, defect of illuminating power, or excess of impurity of the gas, where it can be shown as being produced by circumstances beyond the control of the Company. The Company have power to specify the sizes of material and pipes and fittings to be used in the first instance or on the occasion of any renewal between the mains and the meters. Power is asked to require every meter to be placed as near as reasonably practicable to the gas-main, but within the outside wall of the boundary to the consumer's property.

Mr. Macmillan (instructed by Mr. Beveridge, the Parliamentary Agent) appeared for the Company; and the Hon. W. Watson (instructed by Messrs. Guild and Guild, W.S., of Edinburgh) represented the Musselburgh and District Electric Light and Traction Company, Limited, who were the only opposers, and whose opposition was as to the position of the mains.

Mr. Macmillan intimated that the question with the objectors had been arranged. Mr. James Gibson, the Chairman of the Company, said he was familiar with the statements contained in the preamble of the Order; and the statements were true.

The Commissioners found the preamble proved, and clauses were adjusted.

Mr. Beveridge stated, with reference to the clause regulating the position of the meter, that it was not the Model Clause. The question had been discussed with Mr. Herring, of Edinburgh, who attached considerable importance to the position of the meter.

The Commissioners were of opinion that the Board of Trade clause should be imported into the measure, and suggested that if the Company wanted an alteration in it, they should apply to the Board of Trade.

SWINTON AND MEXBOROUGH GAS BILL.

The Unopposed Bills Committee of the House of Commons presided over by Mr. EMMOTT (Chairman of Ways and Means) had before them on Thursday the above Bill.

Mr. LEES (Parliamentary Agent for the Bill) said the Bill was one to constitute a Gas Board, consisting of representatives of the Urban District Councils of Swinton and Mexborough in the West Riding of York, for the purpose of purchasing the undertaking of the Swinton and Mexborough Gas Company. The Company were constituted a statutory undertaking by the Swinton and Mexborough Gas Act of last year; a clause being inserted in the measure giving the two Urban District Councils the right to purchase. The whole of the report of the Local Government Board had been met; the only possible question outstanding being the period for the repayment of the loan.

The CHAIRMAN inquired whether the following paragraph in the Local Government Board report had been met:—

The proposal that the mortgage debt of the Company should remain a charge on the undertaking after its transfer to the Gas Board is in accordance with section 81 of the Act of 1908; but the Board may state that it is, in their opinion, undesirable in ordinary circumstances to transfer to local authorities the mortgage or other debts charged on undertakings transferred to them. The Board suggest, therefore, that if the mortgage debt can be redeemed, the transfer should be made free from all debts of the Company, and that the purchase money to be paid to the Company should be fixed at such an amount as will provide the funds needed to enable the Company to extinguish the mortgage debt charged on the undertaking.

Mr. LEES said the suggestion was that, if possible, the Company should pay off their mortgage debt, and that it should not be transferred to the Board. If this course were adopted, it would be in direct

opposition to a decision of Parliament last year. He had no power to force such a provision on the Company, nor would such a provision be in accordance with precedent. He knew of no case in which a statutory gas company purchased by compulsion had been compelled to pay off their mortgage debt. From the Local Authority's point of view, it was quite immaterial whether or not they took over the debt.

Mr. MOON, K.C. (Speaker's Counsel): You are buying subject to all their mortgages and liabilities?

Mr. LEES: Yes; and that is according to precedent in taking over a statutory company.

The CHAIRMAN: I think that sufficient. Now as to the period.

Mr. LEES said the period originally asked for was forty years; but it was now 35 years. In their report, the Local Government Board gave all the periods which had been allowed in recent Acts for the purchase of gas undertakings; and he submitted that, having regard to these, the period suggested in this case was well justified. He could not offer any evidence as to the state of the works of the Company—permission to inspect them having been refused.

The CHAIRMAN: You are buying a pig in a poke?

Mr. LEES: In the sense that we do not know what we are purchasing. But we are going to buy by arbitration; and when we have served notice to treat, we shall be entitled to inspection of the works and of the books of account.

Mr. MOON: The price you pay is not based on what the works are—on the value of the pipes or what has been spent on them—but on the goodwill which you buy. The money you pay will be ascertained in reference to the value of the goodwill; and that you hope will last for more than 35 years.

Mr. LEES said for all time, until something came along which was better than gas. He said the question of period was very important to the promoting Councils. These Councils went into this business having regard to what happened in the Pontefract and Wath and Bolton cases—the period in both being 40 years, and the areas being adjacent to Swinton and Mexborough. Moreover, in the Pontefract case, the period was allowed by the Police and Sanitary Committee—a body who were very stringent in regard to this particular matter.

The CHAIRMAN: We have decided to allow you the period of 35 years; but I think I ought to say that the mind of the Committee is set against any increase, and, in fact, is rather set on a decrease, in the number of years they are likely to allow for the purchase of gas-works, because of the somewhat doubtful character of the undertaking in the future. I make this as a general statement for the assistance of anybody whom it may concern.

Mr. J. W. Hattersley, the Clerk to the Mexborough Urban District Council, gave formal proof of the preamble; and the Bill was allowed to proceed.

Price of Gas at Bradford.—A meeting of the Finance Committee of the Bradford City Council was held last Thursday, when the business to be submitted to the next meeting of the Council was considered. A resolution was proposed by Mr. Trotter, and was strongly supported by Alderman Land, recommending the Gas Committee to raise the price of gas. No amount was stipulated in the resolution; but an increase in the price of 2d. per 1000 cubic feet was generally spoken of. The resolution was passed with few dissentients. A proposal was also submitted by the Gas Committee asking the Finance Committee to give back to them the balance of the £2000 appropriated last year for the clearing of insanitary areas; the Health Committee having spent only about £120. This resolution was strongly supported; but finally the Chairman (Mr. David Wade) persuaded the Committee to leave the matter over, as there was no immediate hurry.

Londonderry Gas Company.—At the ordinary general meeting of this Company on the 26th ult., the accounts presented showed a profit balance of £4281; and the Directors recommended dividends of 10 and 7 per cent. per annum, less income-tax. The Chairman (Mr. H. J. Cooke), in moving the adoption of the report, said the Company had been working at considerable disadvantage during the past year, especially in regard to the price of coals and other materials, the extra charge for which was a very considerable item in the expenditure. However, owing to the recent improvements at the works, they had come through the year fairly well, notwithstanding that they had spent a large sum upon the renewal of several parts of the plant. The Directors intended to pursue the course of getting the works into the highest possible state of efficiency for the more economical production of gas, which they deemed to be the best policy in the interest of consumers and shareholders alike. The report was adopted.

Cromer Gas Company.—At the recent ordinary general meeting of this Company, Mr. Percy Griffith, who was formerly the Company's Consulting Engineer, but is now upon the directorate, in seconding the motion for the adoption of the report, dealt *seriatim* with the paragraphs which he thought the shareholders might desire to have elucidated. He pointed out that the Directors had taken a step by which the capital would be written down by £6492, which would aid them in strengthening the security of the shareholders' property. With regard to the extension of the undertaking to East Runton, he said it was not anticipated that there would be much development there, but it was at West Runton where they would have the greatest amount of scope. He mentioned that the Company had obtained the public lighting in Cromer for the next twelve months; and in this connection he referred to the good relations existing between them and the District Council. Commenting on the 2 per cent. dividend recommended, he said he thought it well to maintain a steady dividend, which was much more satisfactory than a variable one, and would improve the Company's position on the market. Mr. C. J. Parker criticized the action of the Directors in regard to many of the matters mentioned in the report; and he moved, as an amendment, that no dividend be paid. On a show of hands, the numbers were equal; but on a vote being taken according to holding, the amendment was lost by 82 votes to 47. The report was adopted with the exception of a clause relative to a money payment to Mr. Griffith, which the Directors thought should be made in recognition of his valuable services to the Company.

LEGAL INTELLIGENCE.

CARRIAGE OF COAL TO THE BIRMINGHAM GAS-WORKS.

The inquiry by the Railway and Canal Commissioners into the allegation by the Corporation of Birmingham of excessive charges by the Midland, London and North-Western, and Great Western Railway Companies for the carriage of coal to and from their gas-works at Saltley, Nechells, Windsor Street, and Swan Village, the opening proceedings in which were reported in the "JOURNAL" last week (p. 922), was continued on the 29th ult.

Mr. T. Mitchell Hill, the Mineral Traffic Manager of the London and North-Western Railway Company, examined by Mr. Simon, said it was impossible to take the outward traffic from Nechells straight to its destination, because it was not received in train loads for any particular place, but had to be all rearranged on the Company's sidings at Windsor Street. It could not be done nearer to Nechells because of the amount of traffic on the lines. If the Corporation provided sufficient sidings for marshalling the trains within the works, he would have no objection to doing it there. He doubted whether the Corporation could find ground for the extension of sidings; and even if they did, there would be the objection to them that there was a falling gradient towards the gas-works. The Company had the same difficulty in dealing with outward traffic from the Windsor Street works as from the Nechells works. If the plaintiffs were to marshal all their trains on their own sidings, he would gladly give up the 1d. a ton now charged.

In cross-examination by Mr. Balfour Browne, witness admitted that the coke from the Corporation works was shunted and marshalled with other traffic at Windsor Street.

Asked if a railway company could conduct its business without sidings for shunting and marshalling goods, witness replied that, speaking generally, traffic must be shunted and marshalled, and the Railway Companies must have a place for it. Theirs was at Windsor Street; but if other arrangements were made, they need not take the Corporation coke there.

Mr. A. Jephson, the Assistant Goods Manager to the London and North-Western Railway Company, and Mr. T. H. Rendell, the Chief Goods Traffic Manager to the Great Western Railway Company, having given evidence,

Mr. Simon, K.C., addressed the Court on behalf of the first-named Company; and the inquiry was adjourned.

Next morning, Mr. Balfour Browne replied for the Corporation. He said the other side admitted that when a trader wished to do the unloading when merchandise arrived at a station, he was entitled to a rebate; and he contended that if any accommodation and terminal charge were included in the rate, the Corporation were entitled to have an allowance. The Railway Companies denied that they were charging for accommodation; but he asked the Court to draw the inference that the rate did include a terminal charge. If the Companies were to be allowed to succeed in this case, no power would be able to find out what was being charged for accommodation or terminal service. The sorting of the trucks was not a terminal charge at all; it was part of the conveyance rate to the applicants' gas-works. This charge for sorting was, therefore, entirely outside their power; it was not done for the convenience of the Corporation, but simply for that of the Companies. Counsel then proceeded to point out that disintegration of rates charged by the Midland Company showed there was a terminal charge of 3d. a ton at Lawley Street for traders, and said it was difficult to understand why they now said that only 1d. was the terminal charge to the Corporation. The Midland Company admitted that there was a 3d. terminal rate on coke; and he asked the Commissioners to infer that there was also a terminal charge of 3d. on coal. He contended that the Company's figures as to disintegration were not genuine, but were arranged to suit their own purpose when asked to allocate the amounts charged for conveyance and for station accommodation. He claimed that there were terminal charges on all rates.

At the conclusion of Counsel's address, the Court reserved judgment.

Wrongful Abstraction of Water.

From the evidence tendered during the hearing of two cases at the local Police Courts last week, of wrongful abstraction of water from the mains of the Oldham Corporation, it would appear that motor-lorry drivers are the worst offenders. For the prosecution, it was submitted that, though the value of the water taken was not of great importance, danger might ensue through persons taking a supply from unauthorized places, because the pressure in the out-townships was very great, that there might be serious results at any time when such a thing was done. At the Royton Police Court, last Wednesday, William Pettiford, a motor-lorry driver in the employ of Messrs. C. T. Faulkner and Co., of Manchester, was fined 5s. and costs. He pleaded that, as the boiler of his motor-lorry was empty, he had to get water from somewhere. Mr. Arthur Andrew, the General Manager of the Gas and Water Departments of the Oldham Corporation, had written the defendant's firm advising them to take out a permit to abstract water; but they replied that it would not pay them to give £1 per annum for water taken from street hydrants, as they used so little. A similar case was heard on Thursday at the Manchester County Police Court; the defendant being another motor-lorry driver employed by the same firm. It was alleged that the driver filled the boiler of his motor-lorry by means of a suction pipe which was attached to the main, and by carrying buckets of water from a pipe outside a public-house at Failsworth. Defendant said the landlord gave him permission to take the water; and under the circumstances he was only fined 5s.—the Stipendiary (Mr. Yates) remarking that in a previous case the Bench inflicted a heavy penalty.

Mr. A. E. Fisher, formerly Government Inspector of Schools in Somerset, was found dead in bed at the Half-Moon Hotel, Exeter, last week, having apparently poisoned himself by gas.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Wednesday—Alderman W. F. COTTON, D.L., J.P., in the chair.

The SECRETARY AND MANAGER (Mr. Francis T. Cotton) having read the notice convening the meeting, the report and accounts for the six months ended Dec. 31, to which reference was made in last week's "JOURNAL" (p. 937), were taken as read.

The CHAIRMAN, in moving the adoption of the report, expressed his regret at having to state that there had been a falling-off in the sale of gas in the six months to which it related, when compared with the corresponding period of 1907. This was attributable to several causes. In the first place, there was the great depression in trade, which had affected adversely the output of gas from nearly every undertaking in the kingdom; secondly, the exceptionally mild weather experienced during the autumn and winter months; and, further, there were the many competitors, such as suction and power gas and the electric light. Then there had been introduced the inverted incandescent gas-burners, which, so far as light and cheapness were concerned, surpassed in economy all other means of artificial lighting. When making comparison with the half year ended December, 1907, it must be borne in mind that during the months of August, September, and October the Company supplied a large quantity of gas to the International Exhibition. However, the past half year was a very bad one for gas undertakings generally. On referring to the accounts, the proprietors would find that the increased cost of coals and the falling-off in the gas-rental and receipts for residual products would account for having to make use of the reserve fund, which existed for the purpose, and drawing therefrom £9950 to make up the dividends recommended by the Directors. There had been a considerable reduction in the receipts for residual products. When he addressed the proprietors last September, he was under the impression that coke would demand, if not a higher price, at all events the price they were then receiving. This, however, had not been the case. Though coals cost 3s. per ton in excess of the corresponding period of 1907, the Directors were obliged to reduce the price of coke in order to compete with the markets; the result being that the receipts under the head of "residual products" were less by £1778. He was pleased, however, to be able to announce that the situation had changed for the better. They had entered into contracts for twelve months' supply of coal at a considerable reduction in price. These contracts would come into operation immediately on the present stock of coal, which was purchased in October, 1907, being worked out. He was glad to say the public were beginning to appreciate the great advantages to be derived from cooking and heating by gas. During the half year under review, their people fitted up 2102 automatic installations; a cooker being in each case supplied with a gas-bracket or two, and in addition a pendant, where required. In the same period, there were let on hire 336 cookers and 208 heating-stoves; 56 free cookers were connected with consumers' fittings, in addition to which there were purchased and fitted by consumers 14 cookers, 198 heating-stoves, and 72 gas-fires. There were laid 6684 yards of new mains of various sizes, ranging from 3 to 12 inches in diameter, and 2646 new service-pipes. They had also put in 3835 new meters, nearly all of them being for automatic supplies. In order to meet the overdraft at their bankers, the Directors issued additional capital to the extent of 5562 £10 shares, which were disposed of by auction, in accordance with the provisions of the Company's Acts. They realized £68,014, including a premium of £12,394. The latter sum, being premium capital, could only be used for capital purposes; it bore no dividend or interest. Immediately after the termination of the meeting, a special one would be held for the purpose of obtaining the consent of the proprietors to a Bill now being promoted to confer additional powers on the Company. The object the Directors had in view was to place the undertaking in a similar position to that of nearly every other in the kingdom, whether the property of a local authority or of a private company. No doubt the proprietors were all aware that from time to time complaints of the price of gas had been made. Well, so long as the Company were labouring under their present disabilities, they would have similar complaints. The Directors' object was to be in a position to furnish an article of commerce such as was supplied in nearly every other city and town, with the exception of a few isolated places in Scotland, where the manufacturers had cannel coal at their doors. If the Bill became law, the Company would be in a position to sell gas at a reduced price. There were provisions seeking power to supply gas of a standard of 14 candles, in lieu of 16 candles as at present. He did not think it was at all likely that Parliament would refuse to place Dublin, as regards its gas supply, under similar conditions to those which were in operation in nearly every other city and town in the United Kingdom. He should mention that there was no apparent difference between the light produced by 14 and 16 candle gas when consumed in incandescent burners. After providing for the payment of interest on the debenture stock and the overdrafts at their bankers, there remained £25,056 to be carried to the profit and loss account. The Directors recommended the payment of dividends at the rates of 10 and 7 per cent. per annum on the respective shares. This, as he had said, would involve the withdrawal of £9950 from the reserve fund, but a balance of £43,255 would remain to the credit of the fund. He might point out that this fund could only be used for the purpose of making up dividends.

Mr. CHARLES LAWLER, J.P., seconded the motion; and it was carried.

On the motion of the CHAIRMAN, seconded by Mr. J. MURPHY, the salary of the Secretary and Manager was increased £200 a year.

The dividends recommended having been declared, and the retiring Directors and Auditor re-elected, the business of the ordinary meeting concluded.

Subsequently a special meeting was held for the purpose of obtaining the proprietors' sanction to the promotion of the Bill referred to by the Chairman. The Law Agent of the Company (Mr. E. Fitzgerald)

explained the various clauses; and the Chairman added that they were of quite the ordinary character. On his proposition, the Bill was approved of.

Mr. DAVISON proposed a vote of thanks to the Chairman, Directors, and Officers of the Company. He said anybody who read the reports of the Corporation meetings would see the ill-feeling that existed towards the Company. The Directors had conducted negotiations with the Corporation in a very friendly and gentlemanly way, and had given them no cause for their unreasonable attitude.

Mr. JOHN M'BRIDE seconded the motion, which was passed by acclamation.

The CHAIRMAN, in reply, said the Company were in a totally different position from the Corporation, who were in the happy position of being able to call on the rates to make good any deficiencies in connection with their electric light undertaking. Up to the present time, £54,000 had been made up out of the rates as losses on the electric light; and this year the rates would be saddled with something like £11,000 on the same score. This did not surprise him. It would be a long time, so far as he could see, before the Corporation would make any profit out of their electric lighting. The general public did not know the amount of money lost on the undertaking. During all the time the plant was wearing out, while there was nothing going towards depreciation. Ultimately a great portion of the apparatus would be scrap.

Mr. M'BRIDE said that in his township there was a serious loss on the electric light.

The CHAIRMAN: You are a ratepayer, why submit to it?

Mr. M'BRIDE: I am only one of a crowd.

The proceedings then terminated.

BRITISH GASLIGHT COMPANY.

Financially a Good Half Year—Assisting the Distressed Unemployed—Reduction in Price at Norwich.

The Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, the Directors' report for the half year, the Auditors' report, and, in compliance with the Act of Parliament, the accounts of the Norwich station. The Directors' report was as follows:—

The Directors submit the half-yearly accounts of the Company to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £27,206, after deducting the following sums (excluding shillings and pence): Income-tax, £1775; Hull debenture interest, £2137; Norwich debenture interest, £1681; Potteries debenture interest, £665; Trowbridge debenture interest, £166; and interest on debenture stock, £2280—total, £8704.

HULL.—The gas-rental shows an increase of £1098, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows a decrease of £481; tar and tar distilling, of £511; and ammoniacal liquor and sulphate of ammonia, of £457. Coals have cost 14s. 3d. per ton, as against 13s. 11d. Coke has realized 11s. 4d. per ton, as against 11s. 5d. The gas sold was 627,842,142 cubic feet, against 621,122,625 cubic feet in the corresponding period of 1907—an increase of 6,719,517 cubic feet, or equal to 1.08 per cent. Of this quantity, 43,965,000 cubic feet was supplied in bulk to the Corporation for the supply of the Old Town. The profit realized is £411 in excess of the parliamentary interest. This sum has been invested, making the reserve fund £34,009.

NORWICH.—The gas-rental shows an increase of £1600, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows an increase of £268; and tar and ammoniacal liquor, of £188. Coals have cost 17s. 8d. per ton, against 17s. 9d. Coke has realized 15s. 8d. per ton, against 15s. 7d. The gas sold was 250,983,900 cubic feet, as against 244,712,800 cubic feet—an increase of 6,271,100 cubic feet, or equal to 2.56 per cent. The profit realized, after writing off £4000 on account of reconstruction of works, is £1929 less than the parliamentary interest.

POTTERIES.—The gas-rental shows a decrease of £177, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows a decrease of £79; tar, of £677; and ammoniacal liquor and sulphate of ammonia, of £342. Coals have cost 11s. per ton, against 10s. 10d. Coke has realized 8s. 5d., against 8s. 2d. per ton. The gas sold was 176,395,877 cubic feet, as against 178,875,934 cubic feet—a decrease of 2,480,057 cubic feet, or equal to 1.38 per cent. The profit realized, after writing off £2000 on account of buildings and plant thrown out of use, is £653 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £4589 to the credit of that account.

TROWBRIDGE.—The gas-rental shows a decrease of £39, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £202. Coals have cost 17s. per ton, against 16s. 10d. Coke has realized 12s. 3d., against 12s. 7d. per ton. The gas sold was 36,712,676 cubic feet, against 37,049,576 cubic feet—a decrease of 336,900 cubic feet, equal to 0.90 per cent. The profit realized is £334 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows an increase of £66; and residual products, of £25. The profit realized is £500.

The available profit added to the previous balance of profit and loss amounts to £79,266. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500 and leave a balance of £54,766.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had frequently pointed out, at their meetings and in another place, how a gas company was like a barometer reflecting the trade of the country. There was no business which told more definitely how trade was going than a company like their own. The result of the half year, though satisfactory to the Directors and, he was sure, to the shareholders from the financial point of view, was not so satisfactory from the point of view of the increase in the gas sold. The shareholders would have learned from the report that the increase at Hull was only just 1 per cent. At the Potteries, there had been a small decrease, as well as at Trowbridge. But there was an increase of 2½ per cent. at Norwich. So that over the whole business of the Com-

pany, there was only an increase of 1 per cent. for the half year. He was glad it was not worse, because, during the visit the Directors paid to the two principal stations within the past fortnight—Hull and Norwich—both of the Engineers reported a deplorable state of affairs in regard to the trade of the towns; and they also heard from the Potteries, through their friend Mr. Woodall (who was interested in the Potteries business generally), that everybody down there—bankers, merchants, and even the Company's own collectors—said how difficult it was to obtain money from customers. Of course, in times like this, the consumers of gas were always striving to cut down their gas consumption by closing their business premises and shops earlier than usual. This was why the gas business had not expanded in the way he had had to report at previous half-yearly meetings. He was sometimes glad that the great expansion they saw in certain suburban companies did not come to them, because it gave them a little breathing time to look round, and see how they could improve their property, both in regard to the works and office accommodation. He would give a few interesting items with respect to what had been done at the different stations during the half year. On their visit to Hull, the Directors found everything in perfect order, and also looked into one or two interesting matters, about which he would tell the shareholders. First of all, the Company were much cramped with regard to their office and stores accommodation in Baker Street; and taking advantage of some property falling into the market immediately adjoining their premises, but at the back, and facing another street known as Wright Street, the Directors purchased two houses and back gardens at a moderate figure, which would stand in the capital account at £1660. They still wanted to purchase one more small plot, which they hoped to get for £400; and then they would have the additional land required for enlarging and perfecting the accommodation referred to. A short time ago, he told the shareholders, the Directors established in a prominent position, a very fine show-room at Hull. Unfortunately, they had a fire there during the half year. A considerable amount of damage was done to the top floors and rooms. They were, however, amply insured; and they had received from the Insurance Company quite sufficient to cover the loss. The Company had also taken over the salvage of their own goods, which could be readily cleaned and renovated. The Directors found the show-room in full swing, as if nothing whatever had happened there. A nice addition had been made to the works at Hull. It had always been pointed out to the Directors whenever they went down there that the Hull workmen liked to be dirty. He (the Chairman) could never in his heart believe this was the case. The Board determined to "take the bull by the horns," and put up for the men good washing rooms and mess rooms; they, at any rate, made up their minds to try to influence the men to become better citizens. These rooms were simply but beautifully arranged; and they were nicely heated. There was a good gas-fitted kitchen, where the men could have their meals warmed up; and the arrangements for washing were admirable and well studied. This had "caught on" tremendously; and therefore the stigma of dirty workmen from the British Gas Company's works would not be upon them in future. Of course, at Hull there had been a great deal of distress; and, with he hoped the approval of the shareholders, the Board had contributed £100 to the Hull unemployed distress fund. So much for Hull. Then the Directors proceeded to Norwich. With regard to that city, on the last occasion he told the shareholders there was a balance of Norwich debentures which the shareholders had not taken up. It was only £5000. But after the remarks that he made at the last meeting, some people came in, and, in a short time, the balance was disposed of. The consequence was that now the total amount of debentures which were issued for Norwich had been applied for and taken up. Then another important thing had occurred in Norwich—that was, the reduction in the price of gas. He mentioned at the last half-yearly meeting that they were endeavouring to do this; and he was glad to be able to report that the Directors thought the time had arrived when this reduction should take place—in fact, it came into operation from Jan. 1 last. As the shareholders knew, 3s. 3d. was really a high price for a city of the size of Norwich. The Company had certainly been hampered there with a large capital, and with a heavy expenditure, during the last few years. In order to give the shareholders some idea of what had been done there, he might say that the reconstruction of the works in the past four or five years had cost no less than £71,000; and of this they had been obliged to place £44,500 to revenue, and only £26,500 to capital. Consequently, it had been very difficult indeed for the Directors to lower the price of gas. They had, however, now written off £41,000 out of revenue, leaving only £3482 still to be written off. Therefore, the Board had reduced the price to 3s. He might say this had created great satisfaction in the city; and the Company were now more popular than ever before. In Norwich, again, there had been a certain amount of distress. He said "a certain amount" because it was not so acute there as in other industrial towns. But the Board had endeavoured to meet the situation by advancing certain works which they had contemplated carrying out this summer, in the way of some large main-laying. The Company were now coming to a point in their gas sales at Norwich when they would require additional gas storage accommodation; and they had only one spot on the works where such a holder could be erected. That was at the Bishop Bridge works. They could just squeeze in a holder there, which would have a capacity of 1½ million cubic feet; and during the coming year, he was afraid they would have to go to this capital expenditure. He did not think there was anything further to be said about Norwich, except that there was a considerable demand for tar there for road purposes. They had put up a small still for taking off the light oils, so that the tar would be better available for the requirements of the City Surveyor. Then with regard to the Potteries, the shareholders were aware they had been gradually removing the old works down to a new and better site close to the railway. At the present time, one of the old holders was being moved down to the new site; and they were also erecting there a new holder of 1,025,000 cubic feet capacity. The distress in the district had been very considerable; and the Directors had endeavoured to alleviate it by making contributions of coke. These were all the specially interesting points at the stations. It would be noticed from the accounts that the half year had been a favourable one, and that they were carrying forward

a larger balance than they did on the previous occasion. He sincerely hoped he should be able six months hence to report to the shareholders a similar state of things financially. It might, he hoped, even lead to a small bonus being added to the same dividend they were declaring that day. It was some years since the Directors paid a bonus to the shareholders; and they would certainly do so again if their accounts proved it was possible. There was another matter to which to refer. Only a fortnight after the shareholders met in September, one of the Auditors—Mr. Edward Yardley—died suddenly. Mr. Yardley was elected an Auditor in January, 1867, in the place of his father; so that he had acted for the Company for 42 years, and had done his work exceedingly well. It became a question of what the Directors should do with regard to the appointment of a new Auditor, because, by section 21 of the Companies Act of 1900, which would be confirmed by the Act which came into force on April 1, the Directors had the power to fill any temporary vacancy in the auditorship, and then the appointment of Auditors would be made by the shareholders, in the usual way, at the next general meeting in September. As the shareholders were aware, for many years the Auditors of the Company had not been registered accountants; and the Board thought they would make a departure on this occasion by appointing a gentleman who was well known to many of the shareholders, and also in the accountancy world, and especially in the gas profession. They had therefore asked Mr. William Cash if he would take up the duties on this occasion. He (the Chairman) was glad to be able to report that he had acquiesced. As they had heard on this occasion, Mr. Cash had signed the accounts; and, at the next general meeting, it would be for the shareholders, if they thought fit, to re-elect him. He hoped the shareholders thoroughly approved of the choice the Board had made. One other matter to which he had to ask the sanction of the shareholders was the contribution the Board had made to the memorial to Sir George Livesey. He was not going to enter into an account of what Sir George Livesey did for the gas industry generally; but the Directors considered it only right they should contribute £200 to the fund which was being raised to establish a professorship at Leeds University in his memory. He trusted the shareholders would approve of what had been done in this respect.

Mr. F. WILKIN seconded the motion, which was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. CORBET WOODALL, a dividend was declared at the rate of 20s. per share, clear of income-tax.

On the motion of Mr. R. B. FITZMAURICE, seconded by Mr. B. FRANCIS HARRIS, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN having acknowledged it on behalf of himself and his colleagues,

Mr. LEONARD R. WILKINSON proposed, and Mr. CORBET WOODALL seconded, a vote of thanks to the Secretary, the Engineers, and staffs generally, both in London and at the different stations. The mover spoke in high terms of praise of the work of all the officials.

The motion having been cordially adopted,

The SECRETARY replied, saying how greatly he and the officers and staffs generally appreciated the vote.

This concluded the proceedings.

PROGRESS OF THE KEIGHLEY GAS UNDERTAKING

Under Mr. John Laycock's Management.

In connection with the forthcoming retirement of Mr. John Laycock, who has (as announced in our "Personal" column to-day) for the past 42 years occupied the position of Engineer and Manager of the Keighley Corporation Gas-Works, the following particulars of the progress of the undertaking under his care will doubtless prove of interest.

Keighley's first gas-works were erected in 1825, on a site at Low Bridge; and in November of that year the town was lighted with gas for the first time. It was one of the first towns in the kingdom to be lighted with gas from works erected by the local authority. As the town enlarged and the manufacture and distribution of gas became more understood, its use became more general, with the result that from time to time the plant had to be re-arranged and enlarged; the available land on both sides of the river being purchased for the purpose. For a considerable number of years after their erection, the works did not pay working expenses, and had to be supported from the rates. The extension of the works at Low Bridge was, however, put a stop to in 1873 by the Great Northern Railway Company requiring a portion of the works and land for the purpose of constructing the line from Halifax to Keighley. The Local Authority received £19,300 for the land required by the Railway Company, and at once took steps with a view to the erection of works elsewhere. Eventually land was purchased at Thwaites; and the erection of the present works was begun in March, 1875. They were pushed on with remarkable celerity, and on Dec. 5, 1876, were officially opened. The whole of the works were designed by, and erected under the supervision of, Mr. Laycock; and the present satisfactory position of the undertaking is a tribute to the thoroughness of his work and the care and skill exercised in the management. Since the present works were erected, every effort has been made to keep abreast of the times; and to-day the works are equipped with the latest apparatus for the manufacture and distribution of gas.

When Mr. Laycock took up his duties in the gas office in 1860 (seven years before he became Manager), the expenditure on capital account was £13,706; there was a debt on capital account of £6000; and there was nothing to the credit of working capital, sinking fund, or renewals and insurance accounts. In 1867, when Mr. Laycock was appointed Manager, the expenditure on capital was £20,076; the debt on capital was £6000; and there was still nothing to the credit of working capital, sinking fund, and renewals and insurance. At June 30, 1908, the expenditure on capital was £142,550; the debt on capital was £82,162; the working capital account had £15,000 to its credit; £5657 had been

set aside as a sinking fund; and £14,107 had been reserved for renewals and insurance. In 1860 and 1867, the price charged per 1000 feet to residents in the borough was 4s.; in 1908, the prices were 1s. 5d. and 2s. 1d. In 1860, the total number of consumers was 1415; in 1867 they had increased to 2366; and in 1908, to 13,675. In 1860, public lamps numbered 256; compared with 300 in 1867; and 1718 in 1908. In 1860, 2390 tons of coal were used for gas making; 21,260,000 cubic feet of gas were made, representing 8895 cubic feet per ton of coal; 17,620,000 cubic feet of gas were sold, or 7372 cubic feet per ton of coal used; the minimum number of employees in summer was 6, and the maximum number in winter 11. In 1867, 4552 tons of coal were used; 40,535,000 cubic feet of gas made, or 8904 cubic feet per ton of coal; 34,046,000 cubic feet were sold, or 7479 cubic feet per ton of coal used; and the minimum number of employees in summer was 20, and the maximum in winter 34. In 1908, 28,984 tons of coal were used; 337,372,000 cubic feet of gas were made, or 11,640 cubic feet per ton of coal used; 321,614 cubic feet of gas were sold, or 11,096 cubic feet per ton of coal used; and the minimum number of employees in summer 129, and the maximum in winter 154.

The profits made, after paying interest on the debt, from 1825 to 1866, amounted to £19,178, which was used in the reduction of the debt on capital. The profits, after payment of interest on the debt, from 1866 to 1908—being the 42 years Mr. Laycock has been responsible for the management—amount to £326,074. These profits have been apportioned as follows: £42,878 to capital account for new works, plant, &c.; £21,000 to writing off capital for obsolete works and plant; £63,682 to sinking fund account for extinguishing debt; and £41,726 to reserve fund, renewals, and insurance account for replacing worn-out and obsolete plant, stoking machinery, &c. These amounts, totalling £169,286, were devoted solely to gas-works purposes, and left a balance of profit amounting to £156,788, which has been allocated as follows: £56,777 to the Finance Committee in aid of rates; £22,470 to the cost of public lighting; £50,770 to the Water Committee in aid of the water-works; £17,924 to the Fire Brigade Committee for maintenance of the Corporation Fire Brigade; £937 to cost of Specification of Patents Library; and £400 to cost of town survey and subscriptions to the Cottage Hospital. These make a total of £149,278, and leave £7510 profit in hand at present. The above sum of £149,278 apportioned during the last 40 years equals £3732 per annum—indeed, the amount during the last 10 years has been over £6000 a year. In addition to these apportionments from profits, large amounts have been annually paid direct for rates from revenue account.

As to the present value of the gas-works property, Mr. Laycock's estimate is as follows: Value of the works, plant, and property, £240,000; surplus land near gas-works and the site and buildings at the electricity works, still unpaid for, £12,000; amount of floating capital in hand, £15,000; amount of renewals and insurance fund in hand, £14,108; amount of sinking fund in hand, £5657; balance of profits in hand, £7560. This gives a total value of the gas estate of £294,325, less the debt on capital account of £82,162, leaving £212,163. The works are in excellent order; and the new stoking machinery and coke-conveying plant promise to be a complete success.

It is interesting to note that Mr. Craven, the Manager whom Mr. Laycock succeeded, is still living.

The Suggested Inquiry as to Disused Sewers.

The Borough Engineer for Camberwell (Mr. William Oxtoby) has prepared a report upon the circular-letter sent out by the Local Government Board with reference to the explosion in Grange Road, Bermondsey. The Board asked if the Council had any observations to make in regard to a suggested inquiry in reference to disused sewers in London. Mr. Oxtoby says there can be no doubt that leaving old and disused sewers without constant inspection and attention is a serious source of danger. In Camberwell, however, it has always been the practice to break up and fill in old sewers; so that, as far as that borough is concerned, any inquiry is unnecessary. He thinks that such filling up should be made compulsory everywhere. But to his mind the more important question is that of obtaining stronger powers to prevent the practice adopted by several companies of laying their mains through the brickwork of sewers, gullies, and manholes, and other work in direct communication with sewers. This, he says, is frequently done, and is very difficult to detect unless an officer is constantly standing over the men at work. Whenever mains are so run through and built into the brick or concrete work and there is a settlement of the adjoining ground, the two are sure to be affected unequally; and in consequence the weaker—this being usually the main—has to give way. When this happens, whether the sewer is out of or in use, the water or gas is bound to find its way into the sewer, and immediately renders it a source of danger—the gas by explosion, or the water by washing away the soil and causing large cavities under the highway. Mr. Oxtoby is aware that companies' work in laying new mains is greatly hampered by the ground under the highways being crowded with pipes of various kinds, and that it is almost impossible to avoid the practice mentioned. In many cases, the different mains are not only crowded together throughout the whole width of the road, but are several tiers deep. It has become a matter of extreme difficulty, in certain places, for the Council to get sufficient space for opening down to the sewers, either for inspection or to put in connections to house drains. He urges, in conclusion, that serious objection should be raised to the conferring of any future powers giving a right to occupy the subsoil of a highway. Copies of the report are to be forwarded to the Local Government Board and the Board of Trade.

Price of Gas in the Bognor Out-District.—The passing of the Bognor Gas Company's Bill has been reported to a parish meeting at Barnham, and that district will now be supplied with gas for the next five years at a standing price of not less than 6d., and not more than 8d., per 1000 cubic feet above the Bognor charges. After this period, the charge is not to exceed the Bognor price by more than 6d. The terms were considered satisfactory.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Staff Dinner—Progress of the Undertaking.

In the Grosvenor Rooms at the Grand Hotel, last Tuesday evening, the City of Birmingham Gas Department held their Staff Dinner, which on this occasion included those over eighteen years of age who are engaged both on the different works and at the Council House. The Secretary, Mr. G. Hampton Barber, occupied the chair; and a party of about 200 sat down—among the guests being Aldermen Sir Hallowell Rogers and J. H. Lloyd, and Councillors Harrison Barrow, Murray, Wilson, Toller, and T. E. Smith. Mr. Charles Hunt and Dr. H. G. Colman were also present. The arrangements, which were in the hands of a Dinner Committee, to which Mr. W. Wastell acted as Hon. Secretary, were admirably carried out; and a most enjoyable evening was spent. During dinner the Grand Hotel Orchestra performed; and the subsequent toast list was interspersed with music and song. A feature of the programme and menu was an appropriate selection of quotations. Most of these were from Shakespeare; but the authorship of the following lines, which headed the menu, was not stated, though it deserved to be: "We'll turn stokers for an hour. See to it there are no light charges." The Loyal Toast was first submitted by the Chairman and duly honoured; and then some interesting speeches were made which had a direct bearing on the Birmingham gas undertaking.

Mr. Walter Chaney, the Engineer-in-Charge of the Nchells Works, proposed "Our City," and remarked that there were very few towns where so much progress had been made as had been the case in Birmingham during the last fifty or sixty years, while he thought there were no cities that had claimed so many eminent men. Birmingham had been called the workshop of the world; and it had been able to dispose of its wares wherever commerce was established. They who served the Corporation in the various departments knew that such progress as had been witnessed could not have been made without some initiative. They knew how much they were indebted to the municipal and city authorities and to the public spirit of the gentlemen who formed the City Council. Everything was done to maintain the position of Birmingham; and assistance had been rendered in such a manner that technical education was now available to all. With all these surroundings, there was no doubt whatever that progress must continue.

Alderman J. H. Lloyd, in reply, said Birmingham men were always loyal to their city, which was a good point in their character. He would like to take the opportunity of congratulating the Chairman on the very successful gathering that had been arranged that night. Some of those present had had to do with the Gas Department for a great number of years. He was glad to see among them his friend Mr. Charles Hunt, who was Engineer for a long time; and he was also pleased that Dr. Colman was with them. They were very fortunate in their staff, and were grateful to them for what they did. They wanted them all to feel that they belonged to a great department of a great city. In the past, gas had made vast strides; and it had a great future before it. Never had the problems connected with gas been more studied than of late; and there were evident signs that still greater progress would be made. It was a pleasure to be connected with such a department.

Mr. W. H. Powell, Chief Cashier, submitted "The Gas Committee," who he said had been in existence for thirty-three years, and who might look back over this long period with pardonable pride at the successful results that had been achieved. Not the least gratifying fact was that the last year had been the most successful of them all. These results were largely attributable to the able men who had always served on the Committee. He only recollected two instances in which any recommendation of the Committee had been rejected by the Council. One of them was on the thorny question of salaries, and was subsequently adopted; while the other was on a point of administration which was really of little consequence. He could not call to mind any case in which a member of the Committee had lost his seat at a municipal election owing to dissatisfaction with his work on the Committee. The relations with the staff had been most cordial—the Committee always showing a warm appreciation of the work done. He wished to tender to the Committee their hearty thanks for the generous support they had accorded in connection with these proceedings. He coupled with the toast the name of the Chairman of the Committee. They were all interested in the high position occupied in Birmingham by Alderman Sir Hallowell Rogers; and perhaps he might be excused for thinking that this was partly due to his admirable chairmanship of the Gas Committee.

Alderman Sir Hallowell Rogers, in responding for himself and his colleagues, remarked that they esteemed it a great compliment that the toast should have been proposed by Mr. Powell, who had been with the Gas Department considerably over thirty years, and had won the highest respect. This was one of the first opportunities the Committee had had of seeing the faces of some of the staff; but he hoped it would not be the last. He was sure that every member of the gas staff did his best, owing to the inspiration that filtered down from the chief member of the staff, Mr. Hampton Barber. Were not this the case, they could not have achieved the results that had been attained. It was in 1875—about thirty-three years ago—that the gas undertaking was acquired under Mr. Joseph Chamberlain. Since that time there had been eight Chairmen, of whom Mr. Chamberlain was the first. Some of the other Chairmen were present with them that night; but he was sorry Alderman Bishop was absent. Alderman Bishop was the oldest member of the Committee. He joined in 1878; and he had been for fifteen years Chairman of the Works Sub-Committee. During the thirty-three years that the city had had possession of the gas-works, everything practically had doubled except the capital expenditure of the business, which had only gone up 25 per cent., owing to the good management—he would not say of the Committee, but of the Committee and staff combined. In 1875, the capital was £2,000,000; and now it was £2,500,000. The coal carbonized was then about 300,000 tons; while now it was, roughly speaking, 600,000 tons, and he would throw the oil in. The rentals had gone up from £344,000 to

£720,000—or more than double. They had had three Secretaries—first Mr. Henry Parry, then Mr. Edwin Smith, and now Mr. Hampton Barber, who was the most energetic man he had ever met, and who meant to make the department go, whether they wanted to go or not. He himself knew something of business life; and he was struck with the smoothness of the working of the Gas Department. It was, he supposed, the largest concern in the city; and yet it went like clock-work. The reason was that every man connected with it meant to make the business a huge success. Alderman Lloyd had said there was a great future for gas. He hoped this was so; but there was no future for any concern unless everyone, from the office-boy upwards, had his heart and soul in the work. It was the feeling of confidence they had in each other that would make a great success of the department in the future. People talked about the amount given to the rates; but they did not know how much they might be going to give them. There might come a time when the Gas Department would pay all the rates of the city; and, if so, it would be due to those he saw before him.

Mr. Charles Hunt, M.Inst.C.E., proposed "The Chairman." He said that personally he felt much indebted to Mr. Hampton Barber for this opportunity of being once more among old friends, and seeing around him so many familiar faces; and for himself and Dr. Colman he wished to return thanks for the hearty welcome that had been extended to them. He was not likely to forget, or to lose his interest in, the city in which so many of the years of his life had been spent, nor that department of its administration in the moulding of the destinies of which he felt he could lay claim to have had some share. Besides being Chairman that evening, there was another aspect in which Mr. Barber had to be regarded, and a much more important one—that was as the chief executive officer of this great department. Without the cordial co-operation of Mr. Barber and those who worked under him, the efforts of the Gas Committee would be of little avail. The position occupied by Mr. Barber was one of great honour, and still greater responsibility. He had not only to keep the machinery of a vast organization going with as little friction and as much useful effect as possible, but he had to satisfy the requirements of many thousands of consumers, and to provide a contribution to the municipal exchequer. He saw that the comparatively modest sum of £25,000, which was for many years more or less the contribution, had been during the last few years—he thought it almost dated from the time when Mr. Barber took office—increased, until it had reached the very large sum of £61,000, notwithstanding which the price of gas had been reduced. He thought he was right in saying that the average price now was lower than it had ever been before. Whatever opinions they might hold as to the policy, under existing circumstances, of subsidizing the rates—and he noticed Sir Hallelwell Rogers rather hinted at a much larger contribution in the future—such a result was convincingly indicative of excellent management, and it was a title to the gratitude of both ratepayers and consumers. It had been achieved, moreover, in the face of competition which was growing keener every year, and of industrial conditions which had all tended to make more difficult the economical production of gas. It was indicative also of the desire and intention on the part of the Executive to keep abreast of the times. The period had gone by when business could be had without the asking. The conditions under which gas undertakings were carried on had become entirely changed. There might be, and he had no doubt there was, a great future for gas; but it was a future which they would have to make for themselves. Prosperity would not come if business was not sought, or if they failed to keep abreast of the improvements which were going on.

Mr. Hampton Barber, in responding, expressed the gratification of the staff at the presence of the members of the Gas Committee. One member especially, who rendered the Committee great assistance, he wished to name, and that was Councillor Toller. He did not intend to go into figures. All that he would say was that the undertaking was making steady progress; and it was absolutely impossible for it to do this without the cordial sympathy and help of all those who were present that evening. He recognized this; and he was proud of his staff, and pleased to have this opportunity of meeting them. Progress had been made in past years; but they hoped to make still greater progress in the future. He believed gas was only in its infancy. When he first joined the department, the output was 5600 million cubic feet; while last year it was over 7000 millions. The income had correspondingly increased; but they had not extended their business at the cost of a big capital outlay. The capital had not gone up a penny piece since he joined the department. They were still at the same capital, although they were contributing to-day a much larger sum to the rates. This was the result of the labours of the staff. The engineers, and everyone (from the seniors to the juniors) co-operated most loyally in striving for the success of the undertaking; and so long as they continued to do this, there need be no fear with regard to the contributions to the rates. Possibly they would even be increased; he hoped for that. He trusted that this would prove to be the first of a series of annual gatherings of the same kind. The Dinner Committee deserved their thanks for the manner in which they had carried out the arrangements. They had done excellently well.

Assessment of the Dowlais Gas-Works.—The Assessment Committee of the Merthyr Union recently heard an appeal by the Dowlais Gas Company against the assessment of their works, which are rated at £1750 gross and £1100 net. Mr. D. W. Jones, who appeared for the Company, explained that in 1907 the Company made 45 million cubic feet of gas, and sold about 36 millions. In 1908, they made 42 millions, and sold 33 millions. Replying to a question as to how he accounted for the great difference between the make and sale, he said there was always an enormous leakage of gas, which was probably greater in Dowlais than in other places, because of the very heavy traffic to the steel-works. The Chairman (Mr. Rees Rees) asked whether any reduction had been made in the price of gas. Mr. Jones said there had not. Messrs. Guest, Keen, and Co. used to have preferential terms until the Company got their Act of Parliament; but now they had no preference. The Committee resolved to reduce the assessment to £1640 gross and £1000 net.

GAS-MAINS AND TRAMWAY LINES IN SHANGHAI.

Liability of the Municipality for Breach of Agreement.

In the summer of 1907, the Shanghai Gas Company instituted proceedings, in the Court of Foreign Consuls, against the Council for the Foreign Community of Shanghai for having committed a breach of an agreement entered into with them, by granting to the Shanghai Electric Construction Company, Limited, permission to open the Canton Road for the purpose of laying their tramway lines on the same side as the Company's main; the Company protesting against the Council's action, on account of the proximity of the rails. They said they could lay an alternative main on the opposite side of the road, at an estimated outlay of £450, together with the cost of any service-pipes which might have to be renewed; but the only reply they received from the Council was that the matter must be settled by the two Companies concerned. The permit was issued in due course, and the tramway track constructed. The Company then applied to the Council to submit the question to arbitration; but they refused to do so. Hence the appeal to the Court, who decided that arbitration was the only proper way of settling the dispute. The Council, however, were dissatisfied with this decision, and applied for a rehearing of the case; but without success. The matter was accordingly referred to Mr. F. S. A. Bourne, who held the inquiry early in July last. The Company's case was stated by Mr. R. N. Macleod; Mr. L. E. P. Jones appearing for the Council. The Arbitrator made his award in favour of the Company on the 24th of August; and, in view of the interest attaching to the question at issue, we give it below, in full.

The issues I have to determine are: Have the Council broken their agreement with the Gas Company; and, if so, what damages or reparation ought they to pay or make to the Company in consequence? As to the first issue, I determine that the Council have broken their agreement with the Company. To avoid misunderstanding, I must state my reasons for this part of my award at some length.

The first reference to the Gas Company in the Council's published reports, to which my attention has been directed, is under the date of Sept. 14, 1864, and reads as follows: "Lighting. The Engineer submitted a sketch of the points at which the lamps of the Gas Company would shortly be fixed." After prolonged negotiations with the Gas Company, noted in the municipal reports *passim*, it was proposed by the Finance, Rate, and Appeal Committee, in their report for the year ended March 31, 1866, that a rate of 1 per cent. on rentals be charged to cover the cost of illuminating the English settlement with gas. The supply of gas for public lighting went on under temporary arrangements between the Council and the Gas Company, no doubt recorded by an exchange of letters, until 1898, when for the first time a written contract was concluded. This contract was amended and renewed by an agreement in writing dated Aug. 5, 1902, which has been renewed from time to time and is still running, with this modification, however, that on July 21, 1905, it was agreed by letters between the Council and the Gas Company that the latter should allow the Council a discount of 25 per cent. on all sums payable to the Company on account of public lighting in consideration of the privilege which the Company enjoys of the use of the municipal roads for its pipes and mains. The discount amounted in 1907 to over \$7500. The written contracts refer almost entirely to public lighting.

On reviewing the above relations between the Council and the Company, it is clear to me that the whole of the contract between the parties was never reduced to writing. The community desired gas in 1865 in the same way that they desired tramways in 1904. The Gas Company agreed to supply gas to those who chose to pay for it; and the Council agreed, in consideration of the community's desire being met, to allow the use of the roads to carry the mains. Such a contract would have been implied in law, because the Court must have held that this was the intention of the parties. For example, suppose that, after the Company had been allowed to put down their mains, the Council without just cause had refused to allow them to take up the roads in order to connect their mains by pipes with the houses of consumers, the Court must have implied that such connection would be allowed; it being implied that the Council would do nothing without just cause to make the carrying out of gas lighting impossible. It seems to me incompatible with just relations between the Council, representing the public local interests of the community, and the Gas Company—a semi-public concern dealing in a public convenience and doing what is often done by municipalities for themselves—that the Council should say: "We have nothing to do with you except that you supply gas for the public lamps." The letter from the Council to the Company dated July 21, 1905, shows that the Council themselves take a much broader view of their obligations; for they say there, in regard to a stipulation with the Gas Company, that they "are actuated solely by the desire to protect the foreign and native community," &c. I have no doubt that the following term would have been implied all along, and must certainly be implied now that the Company pay for the use of the roads—viz., that the Council should be liable for their wilful and unnecessary act or default causing damage to the mains of the Company under the streets of which the Council has charge. This implied term is founded on the presumed intention of the parties and upon reason. I think, on the other hand, that such a term as that the Council should at no time put down wood or rubber pavement, because this would make access by the Company to their mains more difficult and costly, ought not to be implied, because the Council would not have agreed thereto, for such improvements might at any time become necessary in the public interest. Changes of this sort can, I suppose, be met by adjustments of the price charged by the Company for gas.

The next question I must answer is: Was the act complained of—i.e., allowing the Tramway Company to put their track over the Gas Company's main in the Canton Road—a wilful and unnecessary act, or was it necessary in the public interest? All parties had long notice that tramways were likely to come; and on Feb. 28, 1899, in reply to a letter from the Gas Company, pointing out possible danger to their property from tramways, the Council wrote that "in the event of a concession for public tramways being eventually approved by the ratepayers, the Council will adopt every possible precaution to ensure that the tramway lines are all laid down in accordance with the best modern

practice; and protectionary clauses will be inserted in the agreement with this end in view." And when, in 1905, a concession was granted to the present Tramway Company, a clause was inserted (clause 12) providing that the Tramway Company should make full compensation to all parties for all loss or damage they might sustain by reason of any interference with gas-mains, &c. Now, if the Council were in the position of the Legislature of an independent State, they would be able to make the Tramway Company directly liable to the Gas Company, as is done in England by the Tramways Act, 1870, which provides that a tramway company, when about to commence work, shall give seven days' notice to any gas company having mains in a street they intend to traverse, with a plan and section of the proposed work. If the gas company then require the tramway company to remove their main, the tramway company must, if the demand be reasonable, do so at their own expense, or, in case of difference between the tramway company and the gas company, the Board of Trade appoints an engineer as referee. But the Council, although supreme when acting within the powers granted by the Land Regulations, cannot by its contract with the Tramway Company make the Company liable to an action at the suit of the Gas Company, because a man cannot acquire rights under a contract to which he is not a party. The Council had, or should have had, this principle in its mind when Mr. King-Hillier, the Gas Company's Engineer, wrote to Mr. Leveson, the Council's Secretary, on Dec. 29, 1906, protesting against a permit being issued to the Tramway Company to construct their track immediately over the Gas Company's main in the Canton Road, and should have delayed the issue of the permit until the Tramway Company had come to terms with the Gas Company on the lines of clause 12 of the tramway agreement; the Council requiring these Companies to appoint an arbitrator in case of disagreement. Instead of this, on Jan. 10, 1907, the Council replied to the Gas Company that they had decided to leave the settlement of this question in the hands of the Companies concerned, and that the permit for the construction of the Canton Road track was being issued that morning. That is to say, the Council authorized the Tramway Company to construct their line in the Canton Road over the Gas Company's main. They thus put the Gas Company in the position of not being able to sue on the tramway contract, and of being faced, if they sued in tort, with the defence that the Tramway Company had done no more than the Council had authorized them to do under clauses 1 and 2 of their agreement. Both the Companies must go where they are told to go by the Council, without whose control the various companies using the streets would be in chaos. Some one must exercise paramount control, and therefore accept obligation. If the Council will not, who is to? I find the issue of a permit to the Tramway Company to have been a wilful act, and unnecessary in the public interest.

The only remaining question under the first issue is this: Have the Gas Company actually suffered damage by the tramway track being carried over their main in the Canton Road? In regard to electrolysis, the Council have admitted in writing that "there is a probability (be it small or great) of damage by electrolysis to the Company's pipes in the Canton Road, in consequence of the proximity of the tramway rails to such pipes or some of them." Mr. Mayne, in giving evidence, in answer to a question by me, said that it would, according to good engineering practice, be better not to leave the gas-main under the tramway track for over half-a-mile. Mr. King-Hillier, the Gas Company's Engineer, pointed out the danger of settlement of the ground—the lead forming the joint being drawn out of the socket, and a leak of gas ensuing, or the pipe might break; also the danger of a pipe breaking that is half embedded in concrete and half in mud. In case of a leak, the gas might make its way under the flooring boards of a house, and be set alight accidentally and cause damage. He considered the danger of explosion greater because of the bed of concrete over the main tending to keep the gas below, instead of allowing it to escape in a vertical direction. Mr. H. J. Hardy, the Outdoor Superintendent of the Gas Company, said that for 20 feet the tramrail was $\frac{3}{4}$ inch above the gas-main, and that the main was partially included in the concrete bed for 100 feet. I can have no doubt that the Gas Company have suffered damage. The Council have therefore, by their wilful and unnecessary act, caused damage to the Gas Company's main in the Canton Road; and for this damage they are liable.

I have followed English law in my award on the above issue, because the case was presented to me by Counsel for both parties from that point of view; but I would add that I arrive at the same result from the point of view of the general law of the Continent of Europe.

Whereas by an agreement in writing dated the 21st day of August, 1908, supplemental to the agreement dated the 1st day of July, 1908, above recited, it was agreed between the parties to this reference that I should first make and publish my award in determination of prayer (a) only of the prayers set out in the schedule to the agreement of the 1st of July [i.e., for a declaration that the Council had committed a breach of their agreement with the Company], provided at the same time I stated the principles which, in my opinion, should govern the determination of the remedy to which the plaintiffs may be entitled in the event of that prayer being decided in their favour; and whereas I have above decided prayer (a) in favour of the plaintiffs, I now state the principles which, in my opinion, should guide the determination of the remedy to which the plaintiffs are entitled, as follows: The Gas Company should be as far as possible put, at the expense of the Council, in as good a position as they would have been if the question of what ought to have been done in regard to the tramway line and the Gas Company's main in the Canton Road had been referred to an arbitrator before the tramway track was laid; provided that such arbitrator shall be taken to have considered, in making his award, first the public interest and public safety, and then the interest of the two Companies concerned, and to have determined the course the tramway line and the gas-main could most economically follow by considering the space available in the Canton Road for all public and semi-public uses—putting the gas-main, as nearly as local conditions admit, in as favourable a position as it was in before the Tramway Company laid the track, and the Gas Company being charged with any gain that might accrue to them through any change ordered, and not being allowed anything on account of greater difficulty of access to their main where greater difficulty of access was unavoid-

able, looking to the public interest and local conditions. The Council should not be looked upon as ensuring to the Gas Company as great advantages as they had before the advent of the Tramway Company, but as affording them as much as public safety requires and as existing conditions will reasonably admit. And I further award and order that the Council shall pay the costs to date of this arbitration.

PUBLIC LIGHTING OF SOUTHAMPTON.

The Gas Company on the Proposed Extension of Electricity.

It was stated in last week's "JOURNAL" that the Acting Secretary of the Southampton Gas Company (Mr. F. Lewis) had addressed a letter to the Town Council expressing astonishment that the Council should have decided to substitute electricity for gas in a large number of lamps in certain streets of the town without any previous notification of this intention having been previously given to the Company so that the merits of the proposal could have been discussed. In accordance with an intimation conveyed in the letter, the Directors of the Company have submitted to the Corporation the following statements and facts as to the proposals for "changing the existing system of gas lighting for a new form of electric lamps suggested to be only for side streets, but which has already been considerably extended to other localities."

The Borough Electrical Engineer has not given to the Corporation, or in his report to the Sub-Committee of the Highways and Lighting Committee, any idea or estimate of the probable cost of the proposed installation of electric lighting in place of gas. If this is to be paid out of capital, the decision of the London County Council as to Marylebone—refusing to sanction the loan for such purpose—would no doubt be adopted by the Local Government Board on an inquiry being held. Is it not proper that the Council should know from what source the proposed extension should be paid? At present no intimation whatever is given upon this point, although the report has been adopted by the Corporation. This is at least unusual, and forms a bad precedent. The inference of withholding the information as to the probable cost of the change to electricity is that it is found undesirable to publish it.

Are the Council aware that the amount expended by the Corporation in 1905 for adapting the gas-lamps to the incandescent system was about £700, and that for every lamp changed to electricity a proportion of this asset would be wasted? The present proposal of the Electrician—though only a temporary experiment—will cost over £100 for dismantling the gas-lamps. In addition, there will be the cost of the new electric lamps, and wiring same. There will also be the extra cost for lighting by electricity, which, if done at a reasonable profit, will be at least double. The Borough Engineer was instructed to reduce the number of lamplighters at present employed, in consequence of the conversion of the gas-lamps to electric. It is an astonishing fact that the mode adopted for such conversion will still require the attendance of some person to light and extinguish each of the proposed converted lamps. This absolutely negatives the suggestion that lamplighters' wages would be saved.

The Electrical Engineer reports that the number of gas-lamps to be displaced is 336. The Gas Company's Manager states that the number of such gas-lamps in the list of streets forwarded amounts to 430. This great discrepancy requires some explanation. On whose authority was this list of roads sent to the Gas Manager? In the report, the Electrician asks to be allowed to light more of the public lamps in the side streets, as they can give greater candle power at the same price. As it is beyond argument that gas is not half the expense of electricity, it follows that, in the ordinary way, this would be considered reckless trading, if this offer to supply on the terms named was adopted.

No complaint or demand whatever has been made on the part of the public for any alteration or improvement in the gas lighting of the streets where incandescent gas lighting has been installed; but, on the contrary, it is generally acknowledged that the present system of lighting by electricity is most inefficient. This is shown by the Committee's own report that in London Road and the Avenue six additional arc lamps have been found necessary; also that the electric lighting in the High Street was unsatisfactory. It is an important point that there is diminished illumination in the main streets after 11 p.m. by the substitution of incandescent electric lamps for the arcs, which leaves the town more open to depredations at the darkest periods, and deprives the police of the advantage of that preventive of crime—a good light. In addition, frequent failures of the electric current occur.

After quoting a number of facts based on statements which have of late appeared in the "JOURNAL," the document concludes as follows: The Directors are prepared to meet any members of the Corporation and their officials to substantiate the statements contained in this protest, with the view of endeavouring to aid them in arriving, in the interests of the ratepayers, at the most efficient and economical system of public lighting, as they desire to remind the councillors that only one side of this question has, at present, been heard by them, and that on a most meagre report presented to a Sub-Committee of the Highways and Lighting Committee. The Directors feel that the Gas Company are entitled to some fair consideration being shown them in this matter, as the Company are the second largest ratepayers in the Borough, contributing last year no less a sum than £4833 to the total rates of the town, of which £2202 were contributions to the general district rate. The London County Council have appointed a Committee for the purpose of visiting all the large Continental towns, with the view of ascertaining the best system of lighting; and the Directors therefore suggest that it is in the public interest that the Corporation should not commit themselves to the present proposed changes.

Paris Gas Supply Last Year.—The "Bulletin Municipal" has lately published the figures showing the consumption of gas in Paris last year. It reached the large total of 13,678½ million cubic feet; being about 577 millions more than in 1907. The receipts amounted to £3,026,420—an increase of £131,366 on those for 1907. The consumption of gas for public lighting fell off to the extent of about 15,200,000 cubic feet. The gas was sold at an average price of 4s. 4½d. per 1000 cubic feet.

BERMONDSEY GAS EXPLOSION.

Action of the Council.

The Bermondsey Borough Council, acting on legal advice, have instructed the Town Clerk to take out a summons before a Judge in Chambers against the London County Council, applying that they may be restrained by an order and injunction from allowing the disused sewer to remain in Grange Road, where the disastrous gas explosion occurred on Dec. 30, and for an order to compel the London County Council to fill up or remove the sewer.

The Borough Council were desirous of obtaining undertakings from the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company that whatever body was found liable for the damage would repay the Borough Council the cost of reinstating the road. The London County Council have replied that the action which had been commenced by the Borough Council against the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company is for the purpose of obtaining a decision upon the question as to whether all or any of the defendants to the action were liable for the damage caused by the explosion, of course, including damage to the road; and if any of the defendants should be held liable, they would have to pay any sum found to be payable by them in respect thereof. The County Council did not, therefore, see that there was any necessity for the undertaking suggested. The Metropolitan Water Board said the matter had been considered by their Law and Parliamentary Committee, who were not prepared to give the undertaking. The South Metropolitan Gas Company also stated that they did not propose to give any undertaking such as was suggested.

The specifications for the repair of the road, prepared by the Borough Surveyor, had been sent to the three interested parties for their observations and approval, and in each case have been returned. They were returned by the London County Council "without prejudice," and with an intimation that, as the tender for the works was to be a lump sum, it would be impossible to differentiate between the cost of the various works. The Metropolitan Water Board said they did not feel called upon to consider the specifications. The South Metropolitan Gas Company replied that they were not prepared to accept any responsibility. The Company, however, pointed out that they had looked at the specifications, and, without mentioning any other item, found that they included the filling up of the old sewer, the cost of which could not under any circumstances be thrown upon the Company or the Metropolitan Water Board.

In view of these replies, the Council have called in Sir Douglas Fox to go through the specifications, with a view of confirming them or otherwise.

PUBLIC LIGHTING OF HAMMERSMITH.

Gas v. Electricity.

At the Meeting of the Hammersmith Borough Council last Wednesday, the Electricity and Lighting Committee reported that they had received a letter from the Gaslight and Coke Company to the effect that they would be prepared, if given a contract for five years, to quote an inclusive price of £1 4s. 6d. per lamp per annum for the lighting, extinguishing, cleaning, &c., of the whole of the gas-lamps in the borough at present supplied by them; this being an average reduction of 9s. 2d. per lamp per annum, or a total reduction of about £77. It was explained that the offer was only made subject to the condition that none of the lamps should be converted from gas to electricity. The Committee recommended that, as the conversion of some of the public lamps in Latimer Road and the neighbourhood was already in hand, the proposal should not be entertained. They had also received a letter from the Brentford Gas Company stating that they would be willing to reduce the charge for the future supply of gas to the public lamps in the borough by 2½d. per 1000 cubic feet, making the price 6½d. below the standard price to other consumers; and in the event of a reduction being made in the price to ordinary consumers, a still further reduction would be granted. The offer, however, was subject to the Council entering into an agreement to take a supply of gas for not less than 1000 public lamps for a period of five years. The Committee stated in regard to this proposal that upon the completion of the conversion scheme there would be about 1000 gas-lamps in the borough still supplied by the Company, and the proposal would mean an estimated reduction of £132 8s. 9d. in the annual cost of these lamps. On the other hand, an agreement as suggested would have the effect of preventing any further conversion for five years; and for this reason the Committee recommended that the proposal be not accepted.

Mr. A. Pascall moved, as an amendment, that the report be referred to the Works Committee. On being informed, however, that it could not be dealt with by them, he substituted the Finance Committee. He said that from the commencement of the electricity undertaking he had been of opinion that the street lighting of the borough should not be in the hands of the Electricity and Lighting Committee. They were the providers of the electric light, and he suggested that they were forcing a particular kind of light on the public, quite irrespective of the question of cost. They did not take the steps that would have been taken by any other Committee; they did not even negotiate with the Gas Companies to ascertain the most advantageous terms they would offer. Mr. E. C. Rawlings (the ex-Mayor) seconded the amendment. Mr. Levy asked why the Committee did not, before they entered upon an electric lighting scheme, approach the Gas Company and negotiate for the lowest terms. Mr. Mayle considered it was "ungraceful" for the Company not to have come forward with their offer of reduction before they knew arrangements were being made to change from gas lighting to electricity. As to the question of cost, the Council must remember that the money paid to the Committee for lighting by electricity would come back into the ratepayers' own pockets. The Committee thought they would get a better light by converting the gas-lamps to electric

lamps; and they were instructed by the Council to do so. Mr. Burns (the Chairman of the Finance Committee) supported the amendment. He said the Gaslight and Coke Company offered the Council a reduction of 9s. 2d. per lamp per annum, and the Brentford Company should be asked to do the lighting at the same price. The ratepayers were quite satisfied with the present lighting; and he thought the Council ought to save the money. There was no need to rush the matter through, and it should be referred to the Finance Committee for consideration by them in the light of these new offers. Mr. Cracknell (the Chairman of the Electricity and Lighting Committee) quite agreed that the Committee ought not to have charge of the public lighting; and he would support any alteration of the bye-laws to this effect. But he disagreed with the contention that their policy in adopting the electric light was wrong. Let them take the offer of the Gaslight and Coke Company. After the reduction of 9s. 2d. per lamp per annum, the amount would be £2 18s.; and the Council would be bound to keep to gas lighting. The lamps under the electric scheme would cost them £3 0s. 1d. per annum; but at the end of ten years the expense would only be £2 8s. 8d. This would be cheaper than any other lighting in London. As had been said, the Companies only came forward with their offer after the Committee had taken the matter in hand. If he were the Gas Companies, he would come forward and offer to do the lighting for nothing, in order to stop the Council competing with them by electric lighting. It had been stated that the ratepayers were satisfied with gas light. But the Town Clerk had had a petition from 114 people in one road asking for better illumination; and there had been other complaints. The amendment was then put and lost by 16 votes to 13; and the Committee's recommendations were confirmed.

LONDON COUNTY COUNCIL AND ASSESSMENT.

Assessment of Metropolitan Water-Works.

At the Meeting of the London County Council last Tuesday, the Local Government, Records, and Museums Committee (No. 1) presented the following report on the subject of the assessment of the undertaking of the Metropolitan Water Board.

We have had under consideration the assessment of the undertaking of the Metropolitan Water Board; and the appeals by the Board against assessments in various parishes having recently been decided, it is now possible to estimate the effect upon rating of the transfer of the undertaking from the Water Companies to the Board.

The transfer of the undertaking took place in June, 1904, and at the quinquennial valuation in 1905 the Metropolitan Water Board contended that the undertaking should be valued as a whole, and the rateable value of the directly productive portion—i.e., the distributing mains and services—should be apportioned among the several parishes on the basis of the gross revenue in each parish, subject to allowance being made for variations in local rates. Four of the London Assessment Committees—viz., those of the City of London, the Greenwich and Woolwich Unions, and the Metropolitan Borough of Islington—declined to agree to this proposal, taking the view that the undertaking should be valued in sections, or that the rateable value of the directly productive works should be apportioned on the basis of net earnings. In the proceedings which followed, the Court of Quarter Sessions adopted the principle contended for by the Board; and this decision was subsequently upheld by the High Court, but rather owing to the absence of any other practical method of valuation being suggested.

The full effect of the decision will not be appreciated until the next quinquennial revaluation; but, comparing the total rateable value of the undertaking before and after the last revaluation, there has been an increase in the case of the Administrative County of £15,205—i.e., from £620,328 to £635,533. In the City and the Metropolitan Boroughs there have been decreases in eight cases, aggregating £35,808; and in twenty-one cases there have been increases, aggregating £51,013. The total rateable value (£635,533) represents an increase of £10,306 over the total rateable value of the Companies' undertakings in London at the quinquennial valuation in 1900; whereas during the quinquennium of 1895-1900 there was an increase of £95,398. On the assumption that the latter increase was normal, and was roughly proportionate to the mean increase of the population and total rateable value during the same period, the corresponding increase in the rateable value of the undertaking during the quinquennium of 1900-1905, had there been no transfer, would have been about £108,000, or nearly £98,000 in excess of the increase which actually took place.

We think there can be little doubt that, under existing conditions, the extra-county districts within the limits of supply are gaining at the expense of London. The adoption of the principle laid down by the Courts does not affect the total valuation of the Metropolitan Water Board's undertaking, but only the apportionment of the valuation among the several districts. It may be assumed that in the sparsely populated extra-county districts, where rateable values of properties are comparatively low, working expenses are higher in proportion to revenue than in the compact central districts where high rateable values obtain. The adoption, therefore, of the basis of gross revenue, instead of net earnings, results in preferential treatment of the extra-county districts.

We are of opinion that the Council should endeavour to obtain the removal of this injustice to London. It may be urged that the Board are bound by the decision of the Court. But we would point out that, in announcing the decision of Quarter Sessions, the Deputy-Chairman stated that the respondents had not placed before the Court any other practical method of valuation; and the decision of the High Court was, as already mentioned, also arrived at on the same grounds. We feel that it would be possible to formulate a scheme whereby the total rateable value of the Board's undertakings could be more equitably apportioned, and we therefore recommend—(a) That in the opinion of the Council the method of arriving at the rateable value of the undertaking of the Metropolitan Water Board in the various parishes within the limits of supply is inequitable to London, and that a more equitable apportionment of the total rateable value of the undertaking as between

the Administrative County of London and the extra-county districts, should be adopted. (b) That the foregoing resolution be communicated to the Metropolitan Water Board, and to the London representatives thereon.

Conference on Valuation and Assessment.

The same Committee presented a report on the conference on valuation and assessment. It set forth that on the 1st of December last the Council decided to convene a conference with representatives of the City Corporation, the Metropolitan Borough Councils, the London Assessment Committees, the Metropolitan Asylums Board, the Metropolitan Water Board, and the Receiver of the Metropolitan Police District, to consider questions of assessment procedure and practice in connection with the quinquennial valuation of property in London in the year 1910, and also matters relating to the amendment of the valuation law. The conference was held on 19th and 26th of February, and all the authorities were represented except the Receiver of Police. The conference resolved—"That, pending legislation, it is desirable that the Council should exercise such powers as it may possess under the Valuation (Metropolis) Act, 1869, with a view to securing a fair valuation to common charges of every parish included within the Administrative County of London." The Committee suggested that this resolution should be referred to them; and they said they would take the necessary steps to communicate with the Government departments and authorities concerned in certain resolutions of the conference. The recommendations were agreed to.

WORK AND WAGES AT THE LIMERICK GAS-WORKS.

Report by Mr. Henry Hawkins.

As briefly mentioned in the "JOURNAL" last week, the Gas Engineer and Manager of the Limerick Corporation has lately presented to the Gas Committee a report on the working of the undertaking during the time he has been in office; his object being to rebut certain statements which had been circulated in the city.

Mr. Hawkins first enumerated the items of expenditure on plant, which amounted to £5886, compared with £13,000 which the Chairman of the Gas Committee stated he had been informed had been laid out on the works; and it was explained that the lower sum included not only renewals and extensions at the works, but also mains and public lamps. Turning to the carbonizing department, Mr. Hawkins produced figures showing that while the gas made in the year ended March 31, 1905, was 107,008,000 cubic feet, and the total wages paid £1959 15s. 3d., in the last financial year the figures were 104,667,000 cubic feet and £2478 8s. 7d. Consequently, with a smaller make of gas by 2,341,000 cubic feet, the retort-house wages had increased by

£518 13s. 4d. The cost per 1000 cubic feet for stokers and coal wheelers in 1905 was 4'395d.; and in 1908, 5'608d. In Dublin, Belfast, Cork, and Londonderry, the average is 3'432d. The average production of gas per retort from April 1, 1908, to the 12th ult. was 6504 cubic feet. About eighteen months ago the workmen applied for the adoption of the terms and conditions in force at the Cork Gas-Works; and these were granted. Up to that time, the pay was as follows: Stokers' wages (for an 8-hour shift), 4s. 6d.; coal wheelers' (for a 12-hour shift), 3s.—the bulk of coal handled being in each case unknown. The Cork terms were: Stokers' wages, 5s. 2d.; coal carbonized, 50 cwt.; shift, 12 hours. Coal wheelers' wages, 3s. 7d.; coal weighed and wheeled, 10 tons; shift, 12 hours. The men practically agreed to accept the Cork terms; and the stokers' wages were advanced to 4s. 10d. and the coal wheelers' to 3s. 7d. The Gas Committee, in order to prevent dissatisfaction, spent £56 in providing four 5-cwt. weighing machines in the retort-house; but the conditions accepted had not been adhered to. The stokers carbonized only 2 tons of coal in the 8-hour shift; and the wheelers dealt with only 5 tons in 12 hours. Moreover, Mr. Hawkins informed the Committee that it was a common practice for a number of men to absent themselves from work at week-ends, especially on Saturday morning, when from 10 to 15 of them would stay away till ten o'clock. He pointed out that no engineer could carry on the works successfully under such conditions. He asked—and he said he had a right to expect it—that the workmen should unite with him in doing what was right and just to the Committee and all concerned; for where unity existed, success was bound to follow. In conclusion, he assured the Committee that he had no desire to reduce labour but to increase it; and it was only by the success of the undertaking that this could be accomplished. He therefore trusted that the workmen would join with him in promoting a kindly feeling throughout the department, and would thereby further its interests.

Prescot Gas Company.—The annual general meeting of this Company was held on the 25th ult.—Mr. Henry Cross (the Chairman) presiding. It was reported that the quantity of gas made during the past year was 46,800,000 cubic feet, and that the gas sold showed an increase of 5½ per cent. Though the price of gas was reduced by 1d. per 1000 cubic feet last year, there was an increase of £235 in the gas-rental, as well as in the amount received for coke and sulphate of ammonia, but a decrease in the tar account. The profit for the year was £1830; and the amount to be carried forward, after paying dividends, £2339, against £2010 this time last year. The Chairman intimated that the price of gas would be reduced by 2d. per 1000 cubic feet for lighting and power purposes, and that there would be a further reduction of 4d. per 1000 cubic feet for gas used for gas-fires; the alterations to take place as from the 1st inst. A vote of thanks was accorded to the Chairman for presiding, and to the Manager and Secretary (Mr. John E. Hall) and the whole of the staff.

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GAS APPARATUS SUPPLY COMPANIES.

The seventh ordinary general meeting of the New Inverted Incandescent Gas-Lamp Company, Limited, was held on Monday last week—Mr. J. T. Saunders in the chair. The Secretary (Mr. E. C. C. Smith) having read the notice convening the meeting, the Chairman moved the adoption of the report, some figures from which were given last week. He first congratulated the proprietors on the result of the past year's trading, especially as the commerce of the country had gone through a period of great depression. In addition to being able to recommend a dividend at the same rate as last year—viz., 6½ per cent.—the Directors had written off the patents account the sum of £1000, making the amount so written off £17,500. They now proposed to add to the reserve fund £1000, making this up to £7500, and to carry forward £1477—an amount which he was happy to say was slightly in excess of that carried forward last year. During the twelve months they had moved into new show-rooms and offices, and were now able to display goods to very much better advantage. He thought they might fairly claim to have the finest show-rooms and the finest selection of burners, fittings, and accessories in the inverted lighting trade. They owed it largely to the tact and energy of their Managing-Director, Mr. James Bridger, that they had been able so well to hold their own in face of the enormous competition prevailing. Mr. H. Woodall seconded the motion; and it was carried unanimously. The dividend recommended was declared. A motion to increase the remuneration of the Directors was proposed; but, at their request, it was withdrawn.

Mr. J. F. Wright presided at the fifth ordinary general meeting of the Sutherland Meter Company last Wednesday, and moved the adoption of the report and accounts, which were noticed in the "JOURNAL" last week (p. 937). He said it would be remembered that at the last general meeting he held out very slight hopes of any great increase in profits for the then ensuing year. He regretted to say the opinion he formed had been verified. The general trade of the country during 1908 had been deplorably bad—worse, he thought, than he had known it during his forty years' business experience. The bulk of their trade was done in penny-in-the-slot meters, which were bought by gas companies for use in artisans' dwellings. When depression in trade came, fewer artisans' dwellings were erected, and fewer slot-meters were required. This had been the case during the past year. He believed, however, they had more than held their own against their competitors, who had also suffered from this cause. No stone had been left unturned to deal with business where it was to be done; and he could assure the shareholders it was not through want of care, attention, or thought on the part of the Directors, or of hard work on the part of the officials, that the result for the year was not better. Though prices had been better, and had been advancing over the level of 1907, yet during the past year they had had contracts running out at old prices. These, he was glad to say, were practically at an end; and on every meter they were now

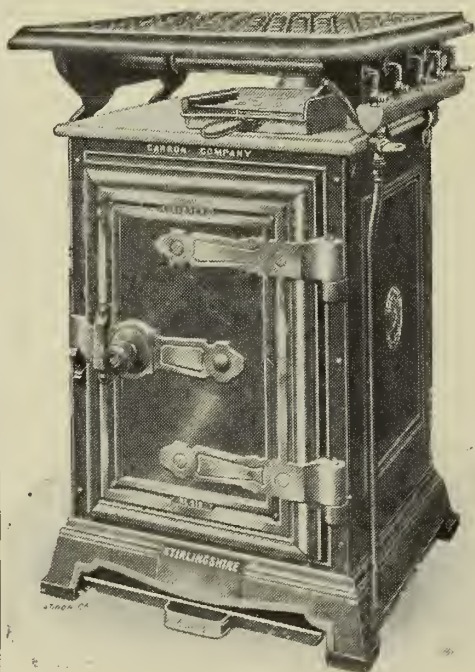
selling they were getting a fair profit. Another matter which had seriously affected their profits had been the difficulties occasioned by the severance of the tie which had hitherto existed between Messrs. John Wright and Co. and the Sutherland Meter Company. During 1908 they had been in a state of transition; and it had necessitated their opening temporary works in London. He looked forward to the future with hope. Trade might improve; and, if it did, they were in a better position than ever before for taking advantage of it, and making a profit. Mr. G. E. Wright seconded the motion, which was agreed to.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Provisional Order of the Musselburgh Gas Company, which yesterday received the approval of a Parliamentary Commission sitting in Edinburgh, raises no new question in gas supply, and probably for this reason it was, in effect, unopposed. It occupied the attention of the Commissioners for only a few minutes. It was, however, preceded by an inquiry into an application by the Corporation of Musselburgh for an extension of the burgh boundaries, which ran into the fourth day. In explanation of the prolonged nature of the inquiry into the boundary question, it may be mentioned that the town of Musselburgh is built upon the Lothian coalfield, which, though it has been worked for over 300 years, is yet in reality only in the infancy of its development; and the county of Midlothian were loth to lose a part of their area which they regarded as certain to yield, in the future, a larger return in assessments. The Town Council's plea was that they had no land upon which they could meet the demand for housing for a prospective increase in the population, and that they therefore required to take in unbuilt-on lands in the vicinity. The Parliamentary Commissioners granted the Corporation their Order. The same reasons which moved the Corporation applied to the application of the Gas Company. Their authorized capital has been expended, and their borrowing powers exhausted; and if the town is to be enlarged in area, and to increase in population, it was necessary that they should extend their works, so that they might be able to meet prospective demands upon them. When they were making the application, they went further, and have asked that, in accordance with the trend of present-day legislation, they should be allowed to reduce the illuminating power of the gas. The Musselburgh Gas Light Company is at the present moment one of five companies in Scotland who possess parliamentary powers. The Company are obliged to supply gas of 22 candles illuminating power; and they are really supplying 24-candle gas. Under the Order they are to be allowed to reduce the power to 14 candles. The Company have been working under a sliding-scale, in which the standard price of gas has been 3s. 9d. per 1000 cubic feet; and this standard price is



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retained. That the testing of the illuminating power of the gas has been changed to a test by the "Metropolitan" argand No. 2 burner does not seem to have aroused any interest in Musselburgh; and the new condition was authorized without opposition. It is to be observed that the word "Light" has been dropped out of the title, which is a sensible thing to do, seeing that the Company intend to offer gas for cooking, heating, and motive power, as well as for lighting purposes, in the town.

I regret exceedingly having to record the death of Mr. G. Malam, the Gas Engineer and Manager at Dumfries. [An obituary notice appears in another part of the "JOURNAL."]

A decision was given in the High Court of Justiciary in Edinburgh on the 17th ult., which, inasmuch as it related to the sale of coal, cannot fail to be of interest to gas managers. Messrs. J. & P. Coats, Limited, thread manufacturers, of Paisley, in January, 1908, purchased 479 tons of Best Bent splint coal, at the price of £336, from David Brown, of Glasgow. The coal was shipped to Barcelona; and a certificate was granted by Brown to the effect that the coal was as contracted for. It was averred by Messrs. Coats, on the other hand, that only 30 tons were Best Bent splint. They reported the matter to the criminal authorities, who in Scotland are the prosecutors in all criminal matters. The authorities refused to prosecute; the Lord Advocate being of opinion that Messrs. Coats had a civil claim. He stated his willingness, however, to reconsider the matter after the issue of any civil proceedings which might be taken. But instead of instituting these proceedings, Messrs. Coats petitioned the High Court for permission to personally conduct a criminal prosecution. Such an application had not been made to the Court for very many years; and on account of the unusual nature of the case, and the importance of the question involved, a bench of six Judges were appointed to hear the arguments. The Special Court, with one dissident (Lord M'Laren) granted the permission asked; and the trial of Brown has been fixed for the 24th of May. Should a conviction follow, a new power will have been put into the hands of the purchasers of coal.

In 1885, the Corporation of Glasgow obtained an Act of Parliament empowering them to raise the level of Loch Arklet, near Loch Katrine, for the provision of an augmentation to the water supply. The district is the property of the Duke of Montrose; and for the settlement of any questions which might arise between His Grace and the Corporation, it was agreed that Mr. J. H. Dickson, of Liberton, Edinburgh, should be sole Arbitrer. A claim was made by the Duke for £26,500 compensation, upon which the Arbitrer heard evidence in July. He has now issued his final award, fixing the compensation, in respect of land taken, damage to farms through their decreased letting value, damage to shootings and fishings, &c., at £19,090. The level of the loch is to be raised 22 feet, and its area enlarged from 207 to 561 acres. The addition to the city water supply will be equal to 10 million gallons per day. In accepting the award, some hard observations were made regarding the unsatisfactory results that had been secured, and the costs, of arbitrations generally.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 3.

With the covering of March requirements, demand slackened; and towards the close the trend of the market has been rather in favour of buyers, though in some cases full prices have been reported. Home demand has been fairly well sustained, and stocks have nowhere been allowed to accumulate in the hands of makers. The closing quotations are £11 10s. per ton f.o.b. Hull, £11 12s. 6d. f.o.b. per ton Liverpool, and £11 15s. per ton f.o.b. Leith. There has not been much interest in the forward position; makers still holding out for £11 15s. per ton f.o.b. best ports, and buyers being unwilling to pay this price. Speculative sales, however, are reported from abroad, but prices accepted have not transpired.

Nitrate of Soda.

Although negotiations for reconstituting the Combination of Producers have broken down, and though actual demand for prompt and near delivery has been slow, holders of cargoes near at hand have stiffened their ideas as to prices. On spot, too, sellers are very firm at 10s. 4½d. and 10s. 7½d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products.

LONDON, April 5.

Markets have been steady throughout the past week, and values have been well maintained all round. For pitch there is a large inquiry, and prices have hardened up. Creosote is steady, and makers firm in their ideas. Benzols are still very depressed, and makers find it very difficult indeed to sell. Solvent naphtha is quiet, and cheap sales are reported in the north; while in London the manufacturers are feeling the effects of the cheaper country makes which are being offered. Carbolic is steady, and several parcels of 60's have been sold at rather better figures. Crystals are somewhat heavy; manufacturers finding it difficult to place any large quantities. Crude naphtha from coke-ovens is fetching very low prices, owing to the depressed state of benzol. Many qualities are not fetching the price of creosote.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d. ex works. Pitch, London, 23s. to 23s. 6d.; east coast, 22s. 6d. to 23s.; west coast, 22s. to 23s. f.a.s. Mersey ports, 21s. 6d. to 22s. others. Benzol, 90 per cent., casks included, North, 5½d. to 5¾d.; London, 5¾d. to 6d.; 50-90 per cent., casks included, North, 6d.; London, 6½d. Toluol, casks included, North, 8d. to 8½d.; London, 8¾d. to 9d. Crude naphtha, in bulk, North, 3d. to 3½d.; London, 3½d. to 3¾d.; solvent naphtha, casks included, North, 9s. to 10s.; London, 10½d. to 11d.; heavy naphtha, casks included, North, 10s. to 10½d.; London, 11d. to 11½d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. to 1s. 0¾d.; west coast, 11¾d. to 1s. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages

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Sulphate of Ammonia.

The market has been steady but quiet; and the Beckton price is £11 17s. 6d. Other makes upon Beckton terms are £11 10s., and ordinary London £11 8s. 9d. In Hull, the price is £11 10s.; and in Liverpool, £11 12s. 6d. In Leith, the value is £11 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a continued activity in the coal trade; and the demand for best steams has been relatively heavy. The output is full at present; but the collieries seem to be pressed with orders, and the prices vary according to the time of delivery. Best Northumbrian steams are quoted from 11s. 9d. to 12s. 6d., according to time of delivery, second-class steams are from 9s. 6d. to 10s. 6d., and steam smalls are from about 5s. to 6s. In the gas coal trade, the demand is steady for the season, but is less than it was, and will still fall. Durham gas coals are quoted from about 9s. to 10s. per ton f.o.b., with about 6d. higher price for the best "Wear Specials." More contracts have been settled; and the heaviest, local and southern, are now decided—practically on the basis of 8s. 6d. to 9s. per ton f.o.b., according to quality. There have also been sales of some lots of gas coals at 9s. 9d. for best and 9s. for seconds over the year; and the present tendency of the market seems to be firmer—perhaps because the large contracts named have taken a good deal of coal out of the market. Coke is very generally quiet. Gas coke is much less plentiful, and is quoted at from about 12s. 9d. to 13s. 3d. per ton f.o.b. in the Tyne, with a steady inquiry for good quality for export.

Scotch Coal Trade.

The market is quiet, particularly in the West, where the demand for shipping is very restricted. Ell is in very poor request; and so is splint. In the East, the shipping demand is much stronger, and the tone firmer. The prices quoted are: Ell 8s. 6d. to 9s. 9d., splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 287,161 tons—an increase of 35,484 tons on the previous week, and of 38,790 tons on the corresponding week of last year. For the year to date, the total shipments have been 2,929,720 tons—an increase of 243,258 tons upon the corresponding period.

Kingsclere Gas Company to be Wound Up.—At an adjourned meeting of the shareholders of the Kingsclere Gas and Coke Company, held recently at the Secretary's Office, the Chairman (Mr. W. J. Prior) proposed, and it was carried unanimously, "that the Company be wound up, and that a Liquidator be at once appointed."

Reduction in Price at Wokingham.—The Wokingham Town Council are reducing the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet. They have also agreed to supply through slot-meters 18 cubic feet for 1d., and to return to the consumers each quarter a bonus of 1d. in the shilling collected from these meters.

The Universal Gas Methane and Buisson Hella Company, Limited.—The first ordinary general meeting of the Company was fixed to take place at the offices in Cheapside yesterday (Monday) afternoon. Our representative, however, on applying for admission, was informed that "a report would be sent on." We regret, therefore, that we are unable to publish an account of the proceedings.

Briton Ferry Gas Manager Congratulated.—At the last meeting of the Briton Ferry Urban District Council, the Gas Manager (Mr. J. Mogford) was unanimously thanked for having produced a very favourable balance-sheet of the undertaking. The proposer said there had for years been a large annual loss on the works; but under Mr. Mogford's management things had gradually improved until there was a credit balance of £64.

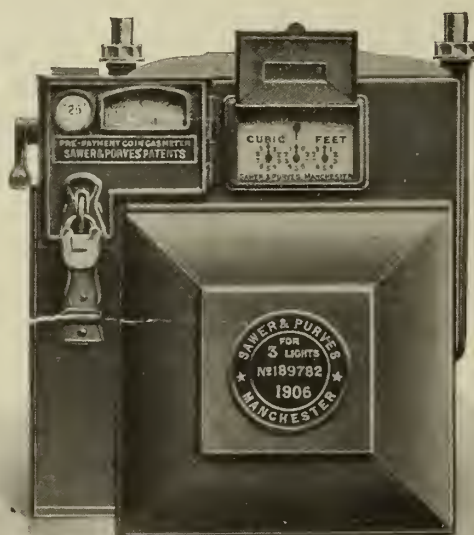
New Joint-Stock Companies.—The Incandescent Manchon Gaulois, Limited, has been registered with a capital of £40,000, in £1 shares, to carry on in France, Great Britain, and elsewhere the business of manufacturers, sellers, and exporters of incandescent gas-mantles and ancillary products. The Selas Lighting Company, Limited, has been registered with a capital of £60,000, in £1 shares, to adopt an agreement, and carry on the business of manufacturers, suppliers, installers, and repairers of incandescent lights, &c. The Wem Gaslight and Coke Company, Limited, has been registered with a capital of £10,000, in £5 shares.

Dartmouth Gas Company.—The report presented at the annual meeting of the Dartmouth Gas Company, Limited, yesterday week, showed that the receipts had been £4835, or £146 more than in the previous year, and that the profit on the twelve months' working was £628. It was decided to pay a dividend of 9s. per share on the ordinary shares. The number of prepayment meters has increased by 115 during the past year, and is now 705. A new gasholder and tank have been erected; and a washer and scrubber and other plant are being installed. To meet the cost of these extensions, 700 new 5 per cent. preference shares of £2 each have been issued.

Proposed Water-Works for Ruddington.—A Local Government Board inquiry was held last week at Ruddington, by Dr. A. W. Brightmore, into an application by the Basford Rural District Council for sanction to borrow £4000 for the construction of proposed water-works for the parish. Mr. S. Maylan, the Engineer and Surveyor to the Council, in a report on the subject, stated that the Nottingham Corporation had agreed to lay a 9-inch main from their reservoir on Wilford Hill to the boundary of Ruddington, and to supply water to the Basford Council at 1s. per 1000 gallons. Ample provision had been made for all reasonable development of the district.

MILES PLATTING,
MANCHESTER.

SAWER
and
PURVES.



PREPAYMENT
METERS.

RADFORD ROAD,
NOTTINGHAM.

AGENT FOR SCOTLAND:
JNO. D. GIBSON,
93, HOPE STREET,
GLASGOW.

The Glamorgan Water Board and the Pontypridd Water-Works.—According to the "Western Mail," terms have been practically agreed upon by which the Glamorgan Water Board, for the constitution of which a Bill is now before Parliament, will acquire the undertaking of the Pontypridd Water Company, including the Ystradfellte scheme for which the Company obtained parliamentary sanction last session. The Company is one of some years' standing, having been incorporated in 1864, with a capital outlay of about a quarter-of-a-million sterling. They have now a reservoir under construction.

Lighting of Ascot Main Roads.—The main roads of Ascot have for some time past been lighted by gas, by public subscription. Last Wednesday evening, a parish meeting was held, when a resolution was moved that the Parish Council be empowered to adopt the Lighting and Watching Act, in order that the lighting of the district might become general, and the cost defrayed out of the rates. When a vote was taken, 13 supported the motion and more than 70 opposed it. A rate of 1½d. in the pound would have been sufficient for the lighting scheme and have left a balance. It was announced by the Chairman that many of the subscribers would not continue their support of the present system.

Reported Discovery of Coal in Essex.—While sinking a well at Roxwell, near Chelmsford, a few days ago, workmen came upon a seam of what was thought to be coal, at a depth of 380 feet from the surface. "The Times" says that no importance is attached by geologists to the discovery, as in order to reach the coal measures in Essex—even supposing them to run through the county—it would be necessary to get through not only the London clay but also the chalk. If coal exists in Essex, it is at a depth of at least 2000 or 3000 feet. It is probable that what the well diggers came upon was a small quantity of carbonaceous matter which might by courtesy be called coal; but its presence there would not indicate the appearance of the coal measures, and could not be spoken of as a discovery of coal. Such carbonaceous matter was found at Croydon some years ago when a railway was being made there; and it occurs also at Bovey Tracey and other places.

Hammersmith Borough Council and Gas Testing.—At the meeting of the Hammersmith Borough Council last Wednesday, the Law and Parliamentary Committee reported that they had considered a letter from the Hon. Secretary of the Gas Conference of the Acton, Chiswick, Hanwell, and Twickenham Councils, reviewing the proceedings taken against the Brentford Gas Company early in the year for alleged deficiency in illuminating power, and stating that it was proposed to ask the Board of Trade to receive a deputation on the subject of the test-burner, such deputation to include, in addition to the Councils within the area of the Brentford Company, other Councils whose supply of gas by companies is furnished on similar conditions; and the conference wished to know whether the Hammersmith Council would be willing to appoint representatives. The Committee recommended that no action should be taken on the letter; and this course was agreed to without discussion. The Public Analyst reported that, acting on the instructions of the Council, he had, on the 24th of February, made a photometric test at the Town Hall of the gas supplied by the Brentford Company, with the result that the illuminating power was found to be equal to 14.51 candles (being 0.51 candle above the statutory requirement), and that the pressure was satisfactory. Instructions were given for certain persons who had complained of the gas to be informed of the result of the test.

Herne Bay Gas and Coke Company, Limited.—At the recent ordinary general meeting of this Company, the accounts presented for the year ended Dec. 31 showed that the revenue amounted to £13,652, and the expenditure to £9963; leaving a balance of £3699. The profit available for distribution (after payment of the interim dividends) was £2398; and the Directors recommended the payment of dividends making with those already paid 10 and 7 per cent. per annum. These would absorb £1602, and leave £796 to be carried forward. The Directors reported that the sale of gas showed an increase of more than 4½ per cent. compared with the year 1907. The Chairman (Mr. W. A. Surridge), in the course of his remarks when moving the adoption of the report, pointed out that the capital account was steadily working downwards, having been reduced from £800 not long ago to £666 now per million cubic feet. He also stated that the carbonizing results, owing to the watchful care of the Manager (Mr. C. V. Bennett) continued on a very high plane; the yield of gas per ton of coal having been 11,099 cubic feet. Mr. W. Benson having seconded the motion, the Auditor (Mr. E. L. Burton) congratulated the Board upon the very successful result of the year's working, and particularly upon the two features mentioned by the Chairman, which he considered most satisfactory. The report was adopted; and the dividends recommended were declared.

Relic of the Early Days of Gas Lighting in Exeter.—A local correspondent writes as follows: The Exeter Gas Company was incorporated by Act of Parliament in 1815; but it was two years later when the city was lighted by gas. During the past few days there has come to light a mutilated slip of parchment, which was discovered in an old book picked up at a second-hand book shop. It is a kind of palimpsest, except that the newer and less-valuable "copy" is written on the back instead of being erased and written over. The parchment contains the information that in the year 1814 a Mr. Phillips, son of Mr. Alderman Phillips, of Fore Street, delivered a course of twelve chemical lectures in Exeter. Those who attended them were so satisfied that they gave Mr. Phillips a table air-pump with subsidiary apparatus. Then follows the statement: "Early in the year 1815, he lighted his father's shop in Fore Street, Exeter, with gas. This was the first illumination by gas that was seen in Exeter." A newspaper paragraph, dated April 10, 1815, thus notices the new illumination: "Mr. Alderman Phillips's shop in the Fore Street, Exeter, has for some weeks past been lighted with gas by the skill and science of Mr. Reuben Phillips, the Alderman's eldest son, whose first course of philosophical lectures and experiments, delivered last winter to select companies of his friends, was so much admired. These gas-lights were of extraordinary beauty and brilliance, and would in a few years produce a great saving if generally adopted throughout the city."

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A Sample will Demonstrate its
Advantages.

Our Catalogue is full of
correspondingly good lines.

Specialities of interest to all
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Manufacturers:

CANNON IRON FOUNDRIES, Ltd.,
DEEPFIELDS, near Bilston, Staffs, Eng.

London Office and Show-Rooms:

18, HOLBORN VIADUCT, E.C.

Australasian Agents:

JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY,
and Box No. 4 (G.P.O.) Dunedin.

Sales of Shares and Stock.—At a recent sale by Mr. Isaac Rice, some £5 "C" shares in the Tonbridge Water-Works Company, Limited, fetched £7 12s. 6d. and £7 13s. each. At the Auction Mart, Kettering, on the 26th ult., Mr. M. C. Wilson sold some "C" stock of the Kettering Gas Company at £123 per £100, and £25 of "A" stock for £66 10s.

The New Reservoir at Honor Oak.—The Lord Mayor, who will be accompanied by the Lady Mayoress, will formally open, on the 5th prox., the new covered reservoir which the Metropolitan Water Board have constructed at Honor Oak. The reservoir, which has taken three years to build, was designed by Mr. J. W. Restler, the Deputy Chief Engineer to the Board, and formerly Engineer of the Southwark and Vauxhall Water Company. It occupies a site by the side of Peckham Rye, and is capable of holding 56½ million gallons of water, or a day's allowance for 1½ million people—a quarter of the total population supplied by the Board. It is stated that the new reservoir is the largest covered reservoir ever constructed at one time. The roof is built on arches supported by brick piers; and the reservoir has a depth of from 21½ to 34 feet.

Application by Birkenhead for a Provisional Order.—On Friday, a special meeting of the Birkenhead Town Council was held to pass a resolution directing application to be made to the Local Government Board for a Provisional Order under the Public Health Act, 1875, to enable the Corporation to utilize certain lands for the purposes of the gas undertaking. Mr. Dodds raised a question as to the amount that was to be borrowed for the extensions; contending that the Gas Committee should as far as possible use any surplus they had in hand, so as to obviate the borrowing of a larger sum than was absolutely necessary. The Mayor, however, pointed out that they were not then discussing the question of expenditure; the present application was merely for power to use the land for the purposes mentioned. The members might, he said, be quite sure that, when the inquiry came on, if the Council could take anything out of surplus revenue, it would be done to as great an extent as was wise in the circumstances. The resolution was carried unanimously.

Gas and Electric Street Lighting at Handsworth.—In reply to an inquiry in the correspondence columns of the "Birmingham Daily Post" as to the relative cost of electric and street gas lighting, Mr. A. Mills writes as follows: There are in Handsworth considerably over 200 miles of roads lighted by the Council, of which some 5 miles, having 120 lamps, are at times lighted by electricity (after 11 o'clock p.m., the darkness merely has the chill taken off it by the same means), while the remaining 195 miles (say) are gas lighted, and would have, on the same basis of 24 per mile, a total of 4680 lamps. In the published report of the Finance Committee's estimates for the ensuing year to be submitted to the Council, it was stated there would be required for street lighting by gas the sum of £2200, and for street lighting by electricity £1488. Now, based upon these figures, the relation of cost as between the two forms of lighting works out as follows: Electric, cost per mile, £297, cost per lamp £12 8s. Gas cost per mile £11 5s. 8d., cost per lamp 9s. 5d. Exact figures as to length of roads and number of gas-lamps would make the disparity between the two kinds of illumination even wider. In face of such wanton extravagance as here shown, what may not the ratepayers expect when, if ever, the Council receive their mandate to apply for incorporation? The penny just taken off the district rate would soon be put on again, accompanied by a swarm of brothers.

APPLICATIONS FOR LETTERS PATENT.

- 6729.—WELCH, W. H. I., "Incandescent gas-lamps." March 20.
 6754.—ANDERSON, J., "Automatic gas lighting and extinguishing apparatus." March 20.
 6811.—COWPER-COLES, S. O., "Bricks and tiles for heating purposes." March 22.
 6892.—DORRINGTON, A. A., HITCHON, F., and HEAP, H., "Generating air gas." March 23.
 6899.—DOXEY, A. S., DUDLEY, S., and BIRCH, G., "Stands for gas utensils." March 23.
 6909.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Muffle-furnaces." March 23.
 6910.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Blast-oven furnace." March 23.
 6911.—FLETCHER, RUSSELL, AND CO., LTD., NEIL, A., and FLETCHER, T. W., "Regulating the supply of gas in apparatus in which the gas-flame is required to be automatically reduced or increased." March 23.
 6928.—KNAPPICH, J., "Welding burners." March 23.
 6963.—DEUTSCHE GASGLÜHLICHT AKT.-GES. (AUERGES.), "Attaching mantles to rings." March 23.
 6986.—SMITH, W. D., and READER, F. J., "Gas cooking-stoves." March 23.
 6997.—RAMASSOT, M., "Automatic temperature regulator for gas-heaters." March 23.
 7028.—POLLOCK, W. C. & S., "Gas-engines." March 24.
 7153.—MILLAN, A., "Anti-vibrators." March 25.
 7212.—STEVENS, A. G., "Actuating gas-taps simultaneously." March 25.
 7272.—HARRISON, J., "Lighting and extinguishing gas-lamps." March 26.
 7245.—LEWIS, J. W., and BANKS, W., "Mantle holders." March 26.
 7271.—AULD, J., "Reducing valves." March 26.
 7305.—CARDELL, C. C., "Prepayment meters." March 26.
 7333.—MEKER, G. A. H., "Gas-burners." March 26.
 7384.—HELPS, G., "Gas lamps and burners and the lighting and extinguishing of same." March 27.
 7399.—EHRRICH AND GRAETZ, "Gas-regulators." March 27.
 7400.—GOWER, J. E., "Production of semi-water gas." March 27.
 7427.—COULSON, S. G., "Treatment of tar." March 27.
 7434.—ROBSON, G., "Automatically operating gas-burners." March 27.

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MAUGHAN'S GEYSERS.



*A Source of Income to Gas Undertakings.
 A Source of Comfort to Users.
 A Source of Satisfaction to all.*

TRIED, TESTED, AND APPROVED AS
 The IDEAL BATH-HEATER.

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PARKINSON STOVE Co., Ltd.
 (Incorporating
 Maughan's Patent Geyser Co.)

BIRMINGHAM:
 STOUR STREET.

LONDON:
 Office and Show-Room:
 129, HIGH HOLBORN,
 W.C.

Where all Patterns may be inspected.

It was stated in the minutes of the Gas Committee submitted at last week's meeting of the Belfast County Borough Council that the Manager (Mr. R. Sharpe) had reported that the Sub-Committee had appointed Mr. John Browne, of Ponder's End, to the position of Gas Engineering Assistant, at a salary of £4 per week; one month's notice on either side to terminate the engagement.

The shipyard co-partnership scheme introduced by Sir Christopher Furness entered upon its twelve months' trial last Wednesday. The employees' shares have been taken up largely; and it is expected that as the two shipyards included in the scheme add to their staffs, the number of shares taken up are, practically speaking, certain to increase proportionately.

Professor Henry Adams, M.Inst.C.E., of No. 60, Queen Victoria Street, E.C., has taken his eldest son, Mr. Henry Charles Adams, Assoc.M.Inst.C.E., into partnership with him in his practice as a consulting engineer and surveyor, under the style of Henry Adams and Son, at the above address. The firm have also an office at 1, Waterloo Street, Birmingham.

During the first week in which the officials of the Consolidated Gas Company of New York were engaged in paying out the "suspense fund," representing the difference of 20 c. per 1000 cubic feet withheld during the time the validity of the 80-cent gas-rate was being determined in the Courts, the sum of \$530,664 was returned to consumers. Of the amount thus refunded, the Company paid \$392,782, of which approximately 71 per cent. was taken from the Special Master's fund and 29 per cent. was paid direct by them; being collections for over-charge which had not been deposited.

We have received from Mr. E. C. Amos, the British representative of the Swiss Locomotive and Machine Works at Winterthur, their new catalogue of gas engines and producers. The former are designed to be used with ordinary or producer, blast-furnace, or coke-oven gas; and they are made up to 2000 H.P. Those of 25 H.P. and upwards are fitted with improved valve-gear, which it is claimed ensures a perfect mixture at all loads with a minimum consumption of fuel. The catalogue is forwarded from the London Office, No. 3, Laurence Pountney Hill, Cannon Street, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT WORKING FOREMAN. (Stove and Repairing Shop). No. 5077.
ENGINEER-MANAGER. Shipley Gas Department. Applications by April 17.
MANAGER (COKE OVEN AND BYE-PRODUCT PLANT). No. 5083.
WORKING MANAGER. Dolgelly Gas-Works. Applications by April 12.
REPRESENTATIVE (IRELAND). The G. J. Eveson Coal and Coke Company, Birmingham.
GAS-FITTER. No. 5082.
GAS-FITTER. Barnstaple Gas Company.

Situations Wanted.

ARCHITECT, &c. (OR ANY OTHER CAPACITY). No. 5078.
MANAGER. No. 5075.
REPRESENTATIVE (GAS PLANT AND CONSTRUCTIONAL IRONWORK). No. 5084.
SECRETARY, MANAGER OR ACCOUNTANT. Mimmack, St. Paul's Cray, Kent.

Premises and Land to be Let (London, W.C.).

MESSRS. CALEY AND SON, LIMITED, Chenies Street, W.C.

Plant, &c. (Second-Hand), for Sale.

PURIFIERS. Hexham Gas Company.

Gas-Works for Disposal.

KINGSCLERE GAS-WORKS. By Auction. April 20.

Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. April 27.
GRAYS AND TILBURY GAS COMPANY. April 27.
SOUTHEAST WATER COMPANY. April 27.

TENDERS FOR

Benzol (Crude).

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 26.

Coal and Cannel.

LINCOLN GAS DEPARTMENT. Tenders by April 17.

Fire-Clay Goods.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.

Gasholder and Tank.

CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by April 24.

General Stores—Castings, Iron and Steel, Bolts, &c., Tools, Ironmongery, Cock Fittings, Oils and Paints, Brass and Copper Tubes and Fittings, Lead Gas Pipe, &c., &c.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.
WIGAN GAS DEPARTMENT. Tenders by April 19.

Governor.

CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by April 24.

Meters.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.

Oil for Gas Making.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.

Oxide of Iron.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.

Pipes and Fittings, &c.

CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by April 24.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.
WIGAN GAS DEPARTMENT. Tenders by April 19.

Purifiers, &c.

CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by April 24.

Residual Products for Sale and Residual Products Works to Lease.

GLASGOW GAS DEPARTMENT. Tenders by April 20.

Stoves.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.

Sulphuric Acid.

WIGAN GAS DEPARTMENT. Tenders by April 19.

Tar and Liquor.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by April 12.
WIGAN GAS DEPARTMENT. Tenders by April 19.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 15	7	Alliance & Dublin 10 p.c.	184-19	..	5 5 3	561,000	Stk	Feb. 25	10	Liverpool United A	222½-224½	..	4 9 1
298,955	10	"	7	Do. 7 p.c.	123-134	..	5 5 8	"	"	"	7	Do. B	169½-171½	..	4 1 7
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	97-100	..	4 0 0	"	Dec. 30	4	6	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd.	58-59	..	5 10 8	"	Dec. 11	6	5	Malta & Mediterranean	4½-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	48-49	..	5 18 11	"	Apr. 1	5	5	Met. of 15 p.c. Deb.	100-102	+1½	4 18 0
50,000	10	Feb. 25	4	Bourne-mouth Gas B 7 p.c.	234-238	..	4 14 11	"	Nov. 13	3½	20	Melbourne 4½ p.c. Deb.	100-102	+1½	4 8 3
51,810	10	"	7	and Water Pref. 6 p.c.	164-165	..	4 3 7	"	Feb. 25	4½	3½	Monte Vid. o. Ltd.	124-125	..	5 9 10
53,200	10	"	6	Brentford Consolidated	154-16	..	3 15 0	"	Dec. 30	3½	3½	Newcastle & G't'sh'd Con	107-108	..	4 3 4
380,000	Stk.	"	12½	Do. New	245-248	..	5 0 10	"	Feb. 25	10	10	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	12½	Do. 5 p.c. Pref.	185-188	..	5 1 1	"	Oct. 10	7	7	North Middl. sex 10 p.c.	193-20	..	5 0 0
50,000	"	"	5	Do. 4 p.c. Deb.	120-122	..	4 2 0	"	Nov. 27	8	8	Do. 7 p.c.	13-13½	..	5 3 8
206,250	Stk.	Dec. 11	4	Brighton & Hove Orig.	101-103	..	3 17 8	"	Mar. 31	8	8	Ottoman, Ltd.	140-142	..	5 12 8
220,000	Stk.	Mar. 12	4	Do. A Ord. Stk.	201-212	..	5 1 5	"	Feb. 25	13	13	Portsea Island A.	6-6½	..	6 8 0
246,320	"	"	7½	British	150-153	..	5 1 4	"	"	12	12	Do. B.	135-137	..	5 0 7
46,400	20	Oct. 15	10	Bromley, Ord. 5 p.c.	42-43	..	4 13 0	"	"	10	10	Do. C.	129-131	..	4 19 3
109,000	Stk.	Feb. 25	6	Buenos Ayres (New) Ltd.	114-117	..	5 2 7	"	"	10	10	Do. D and E.	119-121	..	4 19 2
165,700	"	"	4½	Do. 4 p.c. Deb.	85-87	..	5 3 6	"	Oct. 29	7	7	Primitiva Ord.	101-103	+1	4 17 1
500,000	10	Oct. 15	7	Cape Town & Dis., Ltd.	124-134	..	5 5 8	"	Jan. 28	5	5	Do. 5 p.c. Pref.	61-63	..	5 7 8
250,000	Stk.	Dec. 11	4	Do. 4½ p.c. Pref.	94-96	..	4 3 4	"	Dec. 1	4	4	Do. 4 p.c. Deb.	5-5½	..	4 15 3
100,000	10	"	—	Do. 6 p.c. 1st Mort.	43-54	..	—	"	Oct. 15	8	8	River Plate Ord.	95-97	..	4 2 6
50,000	Stk.	Dec. 30	6	Chester 5 p.c. Ord.	47-49	..	6 2 5	"	Dec. 30	4	4	Do. 4 p.c. Deb.	134-14*	..	5 14 4
100,000	Stk.	Feb. 25	4½	Commercial 4 p.c. Stk.	71-78	..	5 15 5	"	Mar. 31	8	8	Do. 6 p.c. Pref.	95-97	..	4 2 6
157 15½	Stk.	Mar. 12	5½	Do. 3½ p.c. do.	103-111	..	4 10 1	"	Jan. 2	5	5	Do. 5 p.c. Deb.	134-14*	..	5 14 4
560,000	"	Dec. 11	5	Do. 3 p.c. Deb. Stk.	106-108	..	4 16 4	"	Mar. 12	10	10	Sheffield A.	114-12*	+½	5 0 0
475,000	Stk.	"	6½	Continental Union, Ltd.	101-103	..	4 17 1	"	"	10	10	Do. B.	493-503	..	4 19 0
800,000	Stk.	"	7	Do. 7 p.c. Pref.	81-83	..	3 12 3	"	Oct. 29	10	10	Do. C.	236-238	..	4 4 0
200,000	"	"	7	Derby Con. Stk.	138-141	..	4 19 3	"	Nov. 13	5	5	Do. C.	234-236	..	4 4 9
49,270	Stk.	"	5	Do. Deb. Stk.	121-123	..	4 1 4	"	Feb. 11	3	3	South Afr. can.	134-144	+½	7 0 4
55,700	"	"	4	East Hull 5 p.c. Ord.	103-105	..	3 16 2	"	Jan. 14	3	3	South Met., 4 p.c. Ord.	121-123	+1	4 6 8
141,995	10	Mar. 31	12	European, Ltd.	96-98	+½	5 2 0	"	Mar. 12	8	8	Do. 3 p.c. Deb.	85-86	..	3 9 9
286,690	10	Jan. 28	12	Do. £7 10s. paid.	233-244	..	4 19 0	"	Feb. 25	5½	5½	South Shields Co. Stk.	152-154	..	5 3 11
354,060	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	174-184	+2½	4 18 5	"	"	5	5	S'th Suburb'n Ord. 5 p.c.	120-122	+1	4 10 2
15,161,545	Stk.	"	3	light 3½ p.c. max.	102-103	..	4 7 11	"	Jan. 14	5	5	Do. 5 p.c. Pref.	120-122	..	4 2 0
2,600,000	"	"	3	and 4 p.c. Con. Pref.	88-89	..	3 18 8	"	Nov. 13	6½	6½	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
3,799,735	"	"	4	Coke 3 p.c. Con. Deb.	104-106	..	3 15 6	"	Feb. 25	5	5	Southampton Ord.	109-111	..	4 10 1
4,193,975	Stk.	Dec. 11	3	Hastings & St. L. 3½ p.c.	85-86	+½	3 9 9	"	"	5	5	Tottenham A 5 p.c.	132-134	+1	5 0 9
258,740	Stk.	Mar. 12	4	Do. do. 5 p.c.	93-95	..	5 0 0	"	Dec. 30	30	30	and B 3½ p.c.	109-111	+1	4 14 7
82,500	10	Oct. 15	11	Hongkong & China, Ltd.	110-112	..	5 11 7	"	"	5	5	Edmonton 4 p.c. Deb.	101-103	+1	3 17 8
70,000	Stk.	Mar. 12	6½	Ilford "A" and "C"	134-136	+3	4 15 7	"	Jan. 14	5	5	Tuscan, Ltd.	83-91	..	8 13 0
123,50	Stk.	"	5	Do. "B"	103-105	+1	4 15 3	"	Feb. 25	6½	6½	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
65,783	"	Dec. 30	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	"	Feb. 25	5	5	Tynemouth, 5 p.c. max.	105-107	..	4 13 6
51,000	Stk.	Nov. 13	8	Imperial Continental	182-184	..	4 7 0	"	Dec. 30	3	3	Wands- 1 B 3½ p.c.	131-133	..	4 17 9
4,940,000	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	94-96	..	3 12 11	"	Feb. 25	5	5	worth 1 B 3½ p.c. Deb. Stk.	72-74	..	4 1 1
473,600	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10	"	"	4	4	West Ham 5 p.c. Ord.	117-120	+4½	4 7 6
195,242	Stk.	"	6					"	Dec. 30	5	5	Do. 5 p.c. Pref.	124-126	..	3 19 4
								"	"	5	5	Do. 4 p.c. Deb. Stk.	105-107	..	3 14 9

Prices marked * are "Ex div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EASTER HOLIDAYS.

In consequence of the EASTER HOLIDAYS, all Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 56.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

KINGS Patent Agency, Limited, 165,

Queen Victoria Street, London, E.C. Director
Benj. T. King, A.I.M.E., British Chartered Patent Agent
(Regd. by Exam.). Teleg. 682 Central. Teleg. "Geologic,"
London. We sustain over quarter of a century's Experience
and Reputation for Patenting Inventions and Registering
Trade Marks throughout the World.

Write or call. We attend and advise you free.

OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the
NEW WESTBURY IRON COMPANY, LTD.,
WESTBURY, WILTS.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND
CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON."

Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers,
Oldbury, WORCS.

Telegrams: "CHEMICALS."

FRASER'S FIRE CEMENT.

FOR Gas-Works, Retort Settings, &c.

Supplied to the Largest Works in the Kingdom.

A. C. FRASER'S FIRE CEMENT CO., Corbett Street,
Bradford, MANCHESTER.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0648.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.

Telegraphic Address: "Carburine, London."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, and SUNDERLAND.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

33, VICTORIA STREET, S.W.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
Worcs.

Telegrams: "CHEMICALS, OLDBURY."

R. & G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

ROBERT B. FITZMAURICE,

4, EAST INDIA AVENUE,
LEADENHALL STREET, LONDON.

Telegraphic Address: "Fitzmaurice, London." Telephone: No. 11,113 CENTRAL.

Established 1887.

Advertiser, who is Shipping Agent to several Gas
Companies, Municipalities, and Gas Material Makers,
would be glad to undertake SHIPMENT OF GOODS
ordered by Colonial Gas-Works or Others.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.

36, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

APPLY TO THE

CHAIN BELT ENGINEERING CO.

DERBY, ENGLAND,

FOR REALLY HIGH-CLASS

ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, and SUNDERLAND.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIRAY AND SONS, LTD., HUDDERSFIELD.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Sulphate of Ammonia.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.

JOHN E. WILLIAMS AND CO.,

LOWER MOSS LANE,

MANCHESTER, S.W.

Telegrams: "ENAMEL." National Telephone 1759.

DESSAU PATENT VERTICAL RETORTS.

FOR list of Installations, see "Journal,"
March 23, p. I. of Centre.

THE DESSAU VERTICAL RETORT COMPANY,
Care of Mr. CHARLES HUNT, Consulting Engineer,
17, Victoria Street, WESTMINSTER, S.W.

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PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
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MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

To Gas Managers, &c., Wanted, Old

Condensed GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
&c., also bought.

J. WILSON, Pleasant Grove, York Road, King's Cross,
LONDON, N.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

PINCHBECK'S Meters and Burglar
PROOF STRONG BOX.
See illustrated advertisement, March 9, p. I. of Centre.
PINCHBECK LIMITED, Adams Place, George's Road,
HOLLOWAY, N.

AMMONIA.
Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.
Telegrams: "Doric," Newcastle-on-Tyne. National
Telephone No. 2497.

SHOW-ROOM ATTENDANT.
APPLICANTS for the Position of Show-
ROOM SALESMAN to the Reading Gas Com-
pany are THANKED for the Particulars which they
forwarded, and are hereby informed that the Vacancy
HAS BEEN FILLED.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any of all these Offices.
St. Paul's Cray, KENT.

TO CONTRACTORS FOR GAS PLANT AND
CONSTRUCTIONAL IRON-WORK.
PRACTICAL Engineer, Fifteen Years'
Experience in Shops, Drawing Office, Erection
of Gas-Works, and all kinds of Plant, also Travelling
and Interviewing Engineers, is Open to REPRESENT
a Firm of good standing. Can Command Fair Amount
of Business. Good Connection in Great Britain and
Continent.
Address No. 5084, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

ADVERTISER (son of a well-known Gas
Engineer) desires Engagement as MANAGER of
Gas-Works. At present with a Company in North
Wales. Has had Practical Training on Works, also in
Laboratory. Able to prepare Plans and Superintend
Construction of Retort-Settings. Studied Engineering
and Chemistry at the Polytechnic Engineering School,
Regent Street. Moderate Salary only accepted if
reasonable prospect of early preferment.
Address No. 5075, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.
ADVERTISER (Age 28), Articled under,
and Three Years Chief Assistant to, an Architect,
would be prepared to Work hard in any Capacity that
afforded reasonable prospects of a satisfactory per-
manent position. Has had a Wide General Experience,
including Mills, Warehouses, Transferring Machinery,
Reinforced Concrete, &c., and is thoroughly Com-
petent to prepare Drawings, Specifications, Quantities,
&c. Good Draughtsman, Surveyor, and Mechanical En-
gineer. Unexceptionable References and Testimonials.
Address No. 5078, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

PRACTICAL Gas-Fitter wanted. Must
thoroughly understand Modern Systems of
Lighting and Heating.
Apply, by letter only, giving References and stating
Age, Experience, and Wages required, to F. L.
SCHOFIELD, Manager, Gas Company, BARNSTABLE.

WANTED, a Manager for a Modern
Coke-Oven and Bye-Product Plant situated in
the Midlands.
Applicants must have held similar Appointments,
and, further, be Good Practical Engineers, and have a
good Chemical Knowledge. No others need Apply.
Apply, by letter, stating Age, Experience, and Salary
expected, together with copies of recent Testimonials,
to No. 5083, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

URBAN DISTRICT OF SHIPLEY.
APPOINTMENT OF ENGINEER-MANAGER OF
GAS-WORKS.
THE Council invite Applications from
Duly Qualified Persons for the Post of GAS
ENGINEER and MANAGER of the Gas-Works.
Make of Gas, 180 Millions.
Salary, £250 per Annum.
The Person Appointed is to devote the whole of his
Time to the duties of the Office.
Applications, stating Age, present Occupation, and
Qualifications, with copies of not more than Three
recent Testimonials, must be delivered to the under-
signed, endorsed "Gas Manager," not later than
Saturday, the 17th of April, 1909.
Canvassing, either directly or indirectly, will be re-
garded as a Disqualification.

I. LINDOW,
Clerk of the Council.
Council Offices, Shipley,
Yorks, March 29, 1909.

ASSISTANT Working Foreman re-
quired for Stove and Repairing Shops in a Large
Suburban Gas Company. Must be a good Mechanic,
and capable of controlling Men. Age not to exceed 30.
Wages to commence at 40s. per week.
Address No. 5077, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE G. J. Eveson Coal and Coke Co.,
Limited, Birmingham, are in need of an Addi-
tional REPRESENTATIVE in Ireland.
Applicant must be Experienced, and have a Good Con-
nection among Gas-Works throughout that Country.
Application to be made in writing, with full
Particulars.

WANTED, a Working Manager for
the Dolgelly Gas-Works, North Wales. Make,
5 Millions. Coal Business. Wages 35s. per Week,
with House, Coal, Gas, &c.
Apply, by the 12th inst., stating Age, whether
Married, number in Family, how soon could commence
Duties, and enclosing copies of recent Testimonials, to
Geo. E. WOODFORD, RUABON.

NORFOLK COAST.
GAS-FITTER wanted. Compo., Lead,
Brass, Iron, and Modern Fittings, thoroughly
competent, Skilled Estimator of Costs of Interior
Fitting.
Apply, by letter, stating Age, Experience, present
and last Employment, and Wages required for Three
Months' Work (Prospect of Permanency), to No. 5082,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE LET for Show-Rooms, Work-
shops, Warehouses, &c.. Two Magnificent
FLOORS, containing 9300 Square Feet and 3600 Square
Feet respectively, in Alfred Place and Chenies Street,
Tottenham Court Road, W.C. Fireproof Construction.
Built for Heavy Weights. Well Lighted. Lift.
Also Vacant SITE Adjoining, about 9000 Square Feet,
on 99 Years' Building Lease.
Apply A. J. CALEY AND SON, LIMITED, Chenies Street,
LONDON, W.C.

PURIFIERS FOR SALE.
FOR SALE—Four 10-foot Square Puri-
fiers, with Dempster's Dry-face Centre-Valve and
Connections Complete.
Offers to H. LEES, Gas Office, HENHAM.

FOR SALE, Cheap, the undermentioned
GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER
to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.ft.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkin's VALVES, 12-inch, 10-inch, 6-inch.
Apply to SAMUEL WHILE and Son, 60, Queen Victoria
Street, LONDON, E.C.

BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLENBERE.)

TENDERS are invited for the Crude
BENZOL produced at the above Works (estimated
at 450 Gallons per day) testing 80 per cent. at 120° C.,
during the next Three, Six, Nine, or Twelve Months,
delivered into Contractor's Tanks at the Bridgewater
Colliery Siding, Wharfon Hall, on the Pendleton and
Hindley Branch of the Lancashire and Yorkshire
Railway, or at the Brackley Siding on the Little Hulton
Mineral Branch of the London and North Western
Railway.
Tenders, endorsed "Tender for Crude Benzol," to
be addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 26th inst.
Manchester, April 6, 1909.

EDINBURGH AND LEITH CORPORATIONS'
GAS COMMISSIONERS.

GENERAL STORES.

THE Commissioners invite Tenders for
the Supply of GENERAL STORES and require-
ments for the Year ending May 15, 1910, comprising
among others the following:—
Cast-Iron Pipes and Connections.
Iron Castings.
Tubes and Fittings.
Merchant Iron and Steel.
Bolts, Nuts, and Rivets.
Tools, Implements, and Ironmongery.
Brass Cock Fittings, and Meters.
Timber, Yarn, Waste, &c.
Oils and Paints.
Gas Oil, Fire-Clay Materials.
Gas Cooking-Stoves.
Causeway Repairs.
Removal of Surplus Tar.
Removal of Spent Oxide of Iron.

The Contractors will be required to guarantee that
in the execution of their Contracts they pay the
Standard Rate of Wages, or such Rates as are generally
recognized as Fair in their localities.
Schedules and Forms of Tender, and Samples may be
seen, and further Information obtained upon Applica-
tion to Mr. W. R. Herring, the Commissioners' En-
gineer and General Manager, at his Office, New Street,
Edinburgh.
Offers must be lodged not later than Ten o'clock on
Monday forenoon, the 12th day of April, 1909, in sealed
Envelope addressed to the undersigned, and marked
"Tender for _____," as the case may be.
The Commissioners are not to be bound to accept the
lowest or any Tender.

JAMES M'G. JACK,
Clerk.
25, Waterloo Place, Edinburgh,
March 30, 1909.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the Lincoln
Corporation invite TENDERS for the Supply of
30,000 Tons of Screened or Unscreened GAS COALS
and NUTS, to be delivered during a period commencing
the 1st of July, 1909, and terminating the 30th of June
1910.
Further Particulars and Forms of Tender may be
obtained from the undersigned.
Sealed and endorsed Tenders, addressed to the Chair-
man of the Gas Committee, must be delivered on or
before the 17th of April next.
The Committee do not bind themselves to accept the
lowest or any Tender.

JNO. CARTER,
Manager.
Gas Offices, Lincoln,
March 24, 1909.

CLEATOR MOOR URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for
the Whole of the Work required in the Provision
and Erection of the following PLANT at their Gas-
Works:—

- 1—A TELESCOPIC GASHOLDER in a 60 feet
STEEL TANK.
- 2—A Set of Four 12-foot PURIFIERS, Complete
with Centre Valve and House.
- 3—An 8-inch Cowan's Distribution GOVERNOR.
- 4—All CONNECTIONS required to couple up to
Existing Plant.

A Copy of the Drawings and Specifications may be ob-
tained from the undersigned on payment of £3 3s.,
which will be returned on receipt of a *bona-fide* Tender.
Sealed Tenders, endorsed "Gas-Works Extensions,"
and addressed to the undersigned, to be delivered on or
before the 24th day of April, 1909.

The Council do not bind themselves to accept the
lowest or any Tender.

By order,
HENRY ROTHERY,
Clerk to the Council.
Public Offices, Cleator Moor,
April 3, 1909.

CLEATOR MOOR URBAN DISTRICT COUNCIL

THE above Council invite Tenders for
the Supply of the following Cast-Iron Spigot and
Socket GAS-MAINS:—

- 574 Yards of 8-inch.
- 1452 Yards of 6-inch.
- 426 Yards of 5-inch.

All SPECIALS required, including Six Syphon Pots.
All Castings to be of the Best Grey Metal and free
from imperfections of any kind. The Sectional thick-
ness of Pipes to be as follows: 8-inch $\frac{3}{8}$ ins., 6 and 5-inch
 $\frac{3}{8}$ ins.

The persons Tendering must state the earliest date
at which Delivery can be commenced.

Quote price per Ton delivered at Cleator Moor
Station.

Sealed Tenders, endorsed "Cast-Iron Pipes," to be
addressed to the undersigned on or before the 24th day
of April, 1909.

By order,
HENRY ROTHERY,
Clerk to the Council.
Public Offices, Cleator Moor,
April 3, 1909.

COUNTY BOROUGH OF WIGAN.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Supply of STORES over the Year ending on
March 31, 1910, as follows:—

- (a) WROUGHT-IRON TUBE and FITTINGS.
- (b) BRASS and COPPER TUBE and FITTINGS.
- (c) LEAD GAS PIPE.
- (d) CAST MAINS and CONNECTIONS.
- (e) SULPHURIC ACID.
- (f) SURPLUS TAR.

Forms of Tender may be obtained from the under-
signed.

The Committee do not bind themselves to the accept-
ance of any Tender.

Tenders, sealed and endorsed with the name of the
Article tendered for, to be delivered to Harold Jevons,
Esq., Town Clerk, Wigan, on or before Monday, the
19th of April next ensuing.

A Sample of each Article to be forwarded addressed
to the Gas Engineer.

JOS. TIMMINS, M.Inst.C.E.,
Engineer, &c.
Borough Gas-Works,
March 26, 1909.

CORPORATION OF GLASGOW.

(GAS DEPARTMENT.)

RESIDUAL PRODUCTS FOR SALE, AND
RESIDUAL PRODUCT WORKS TO LEASE.

THE Corporation are prepared to re-
ceive TENDERS for the Purchase of the TAR
and AMMONIACAL LIQUOR produced at their
Provan Gas-Works, and also for the LEASE of their
CHEMICAL-WORKS at Provan, during the period of
Five Years, from and after the 1st of July, 1909.

Forms of Tender on which Offers must be made, with
Copies of the Terms and Conditions upon which the
Products are to be Sold and the Residual Product
Works are to be Let, may be had on Application to Mr.
Alexander Wilson, Gas Engineer, No. 45, John Street,
Glasgow.

Sealed Tenders, marked outside "Tender for Provan
Residual Products, &c.," must be lodged with the Sub-
scriber on or before Tuesday, the 20th of April prox.

The highest or any Tender may not be accepted.

A. W. MYLES,
Town Clerk.
City Chambers, Glasgow,
March 29, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.

NEW ISSUE OF 400 £10 "B" SHARES
AND
£2000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

By order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

NEW ISSUE OF £4000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK,
AND
200 £10 NEW ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

THE GAS-WORKS, KINGSLERE.

MR. A. W. NEATE is instructed by the Liquidator, to SELL BY AUCTION, at the Swan Hotel, Kingsclere, Hants, on Tuesday, April 20, 1909, at Four o'clock precisely,

THE KINGSLERE GAS-WORKS, comprising Manager's House, Retort-House, Purifier, Condenser, Scrubber, Gasholder, Holder Tank, Stores, Outbuildings and Gardens, also

THE GAS MAINS AS LAID, with Connections to Houses, Street Lamps, Columns, Brackets, Service Pipes, Meters, &c., Purchaser to take to the Working Plant, Tools, and Stock by Valuation. Possession on completion of Purchase. Particulars and Conditions of Sale may be had at the Place of Sale, of J. BARNES, Esq., Solicitor, KINGSLERE, and of Mr. A. W. NEATE, Auctioneer, NEWBURY and HUNGERFORD.

JOHN HALL & CO. OF STOURBRIDGE, LIMITED,

STOURBRIDGE,
Manufacturers of

**FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,**
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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NEWTONGRANGE, MIDLOTHIAN.**

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Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

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Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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Sperm Value 878.85 lbs. per Ton.

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Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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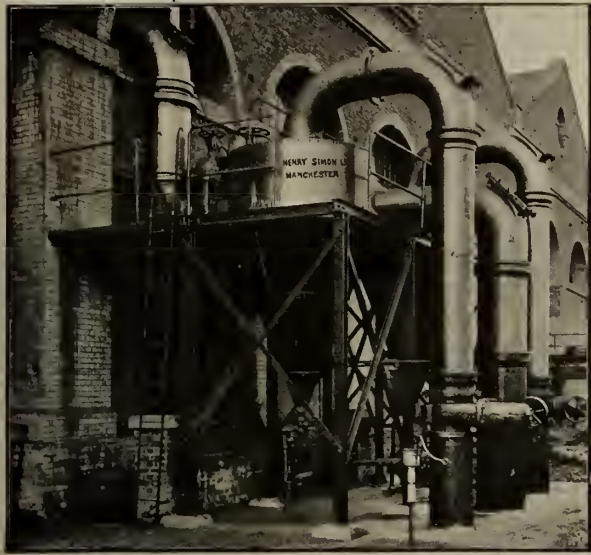
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**CLAPHAM'S
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For
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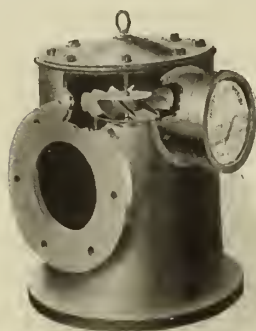
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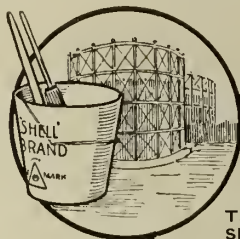
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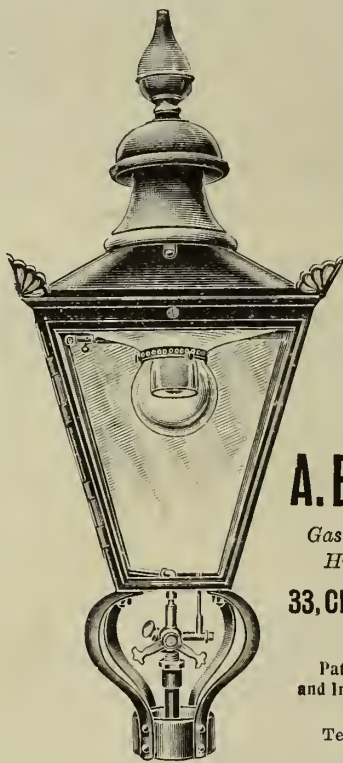
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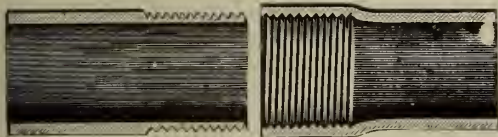
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[See Illustrated Advertisement, March 9, p. 741.]

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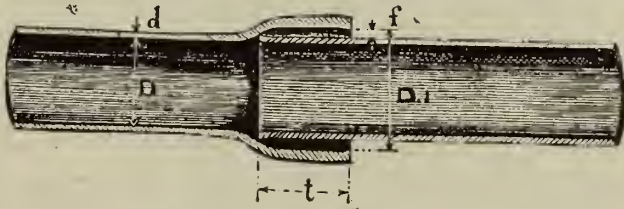
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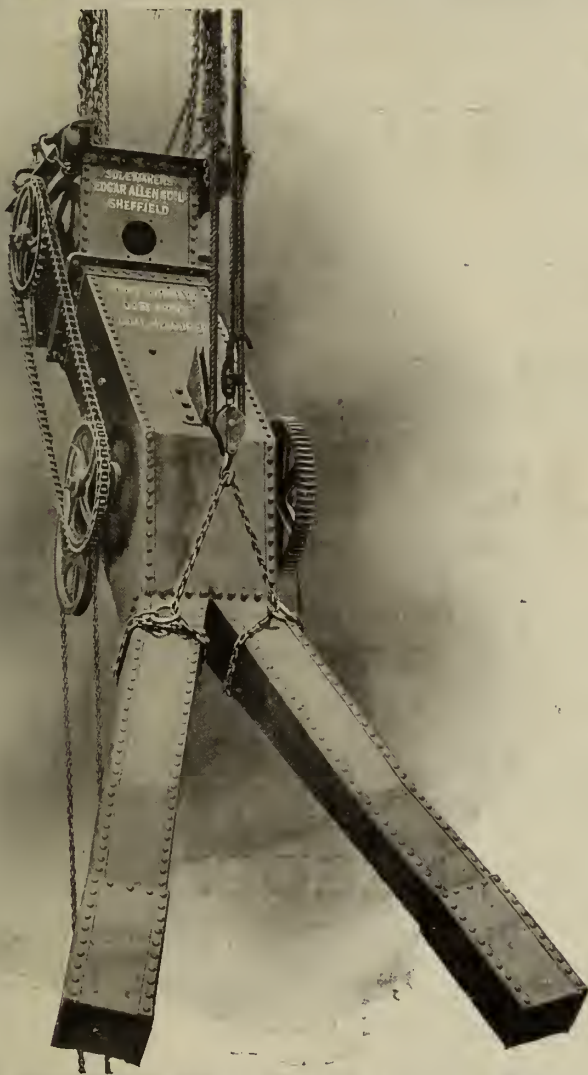
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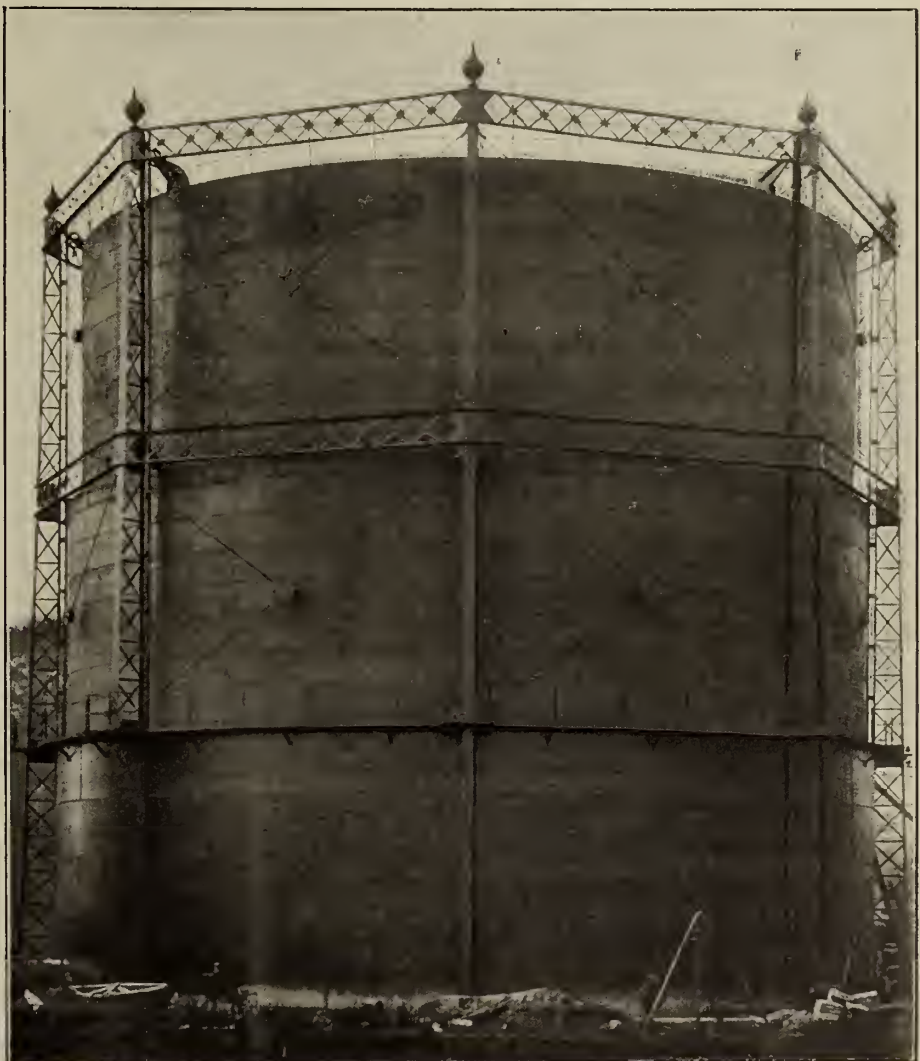
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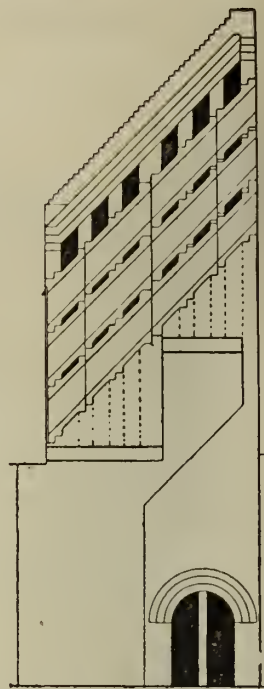
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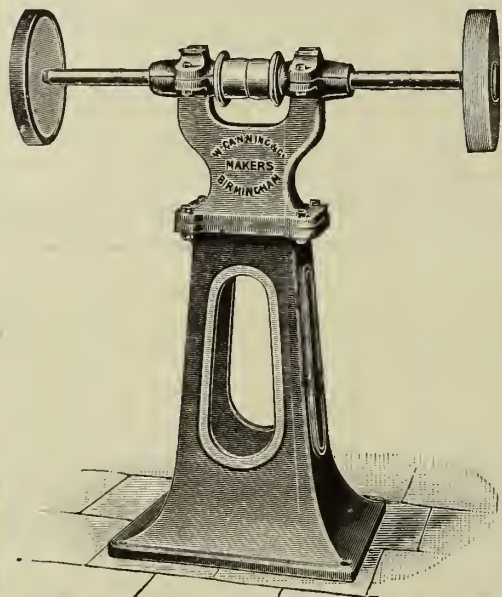
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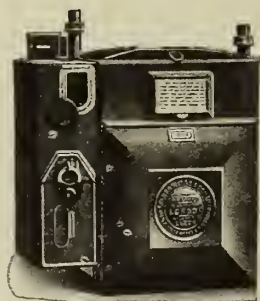
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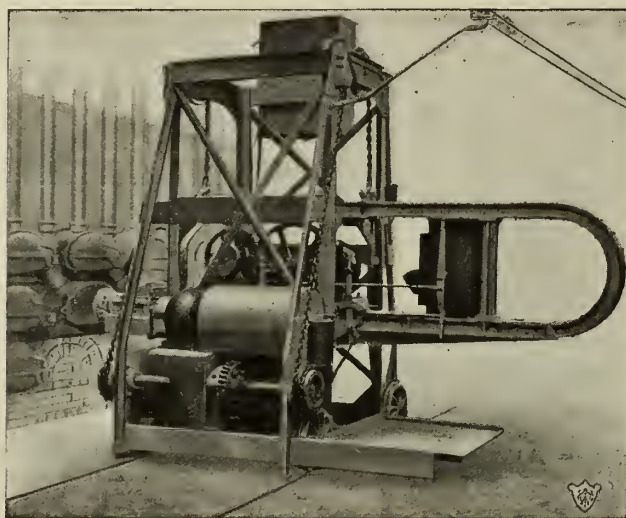
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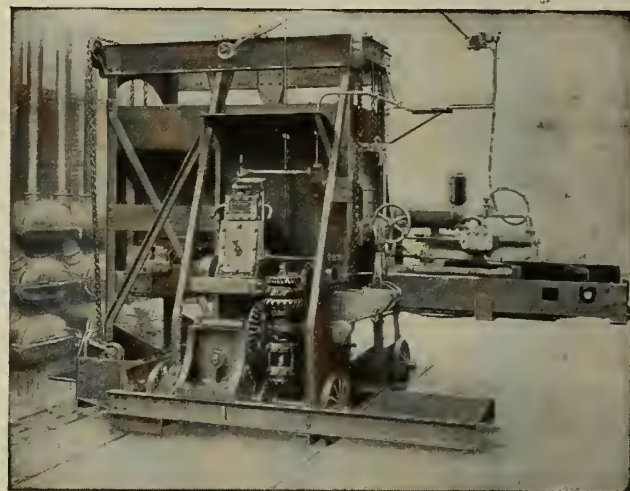
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For Horizontal, Vertical, or Inclined Retorts.

COAL BREAKING, ELEVATING, AND STORING PLANTS.

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LONDON, APRIL 13, 1909.

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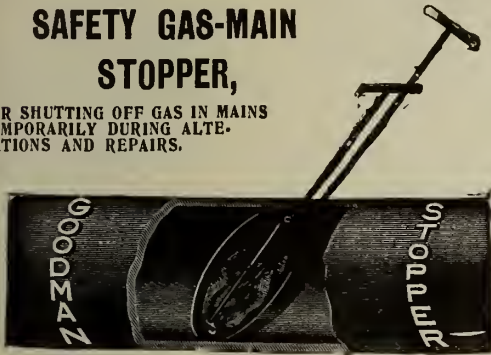
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SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS
TEMPORARILY DURING ALTERATIONS
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GAS-LEAK INDICATORS,

With all latest improvements.

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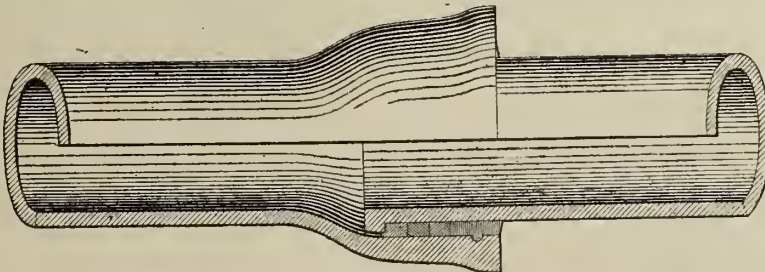
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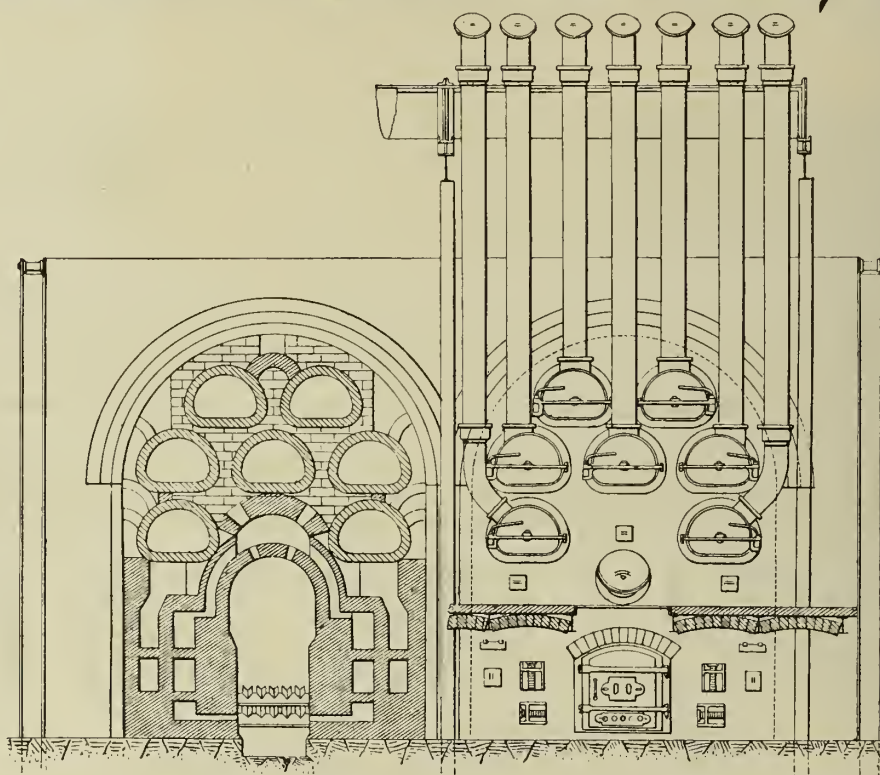
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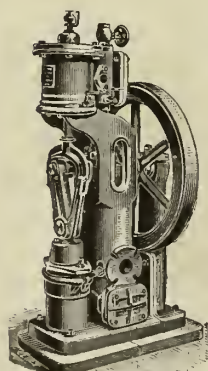


Fig. 708. "SINGLE RAM"
STEAM-PUMP.

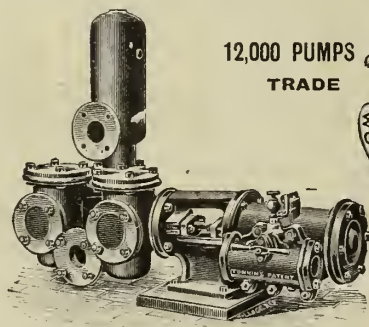


Fig. 598. "CORNISH" STEAM-PUMP FOR
BOILER FEEDING, &c.

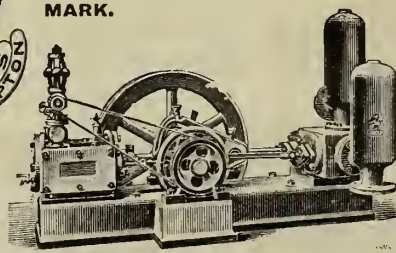


Fig. 685. "RELIABLE" STEAM PUMP FOR
TAR AND THICK FLUIDS.

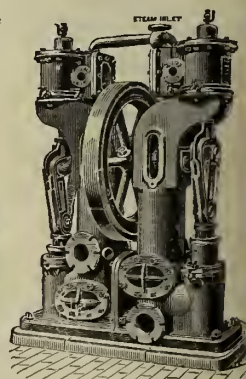


Fig. 712. "DOUBLE-RAM"
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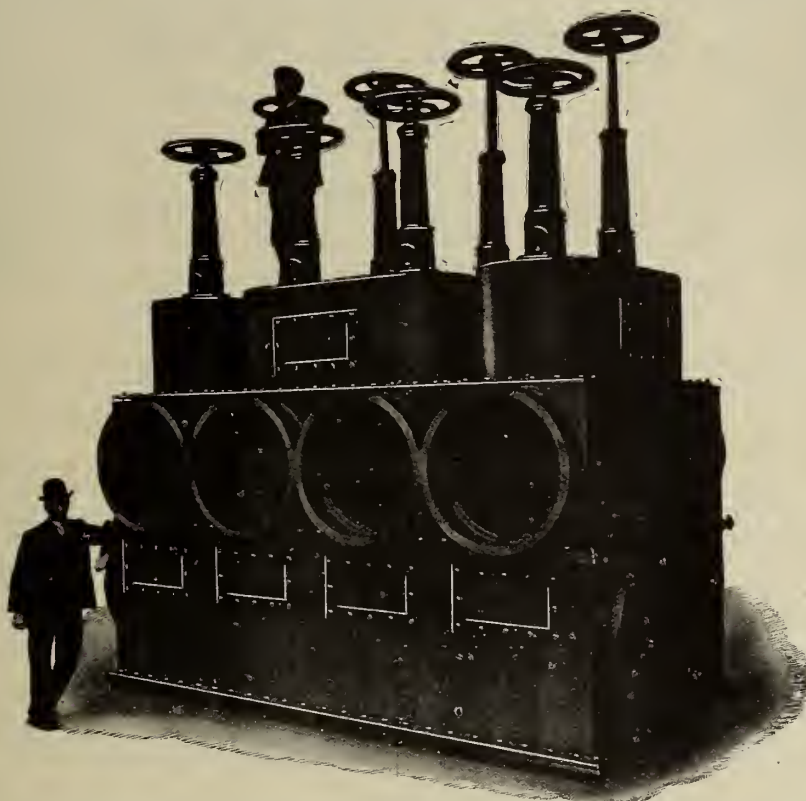
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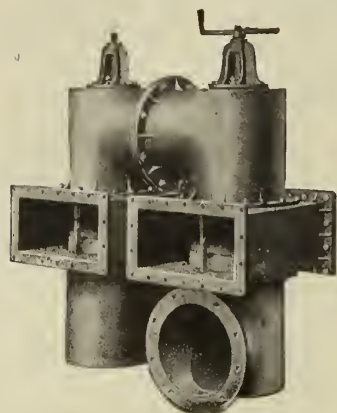
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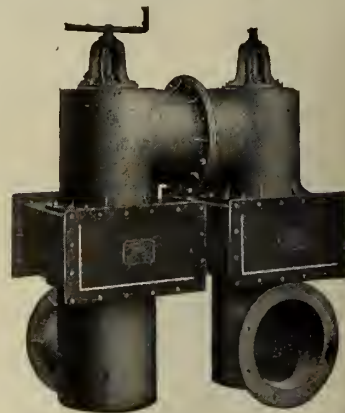
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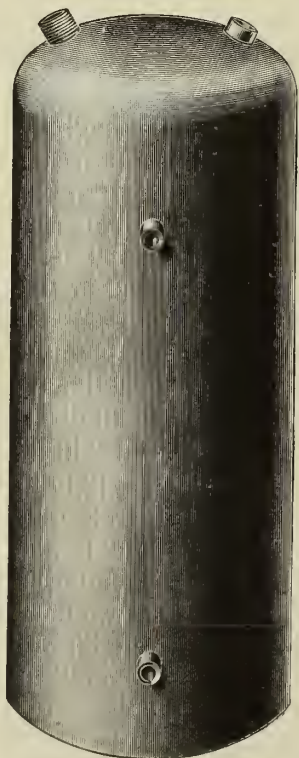
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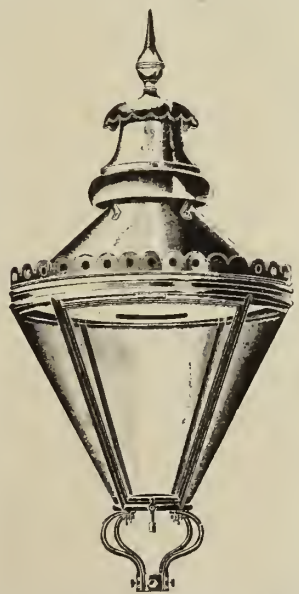
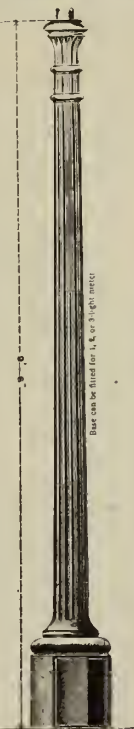
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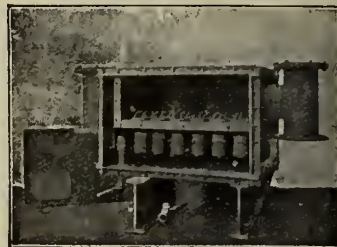
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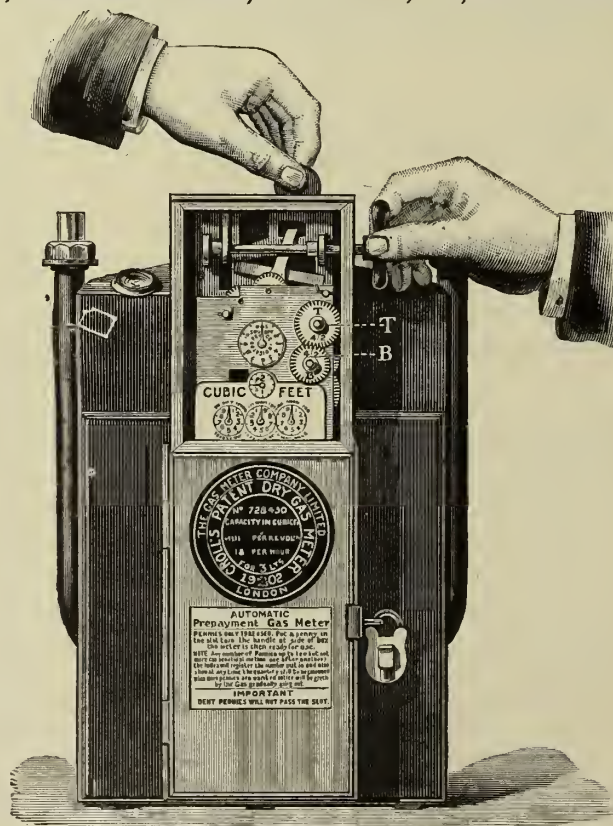
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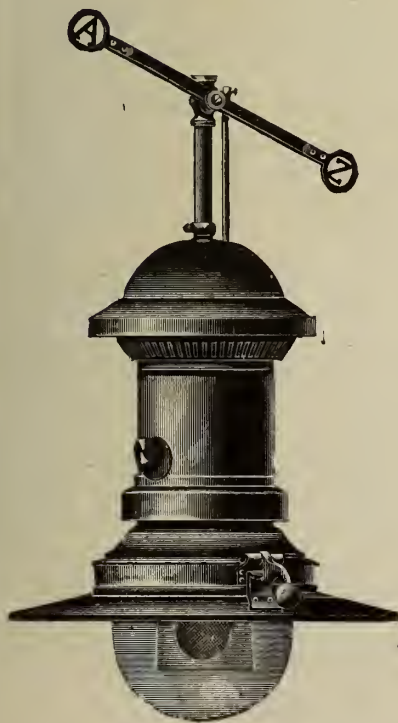
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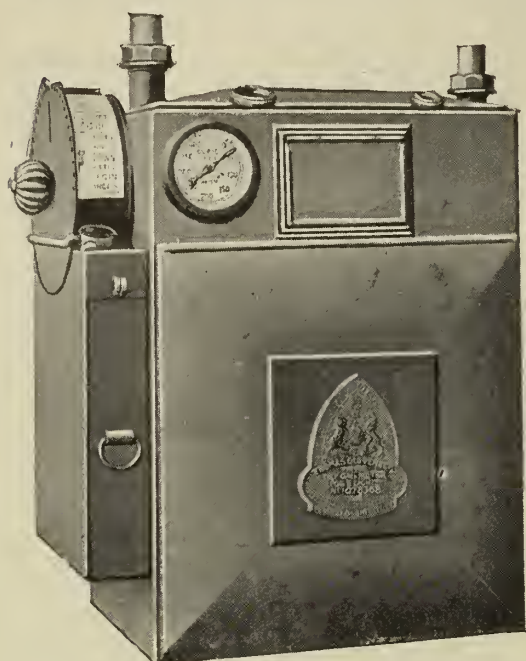
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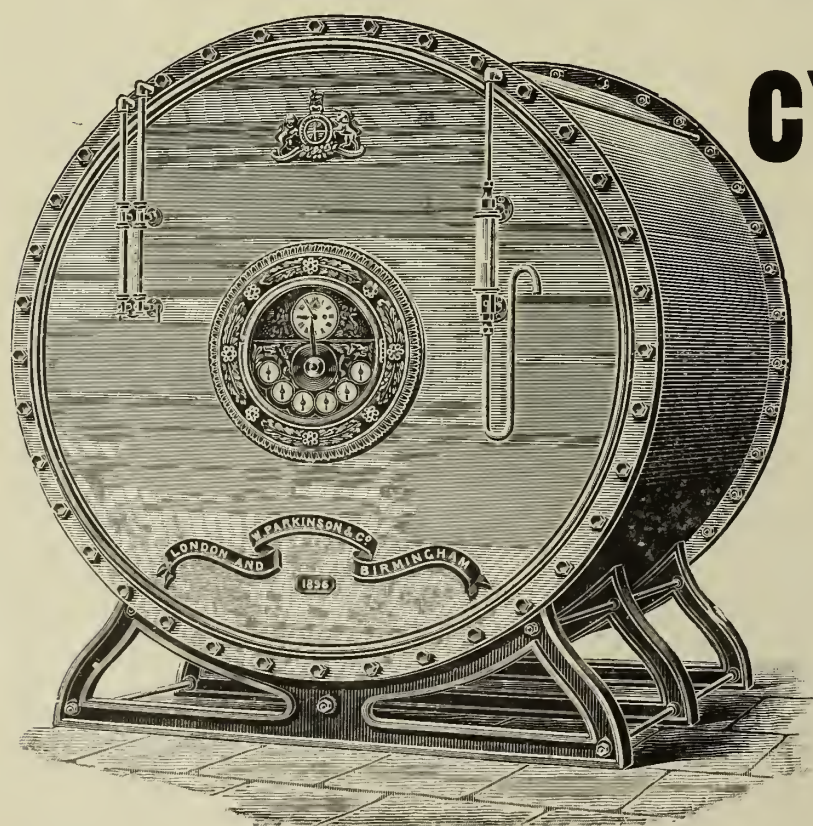
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EDITORIAL NOTES—GAS, &c.

Calorific Power Standard—A Dissentient.

THE first note in our columns of actual discontent with the calorific power standard that has been agreed between the Gaslight and Coke Company (though, for reasons stated last week, reluctantly on their part) and the London County Council, will be found in a communicated article. The writer is not opposed to a calorific power standard, "providing" (this is one of two or three points supporting views already expressed in the "JOURNAL") "that in the question of 'forfeitures it supersedes the illuminating power standard.'" No one likes the second penalty test—not even the Gaslight and Coke Company; but, all things considered, most people will agree they did a diplomatic and prudent thing in settling with the London County Council on the terms eventually arrived at, though not arrived at without much discussion. In the article under consideration, however, there are two predominating points. One is that the writer deprecates the action of the Company in accepting a standard of 125 calories net, on the ground that experience in calorific power testings of the Commercial Gas Company's gas, as made at the two statutory testing-places in their district, shows that the standard cannot be regularly and profitably maintained for a 14-candle mixed gas. The other point is the allegation that the Boys calorimeter, which is the prescribed instrument for calorific power testing in London, is not so reliable as could be wished.

We are glad our correspondent has raised these points, because it is in the initial stages of change in procedure such as this that the whole of the *pros* and *cons* of the subject should be carefully examined. But we do not suppose it would be possible to propose any standard of value that would please everybody concerned. The illuminating power standard, as well as the means of conducting the tests, have never from the first been wholly free from attack, and dissatisfaction has clung very tenaciously to them. But regarding the complaint of our correspondent as to the calorific power standard accepted by the Gaslight and Coke Company, it is difficult to see what would be the use of having a standard that has not some correspondence with the one already existing, or one that would impose no real obligation upon a company. Correspondence and obligation appear to be provided for in this instance, on comparison of the standard and its conditions with the official calorific power tests "for information only" applying to the Commercial Gas Company. In criticizing the standard, the writer of the article does not appear to us to have given sufficient thought to the conditions applying to it. The standard figure cannot be taken alone; it must be the standard *plus* conditions, as the history of the agreement with the London County Council makes perfectly clear. It will probably be well to emphasize this at this the inceptive stage of the calorific power standard.

The Parliamentary Committee of the Council tried hard to get the Company to accept an unconditional standard of 125 calories net; but having regard to practically the same points that our correspondent submits, the Company said, "No," and very positively. Their reply in effect was: "The official calorific power tests that have been conducted 'for your and our information show that we cannot, with a '14-candle illuminating power standard, work to 125 calories 'net; but they do show that we could, as a general rule, 'work to that standard, less 10 per cent., before forfeiture 'is incurred.'" The Council's own returns attested the reasonableness of the Company's submission. The 125 calories net less the 10 per cent. has to be regarded in much the same light as 14 candles less the $\frac{1}{2}$ candle margin before the Metropolitan Gas Companies are subjected to penalty. The 125 calories net is the standard to be aspired to; the 10 per cent. allowance is the recognition that there will inevitably be recessions below the standard line; and the

additional provision as to the (less than) 6 calories drop below the 112 $\frac{1}{2}$ calories (taking the average of two tests) on any one day, with the tests of the preceding and the following days brought into the scale to try to average the 112 $\frac{1}{2}$ calories, is a proper recognition of possible difficulty on occasion. Should the Company find these conditions onerous during the next three years, then there is the provision for an appeal to the Board of Trade. We cannot, from a study of present experiences, see any ground for any particular fear, though, of course, the views of ourselves, and all who agree that in the establishment of this precedent there is nothing, so far as can be seen (other than the unfairness of the dual penalty test), over which there need be any nervous attacks, are subject to modification on the experiences of the penalty testings. Remembering the extent and character of the operations of the Gaslight and Coke Company, the test means more to them than it would do to a supplier with a smaller area and manufacturing operations on a comparatively modest scale; and it would be an insult to the administration of the Company to suggest that they would not have sacrificed the proposals in their Bill rather than put their existing operations under fresh damaging bondage.

By this introduction of the first calorific power standard for town gas, the official returns of the calorific power of the Commercial Company's mixed 14-candle standard gas has been invested with an interest they would not otherwise have possessed. To an observant outsider, there is a curious point about them. It is that the results at the Wellclose Square testing-station are invariably below those at the Parnell Road station. Though that is so, only on five occasions in the first quarter (winter months) of this year have the averages for a week at the Wellclose Square testing-station fallen below 125 calories net, and the lowest of the five is 123 calories. The lowest minimum return for this year is 119.2 calories, and the lowest minimum in the whole of 1908 was 116.7 calories. There is not a single instance in the minima suggesting the danger-line of 112 $\frac{1}{2}$ calories; and the Company were not in any way working to a calorific standard, nor had they, in respect of this quality of their gas, any menacing penalties hanging over them. In fact, looking back to the beginning of 1907, there is not a single occasion on which a forfeiture would have been incurred, in ordinary working, by the application of the terms pendent to the Gaslight Company's calorific standard. The writer of the communicated article remarks on the difficulties there may be when, in foggy or in frosty weather, there has to be an increase above the normal of the use of carburetted water gas. It may be taken that during the week ending Jan. 30 last, these conditions obtained in the Commercial Company's district. There were in that week heavy consumptions due to dense fogs and cold. There was no minatory calorific power standard suspended over the Company; the only restriction to liberty was illuminating power. The net calorific power results at the two stations that week were: Maximum 126.6 and 127.2 calories; minimum 124.4 (at both); average 126 and 125.6. The illuminating power was: Maximum, 14.89 and 15.11 candles; minimum, 14.19 and 14.24; average, 14.39 and 14.68. On these figures for a foggy and cold week, there does not appear to be much to disturb the equanimity of any one, under the conditions of the new test.

The author of the communicated article also draws attention to the fact that on no occasion during the current year have there been less than two calorimeters out of a total of 22 marked in the returns as being "under repair;" and, on this testimony, he imputes unreliability to the Boys instrument. Is he altogether fair in his deductions from the printed returns for this year only? If we look at the returns for 1907 and 1908, it is surprising how infrequently these instruments (which are in daily use) were marked as being "under repair." The unbroken continuance of the records during those years, and the fairly uniform character of the weekly maximum, minimum, and average values

returned, are to our mind extremely creditable to the designer (Professor Boys). Calorimeters like other instruments in constant use cannot go on without some overhauling and repair; and it would seem that this year several of the instruments have been taken in hand. Nor is it quite proper to say, without qualifying the statement by explanation, that on no occasion during the current year have there been less than two calorimeters out of a total under repair. There is truth in the statement, owing to what appears to be the absurd length of time the instruments were away being repaired. Ten of the instruments were out of use from six to ten weeks during the quarter—time enough, we should say, to have remade them over and over again. There are some stations at which there has never been a break in the returns, nor any announcement as to the instruments being under repair, from the time to which we have carried our research—January, 1907. It may be taken that, with penalty testing for calorific power, the Gas Examiners and the Company will ensure that the instruments are in good working order. A penalty could not be enforced on the authority of an instrument shown to be defective.

We reiterate that, while dual penalty testing is the worst feature about this standard calorific power precedent, there is, in view of the terms attaching to the standard—basing judgment on the evidence available through the tests conducted for information only, but, we take it, with exactitude—no ground for the apprehension of the author of the article that has drawn these comments.

The Future of Tar.

IN another column to-day an article appears dealing with the largely-increased production of tar which may be expected in the near future, and the urgent need for greater energy in the development of fresh outlets for tar, or its chief component, pitch. The writer of the article does not presume to offer an adequate remedy for the present depressed prices; but, as a step in that direction, he suggests the briquetting, or to be more precise, the "eggetting" of coke breeze and pitch. There is nothing new in the idea; but fresh conditions affecting tar prices render the resuscitation of an old idea welcome, especially if it promises improving values. The author assumes that a 5 per cent. surplus of coke breeze would, if made up into compressed fuel, absorb the pitch produced by 66,000 tons of tar. On his own showing, however, there are now no less than 1,068,000 tons produced from gas-works and bye-product recovery ovens, with a prospect of an increase (say, during the next ten years) to 1,800,000 tons. Clearly, the satisfactory "eggetting" of gas-works breeze will only be—to use his own description—a "little help." With the extended sales of broken coke for domestic use (as to which more assiduous efforts are being made in all directions) will follow, as a necessary corollary, an increased output of breeze from the screens of coke-breaking plants. Apart from the mere idea of improving the commercial value of tar, therefore, a further means of satisfactorily disposing of coke breeze, such as our correspondent indicates, may be welcome on this ground alone. Tar prices are not entirely governed by the law of supply and demand. Those outside firms into whose hands its distillation has chiefly drifted, are responsible for a good deal of manipulation of the markets. It is a curious fact that a sharp rise in the port value of pitch has frequently been seen very quickly after the bulk of the contracts with gas undertakings have been settled. Those undertakings that sell on the basis of a monthly analysis of the products are in this respect more fortunate than those who sell at a fixed price, inasmuch as they at least share in any such improvement in values. The time is opportune for a thorough consideration of the question of tar in all its bearings as it affects gas undertakings.

Informal but Informative.

THOUGH in the main dealing with but a few of the practical details of gas management—technical and commercial—it was a very suggestive address with which Mr. David Vass, in the capacity of Chairman, opened the debate at the informal meeting of Scottish Gas Managers last Wednesday. The Chairman carried the idea of informality well through the prepared opening, and yet treated, with studied thought, the points that he compassed in it. The most controversial subject of all was that of corporation *v.* company ownership. It is an old topic, but it is rarely introduced at a mixed

meeting of company and municipal gas managers, as the usefulness of discussion is limited by the fact that the expressed views of officials, whatever their inner thoughts may be, must be largely moulded to the service within which their lot is cast. There are few gas managers to-day who, if they were called upon to do so, could not say something sensible and to the point on either side of this polemical subject. Mr. Vass is in municipal employ; and the sum and substance of his argument is that, while upon the transfer of a gas-works, during the period in which the purchase money is being repaid, consumers are worse off in respect of capital charges (including sinking fund) than they would be under company management, yet as progress in business is effected, the charges will diminish, and, after the repayment period for the purchase-money, the charges will go completely over in favour of the corporation. The period during which this repayment of the purchase money is proceeding is the one, according to Mr. Vass, during which the consumers have to pay more for their gas under municipal management than they would have to do under a company; but there is the compensatory thought that, at a long distance from the date of transfer, there will be a gain through the cessation of the charges for the purchase capital. It is all very well to construct as a pastime hypothetical cases of the kind found in the address, and to speak of what should happen theoretically, but which, and not infrequently, does not develop in actual experience.

In the first place, it may be admitted that, averaged from the aggregate, the amount of capital employed by companies per 1000 cubic feet of gas sold is higher than that of (also averaged from the aggregate) municipal authorities; and this is largely accounted for by the differences in the geographical and the topographical characteristics of the two classes of undertaking, and partly by the large conversions of capital to a uniform basis that have occurred in companies during comparatively recent years. There can be no fair comparison between the two without selecting undertakings of a fairly comparable character. There were in 1906-7, 491 company undertakings in the United Kingdom, a large number of which are of small size with proportionately large capitals, compared with 272 municipal concerns in, for most part, districts of excellent character for gas supply. But we do not think Mr. Vass has, in his calculations, done company undertakings full justice, in that he has put the dividend required on the capital invested in the works at a level 5 per cent. On capital raised in these times, it is nothing like this amount, if the dividend and interest are averaged over the whole of the money invested. In the last Board of Trade returns, with a share capital of £72,008,451 in the 491 company undertakings, there was also invested in the business £14,467,842 of loan capital, and £5,863,406 premium capital, on which latter no dividend is paid. Therefore, when it is considered that loan and premium capital diminish the average of 5 per cent., it is seen that the municipal consumer is placed in a worse position than that represented by the naked and unqualified figures in the address in respect of the amount of capital charges to be met during the period of purchase-loan repayment.

Mr. Vass, we understand, is treating the matter generally, and not confining himself to Scotland, so let us go farther. The municipal consumer is not actually in these days being released from capital repayment charges in anything like the beautiful geometrical proportion that the Chairman suggests in his computations. In the case of the municipal undertakings of the United Kingdom, the capital employed (less the sum repaid) was in 1886-7 12s. 2.8d. per 1000 cubic feet of gas sold; in 1896-7 it was 9s. 6d. per 1000 cubic feet; and in 1906-7 it was 9s. 1.7d. It is seen from these figures that, whereas between 1886-7 and 1896-7, the capital employed per 1000 cubic feet diminished by 2s. 8.8d., during the succeeding decade ending with 1906-7 there was only a reduction of 4.3d. per 1000 cubic feet, albeit the increase in sale by municipal undertakings was 19,593,744,000 cubic feet in the latter decade, as compared with 16,762,069,000 cubic feet in the decade preceding. This increase is in part due to the difference in the number of undertakings—69 being added in the second decade, compared with 46 in the first. Let Mr. Vass, too, run down the figures, in any general analysis of accounts, respecting the capital charges per 1000 cubic feet for municipal undertakings, and he will find that his figures are frequently exceeded by many substantial concerns. The point, however, that it is desired to make is that actually, in respect of release from capital charges, the municipal gas consumer is not, on the showing of the

Board of Trade returns, deriving the same ratio of benefit in reduction that he did formerly.

Of course, Mr. Vass in this matter does not tell the whole tale of the differences between the charges upon the municipal and the company gas consumer. If capital charges—interest and repayment—comprised the whole of the charges to which the municipal gas consumer is subject, there would not be so much to complain about by him during the years of the repayment of the purchase money. But upon those charges is the sum taken in aid of the rates in the majority of places where the gas-works are municipally owned; and this is a hardship upon which, on many occasions and in many places, there has been eloquent discourse. The point is only referred to here to show that the capital charges are not the beginning and the end of the difference in position between the company and the municipal consumer; and this diverting of money to purposes foreign to the business makes the burden all the greater for the municipal consumer, though already at a disadvantage in respect of the capital charges during the purchase-loan repayment period. It is a consideration too often lost sight of by gas consumers who, ignorant or ill-informed in regard to this particular subject, vote for municipal acquisition, that they are the people who are going to sink money without obtaining any return for it themselves—the advantage, if there is any, being projected far into the future for posterity. They are befooled, because they are ignorant on these matters. Mr. Vass himself very properly points out that the gas consumers on municipal acquisition have to pay much more than they would do under company administration, for the questionable privilege of owning the gas-works, and providing for future generations a better condition of things than they themselves enjoy. Perhaps there is consolation in believing that in this way one is acting the part of a benefactor to posterity; but in the case of our own individual investments we are common-sense enough to prefer that they should bring in an immediate tangible return.

The conditions, moreover, for the gas consumers during the purchase-loan repayment period are being made worse and worse. At one time—say in the seventies—periods for repayment of purchase loans were allowed of 55, 60, 70, 75 years, and there is a case of 85 years on record; ten years or so later, there had been a shrinkage of the period to between 30 and 50 years; and latterly periods of only 30 to 40 years have been the fashion, with a few below. The term is to be still further narrowed down. The authorities both in Parliament and at the Local Government Board have set their minds on this. Though in the Swinton and Mexborough case this session, 35 years have been allowed, the Chairman of Ways and Means (Mr. Emmott) has made the significant announcement that the authorities of the House are set against any increase, and, in fact, are rather bent on a decrease, in the number of years they are likely to allow for the purchase of gas-works, “because of the somewhat doubtful character of the undertaking in the future.” This reason for curtailing the period was briefly discussed in our “Notes from Westminster” last week; but further reference to Mr. Emmott’s remark is made here to show that, though the days of the purchase-loan repayment period have, generally speaking, never been palmy ones for municipal gas consumers, purchase under the conditions of to-day will put upon the consumers a heavier burden before deriving any direct advantage—if advantage there is to be eventually under a municipally controlled gas undertaking (particularly under the modern composition of local authorities), as compared with a well-ordered gas company working under the sliding-scale. But, after all is said, the question of municipal *v.* company ownership in respect of the effect upon the gas consumer is not to be settled by reference alone to the relative conditions of the capital account and charges, important though they be.

Passing from this topic, many others in the address claim thought; but of these, the premier place must be given to what the Chairman has to say on the subject of developing business, which development has, or should have, some relation to reduced capital charges. From the facts presented to view, it is abundantly clear that Mr. Vass is in the felicitous position of having a Committee of wise business men, who deal with the trading of the concern upon purely commercial principles. Their policy and that of Mr. Vass is to secure business, and not let it go over to competitors, if retention only calls for an amount of sacrifice that will not occasion injury to the ordinary consumers, but will benefit them by usefully employing plant in the day that

their own demands at the top point of night requirement have called into existence. One power consumer wavering between producer gas and town gas has been finally brought over to the latter by considerate treatment. Again the plan that Mr. Vass has adopted to increase his roll of consumers, and make a material addition to his ordinary consumption, will by its success induce others to go and do likewise. He had a list of houses drawn up in which gas was not being consumed; and upon these houses a systematic campaign was conducted. The roll gave a total of 1345 premises not on the books of the gas undertaking. Of these, premises unsuitable or lighted by electricity account for 131; leaving 1214. Of these, Mr. Vass stands a good chance of getting close upon 1000; as a matter of fact, in six months the department dealt with no less than 790, to which he attributes an increase in consumption in nine months of between 7 and 8 million cubic feet, despite bad trade. Mr. Vass is not above emulating the good examples of others. Not a few will do well to emulate him in this respect. With this point—and it is an excellent one—his address must be left. The quality of the several other features may be judged by those already noticed.

The Evolution of the Illuminating Engineer.

A LITTLE friendly criticism has been passed by “The Illuminating Engineer” on some of the points raised in the editorial article in the “JOURNAL” for March 16 on “Illuminants and Illuminating Engineering.” We are pleased to see that there is recognition of the spirit in which that article was written, which was not one of antagonism, but of doubt as to the ultimate influence that the Society of Illuminating Engineering will have in developing illuminating specialists unconstrained by interest and bias, and in dispelling ignorance from the public mind. We have to confess that, while still admitting there is scope for useful work being performed by such a Society in the study of the subject of illumination in all its branches, the criticism of our contemporary only hardens the doubt as to the attainment of the ideals that the progenitors of the Society have set before themselves. It should be made absolutely clear that our wish for the Society is an abundant success; and, if our current fears are in the result proved groundless, we shall be the first to acknowledge it, and to congratulate the Society and its originators upon having attained more than is now believed to be possible.

In a measure, there is in our contemporary endorsement of several of the points made in our previous article. The founders of the Society recognize that its ideals are not easy of realization—that the way to attainment is foreseen to be long and tedious, and that the time is remote before (if ever) the Society will be able to claim that directly, through its intervention and labours, an impression has been made on the public mind in the matter of displacing unscientific illumination by its opposite. But in saying this, it must not be taken to be an admission that the art of artificial illumination has been neglected by those technically concerned in it, or that it is altogether on wrong lines. Recent Cantor Lectures prove the contrary; and on all hands, in all spheres, there are many exemplary installations. Confessedly, however, there is much also that is an abomination in the sight of those who know what illumination ought to be. The reasons for this are several, and are known to all who will be reading these lines. But as to the realization of the aims of the Society. It is seen from the article in the “Illuminating Engineer,” that there are two stages of growth in connection with the achievement of ambition—one of which must succeed the other; and the second can only develop on the successful issue of the first. The first stage is the creation of non-partisan illuminating engineers; and until such experts are brought into existence, nothing more effective than is being done at present can be accomplished in bringing the public mind, on the question of illumination, into a proper state. “The development of such an expert,” remarks our contemporary, “must be very gradual.” There is a long wait foreshadowed in these words. And again—

It must be recognized that a man in the front of his profession, and identified with a particular illuminant, cannot be expected abruptly to modify his course of work, even though his point of view be enlarged and his sympathies widened. Self-interest and business connections alone render it difficult for him to assume immediately the impartial attitude of the ideal illuminating engineer. It is therefore to the younger generation who are growing up in this new atmosphere of toleration, that we must look mainly for the specialist of the future.

There is not very much encouragement here to look with

confidence to those at present engaged in the commercial interests of the artificial illuminants to assume a strict neutrality and broad benevolence that shall be beneficently operative over not one but the various illuminating agents. This is a point that has been made before in these columns; and as to the younger generation who are growing up in this "new atmosphere of toleration," and to whom we must look for the illuminating specialists of a distant day, we regret to say that, if we except perhaps two or three that are with Mr. Gaster in this matter, the representatives of this particular section of the younger generation have not crossed our path. But of those of this "younger generation" wherever they are to be found, and who it is supposed to-day will not be wedded to any particular illumination system, we say deliberately they will not be able to afford to be philanthropic or altruistic any more than their predecessors. They must live, and to live they must attach themselves to the interests of a particular industry. Illumination—something of daily necessity, something that must be bought, and something over which every man will suit his own fancy according to the means at his command—is a field in which few men will find they can secure a competence as free-lances; and they will, wherever operating, always have as strongly placed opponents the experts of one or other of the industries supplying illuminating agents. This is a practical subject that must be treated "in the light of commonsense and reason," and, though it may seem banal, from a practical standpoint.

We do not for a single moment doubt the sincerity of Mr. Gaster and his colleagues, nor the impartiality of the platform that they have provided, and will continue to provide, so long as they direct the operations on that platform. But at the present time, we can urge ourselves no farther than the belief that the Society only, but usefully, adds another to those already in existence at which papers on illumination topics can be presented—admittedly not from one platform on all topics referring to the rival illuminants. That the Society will have any influence in converting any lighting expert from what may be regarded as the error of his present ways in illumination is altogether a moot point. Or that it will achieve much in changing the ways of the public in this matter, we cannot entertain a great deal of hope. The idiosyncrasies of human nature, physical differences, the length of purse, the love for demonstration, the desire to attract notice and to outshine, individual predilection and fads and fancies, prejudices and interests will have greater weight than the illuminating engineer. Local authorities as present constituted hate more expert fees than in their view are absolutely necessary; their own paid officers and their own ideas suffice, they consider, for their needs. The private householder and the shopkeeper believe they know best their own requirements. There are many excellent institutions with excellent objects, all working for the elevation of the human virtues. But the public do not respond; and vice is as rampant as ever. The work of converting the public to scientific illumination is a big, and not a popularly attractive, one. Past history (we say this having exercised the caution of reconsidering our views) will probably be repeated. Nevertheless our best wishes go with the Society; but we hold to the right of our opinion, and to expressing it now.

An Illegal Deficit Charge.

THE Hastings Corporation have been caught napping by the Hastings and St. Leonards Gas Company. The Company have been good friends to the ratepayers hitherto in exposing the reckless manner in which the Corporation have pursued the business of electricity supply in the borough. They are like inveterate gamblers who engage in fresh hazard in the hope of retrieving the losses of previous risks; but, as a general rule, the result is worse than it was before. The financial position of the Hastings electricity undertaking is distinctly more deplorable now than formerly; and yet the Corporation have continued to blindly pursue the course that has made it so, and show resentment when anyone has dared to suggest the impropriety of their procedure. But the Gas Company, in their own interests as large ratepayers—probably the largest ratepayers in the borough—have dared to face the Corporation over this matter; and in so doing, at some expense, they have kept their fellow-ratepayers informed of the facts of the position, and succeeded in putting obstacles in the path of the Corporation in their headstrong career. Hitherto this has only

meant the adoption of fresh tactics on the part of the latter—such as, on the refusal of the Local Government Board to grant loans for extensions of street electric lighting, the payment out of the rates of the cost. The Company have, however, now compelled the Corporation to abandon a piece of illegality, which they were apparently unconsciously proposing to enter upon, inasmuch as they found it necessary to obtain Counsel's opinion before they could realize the strength of the Company's action.

To put the matter briefly: The Company gave notice of an appeal to Quarter Sessions against the general district rate made by the Council on March 5, on the ground that it was bad in law, as it included retrospective charges, incurred and due more than six months before the rate was made; this being contrary to section 210 of the Public Health Act, 1875. For example, there was included a sum of £1616, being a deficit on the electric light undertaking for the year ending March, 1908, and sums being deficits incurred prior to September, 1908. A further point was that the Council did not cause, contrary to section 218 of the above-named Act, an estimate to be prepared of the money required showing the several sums in respect of which the rate was to be made, and in particular of the money required for the electric light undertaking. Counsel advised the Corporation that the Company have ground of appeal in respect of the deficit on the electricity undertaking prior to March 31, 1908; this being a debt incurred more than six months before the making of the rate. The same objection applies to the items in respect of part cost of altering the front line of electric lamps (£711), and installing electric arc lamps in Queen's Road and Cambridge Road (£72). The Corporation have, following the advice of Counsel, amended the rate in these respects. Whether this has given satisfaction to the Gas Company has not transpired at the time of penning this reference to the matter; we therefore limit our remarks to the admissions of illegality. The point is one that may be useful to other gas companies, who are called upon not only to face rate-aided competition, but as ratepayers to give material support to the competing concern. Truly municipal electricity supply has put gas companies into a peculiar position. It has imposed upon them the rôle of guardians of the public interests against the elected representatives of the people, who, in this particular branch of municipal trading, look after the interests not of the whole body of ratepayers, but only of the small section of ratepayers who are users of electricity.

A Lesson to Trades Unionists.

That it is not even now possible for Trades Union officials to do just whatever they please in connection with disputes with employers, was exemplified lately in the King's Bench Division of the High Court of Justice, when the General Secretary of the National Society of Amalgamated Brassworkers and Metal Mechanics was defendant in an action for libel. Circulars had been issued, signed by him, in which a certain Company were accused of "tyranny" in dismissing employees who had used their influence to induce other workers to join the Union. It was proposed that details of this "tyranny" should be sent to members of the House of Commons. The Managing Director of the Company was called, and stated that they had never raised any objection to their employees being members of Trades Unions. The Company had, in fact, always been on excellent terms with their workers, until he had complaints of intimidation by certain men trying to induce the employees to join the Union in question. These complaints proved to be well founded; and he discharged three men who had been reported to him as the ringleaders in the system of intimidation. He then issued a circular to the employees telling them they were free to join Unions, but that he would not have intimidation. It then transpired for the first time that the men dismissed were respectively President, Treasurer, and Secretary of that branch of the Union; and on a refusal to re-instate them, the alleged libels were published—although it had been made clear to the defendant that there were still Trades Unionists among the employees. After this evidence, defendant's Counsel recommended a settlement; and it was agreed that he should pay the costs of the action, and undertake that the allegations should not be repeated—the Judge remarking that after what the Managing Director had said "the result of the action was beyond doubt." Which, in the light of the facts revealed, is the party having the best right to complain of tyranny? Certainly not the Trades

Union official who had expressed the intention of appealing to Members of Parliament. The action is only one more instance of an unjustifiable accusation being made by a labour leader against an employer in the course of a dispute; it is interesting as showing that baseless assertions of this character cannot always be made with impunity.

The Trade Boards Bill.

Any serious effort at the abolition—or perhaps it would be better to say the elimination as far as possible—of the evil of “sweating,” is deserving of the earnest consideration of all who are concerned with industrial occupations. For this reason, the Trade Boards Bill, whatever may be its shortcomings, will be certain to receive careful attention. It is a Bill for the establishment of Trade Boards to consider, as occasion requires, any matter referred to them by a Secretary of State, the Board of Trade, or any other Government Department, with reference to the industrial conditions of the particular trade concerned; and they will fix minimum rates of wages for time work for their trades, and also, if they think fit, settle general minimum rates for piecework. If a Trade Board report to the Board of Trade that it is impracticable in any case to fix a minimum time-rate, the Board of Trade may, so far as that case is concerned, relieve the Trade Board of their duty. Before finally fixing a minimum time-rate or piece-rate, the Trade Board will give public notice of their intention, and consider any objections lodged with them; and they will also give public notice when such rate has been finally determined upon. Provision is made for the variation of any decision, where deemed expedient. A Trade Board shall, on the application of any employer, fix a special minimum piece-rate to apply to persons engaged by him in cases to which a minimum time-rate but no general minimum piece-rate is applicable. After the lapse of not less than six months from the date when a Trade Board have given public notice of a rate finally fixed by them, the Trade Board may, if they think fit, apply to the Board of Trade for an order making the minimum rate obligatory in cases to which it is applicable on all persons employing labour and on all persons employed; and the Board of Trade, if they are satisfied that it is expedient, will make an order. Penalties are, of course, provided for not paying wages in accordance with a minimum rate which has then been made obligatory. That this method of settling an admittedly extremely difficult problem will not prove by any means universally acceptable is shown by the fact that the Employers’ Parliamentary Council have addressed a memorandum on the Bill to the President of the Board of Trade, in which they remark: “It may fairly be assumed that the average rate of profit in the so-called ‘sweated’ trades is not materially higher than the average rate of profit in trade generally. If it were so, capital would be attracted into the ‘sweated’ trades until the rate of profit reached the normal level. If, then, the profit earned by employers in these trades is not in excess of the profit earned by other employers, it would appear that there is no source from which an increase of wages can come except by the enhancement of the price of the product, which would lead to increased competition from manufacturers abroad, who are not subject to the restrictions contemplated, and hence to the ultimate extinction of the trades in this country.” The Council also think it is doubtful if any scheme for the fixing of wages would be in practice enforceable, and that a minimum wage would not increase the total amount paid in wages; and they specially object to a provision by which the Board of Trade are to be empowered to set up a Wages Board for any trade whatever. They also point out that many of the industries to which the Act might be applied have already established voluntary agencies to settle disputes.

Mr. R. Hesketh Jones, after occupying seats on the Continental Union and Union des Gaz Companies’ Boards for upwards of sixteen years, has resigned. Mr. A. F. Phillips, M.Inst.C.E., who is already a Director of the former Company, succeeds him on the Board of the Union des Gaz. At the Board meeting of the Continental Union Company last Tuesday, a resolution was passed stating that the Directors accepted Mr. Jones’s resignation with much regret; and that they desired to record on the minutes their deep sense of the value of the assistance that he had given his colleagues, and the expression of their thanks to him for the willingness with which he was at all times ready to render the Company special services.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 112.)

THE Stock Exchange has just concluded an unusually bright and buoyant week, all the more remarkable because it was a truncated portion of a week to be followed by a holiday of several days of inaction—a phase generally productive of increasing quietude and cautious closing. But the markets gave full play to their elasticity in the sunshine of cheap money and Eastern pacification. The opening day afforded full promise of what was to come. Buyers in many markets were in force; and all the leading departments were on the rise. On Tuesday, the volume of business was brisker, and the advance in prices proceeded merrily. In Gas issues, advances were remarkably numerous, and were to a large extent in the Suburban and Provincial group—ranging from $7\frac{1}{2}$ in Hastings downwards through Brentfords, Brightons, British, South Suburban, and West Ham. Wednesday was a strong and active day; the gilt-edged division being conspicuous, followed by the other leading markets. On Thursday, though the closing day and the very eve of the holidays, the flowing tide was still running very strong. Nothing seemed to come amiss; and so things went on up to the close. In the Money Market, the utmost ease ruled, and discount rates gave way materially. Business in the Gas Market, though somewhat slow at the start, grew brisker with the rest and compiled a very fair average in the end. The strength, as already indicated, was most marked; and rises in quotations make a long list. In Gaslight and Coke, transactions in the ordinary ranged from $102\frac{3}{8}$ to $103\frac{3}{8}$ —a rise of $\frac{1}{2}$. In the secured issues, the maximum marked $88\frac{1}{4}$, the preference $104\frac{3}{4}$ and $105\frac{1}{2}$, and the debenture from $85\frac{1}{4}$ to 86. South Metropolitan was quiet and strong, realizing from 122 to $123\frac{1}{2}$ (a rise of 1), and the debenture made $85\frac{1}{4}$. In Commercial, the $3\frac{1}{2}$ per cent. changed hands at $102\frac{1}{4}$ and $102\frac{1}{2}$, and the debenture at 82 and 83. Among the Suburban and Provincial group, British made from $42\frac{1}{4}$ to $42\frac{3}{4}$, West Ham from 118 to $119\frac{1}{2}$, and ditto debenture $107\frac{1}{2}$ and $108\frac{1}{2}$. In the Continental companies, Imperial was steady at from $182\frac{1}{2}$ to $183\frac{1}{2}$, and the debenture marked from 95 to $96\frac{1}{2}$ —a rise of 1. Union was done at 102, and Malta at from $41\frac{7}{8}$ to $41\frac{11}{8}$. Among the undertakings of the remoter world, Buenos Ayres recorded $13\frac{1}{8}$ and $13\frac{3}{16}$, Hong Kong $18\frac{1}{4}$ and $18\frac{3}{8}$, Primitiva $6\frac{3}{8}$, ditto preference $5\frac{7}{8}$, ditto debenture 97, River Plate $14\frac{1}{8}$ and $14\frac{3}{8}$, and San Paulo $13\frac{5}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

The Question of Charge—Tariff Complications—The Metallics and Increases to Lighting Consumers—Unequal Burdens—The Inadequate Margin of Charge—A Consumer’s Comparison.

THERE are some significant happenings in the electrical world associated with the question of the prices charged for electricity supply. Discussion proceeds over the policy of increasing the charge, in view of the reduced income derivable from those consumers who are using metallic filament lamps in place of carbon filament ones. In the case of some concerns that have not already taken the step, the position will before long resolve itself into one of Hobson’s choice; for even the best concerns—those with a large and diversified custom—have substantial evidence in their accounts of the effects of modern changes. Great as is Liverpool, broad as are the opportunities of the electricity undertaking for recuperation, the Consulting Electrical Engineer (Mr. A. Bromley Holmes) wisely looks the position full in the face, and admits that, however beneficial the metallic filament lamps may be in the future, in the present electricity suppliers must contemplate a reduced sale to consumers for lighting. Under these circumstances, Mr. Holmes cannot recommend any alteration in the charges to ordinary consumers; but he desires that the long-hour customers of the department shall have more consideration. He therefore proposes that the long-hour power consumer shall have the option of a special alternative rate of $\pounds 4$ per kilowatt on the rated capacity of the plant installed, together with a charge of $\frac{1}{2}$ d. per unit of electricity consumed; or the fixed charge can be $\pounds 8$ per kilowatt of the maximum rate of supply actually observed, with the additional charge per unit. For lighting consumers who guarantee to take not less than 100,000 units of electricity per annum, the charge is to be calculated on the basis of a payment of $\pounds 8$ on the maximum rate of supply actually observed, and $1\frac{1}{2}$ d per unit of electricity consumed. There is a growing liking among electrical engineers for this system of charging a fixed rate per kilowatt, and in addition a small one per unit of electricity. The knowledge of a definite income from a fairly considerable installation is attractive to them; but the consumer looks at the matter differently. Unless he has an assured use for a large quantity of energy, he does not, as a rule, approve the idea. The payment of a lump sum quarter after quarter for something intangible does not appeal to the ordinary run of trade and manufacturing consumers whose requirements are subordinate to the rises and the falls of business. There is, too, about the system an appearance of complication, which is uninviting. If a system of charge departs from the customary practices of trading to such an extent that the ordinary consumers cannot readily understand it, it must have the tendency of making the electrical business unpopular. There is some room for sympathy with the Liverpool

electricity consumer who wrote recently asking for some simple proposition of a sliding-scale of price, according to the quantity of electricity used. It is the ordinary custom of business; but then the electricity business is largely carried on by those who look upon it as an extraordinary one. The more they harbour and cultivate that idea, the worse for the industry.

Now, with more directness to the point as to the increase of charges owing to the effect of metallic filaments on the revenues of electricity undertakings. The question has been considered in many places; but in some those responsible for the electrical administration are, in this matter, sitting on the fence, and cannot determine which side to get down. They do not like the idea of increasing the charges, in view of the pressure that modern gas lighting brings to bear on all sides. They picture increases as putting practically a dead-stop to the lighting business. But what nonsense! Why such fears? Electricity at any price, the electrical man preaches, is better than gas lighting at a gift. Just think of that carbon monoxide, that sulphuretted hydrogen, those dreadful sulphur compounds, and that debilitating carbonic acid that we have heard so much about lately in abstract terms from the electricians, but from which they cowardly sneak when asked for substantiation. With such assumed disadvantages, gas ought not to be capable of raising despondency among electricians no matter the price of electricity. In passing, we notice that the ancient sayings of Dr. George Carpenter, in regard to which we made a few observations last week, appear under the heading of "The Triumph of Electricity," on the second page of the wrapper of "The Unit"—a little pamphlet that has been distributed by the Urban Electric Supply Company, Limited, with which Edmundson's Electricity Corporation, Limited, have something to do. Cannot householders have something fresher than this stale and out-of-date pabulum now? However, we are drifting from the main subject. Why, it may be repeated, fear an increase in charge to the consumers when, on the authority of electricians, unequalled excellence in so many ways is on the side of electricity? The position is not a congenial one for electrical managements; and those who have the final word to say in many cases fear to say it. Dublin affords example. The City Treasurer and the City Accountant and the Lighting Committee coincided in asserting that an increase in price was desirable, and recommended accordingly. The Corporation have quashed the recommendation. But shrinking revenues and growing deficits are accelerating decision in other cases. Hastings, for example. The Corporation there cannot from the revenues of the Electricity Department meet the whole of the charges for sinking fund, though no provision is being made for reserve and depreciation funds. The Committee have at length accepted the inevitable, and, with the consent of the Council, have decided to raise the price to all consumers to 6½d. per unit, and the charge for arc lighting by 1d. per unit. Consumers of more than £100 worth of energy are, on all payments in excess of the £100, to be allowed 15 per cent. discount. Something of the kind is what must result in many places from the events of the present.

In considering the question, however, of the increase in the lighting rates, the fact should not be lost sight of that the diminished revenue per unit that many undertakings are now experiencing is due to the growing proportion of the power and industrial consumption at low rates, and the unremunerative prices at which some undertakings are connecting up public lamps, radiators, and so forth—the accumulations of the low-priced business all tending to the one end. It is therefore unfair that the provision of compensation for the declining revenue should be put on the backs of the lighting consumers alone on account of their use of metallic filament lamps. The prospect, however viewed, is not a pleasant one. Mr. W. Harrison Cripps, the Chairman of the Metropolitan Electric Supply Company, was saying the other week that, though the electric supply industry has been in existence between twenty and thirty years, the total capital invested in it has never returned 5 per cent.; and with the singular prices charged for some portions of the business done, and the reducing revenue per lighting consumer using metallic filaments, the 5 per cent. on the whole of electrical investment is not likely to be in sight yet awhile. As a matter of fact, some of the lighting consumers do not nowadays, through the adoption of metallic filament lamps, use sufficient current to give a return on their share of the capital. Under present conditions, therefore, an increase of consumers to compensate for reduced consumption has not the same effect as it would have had under the old order of things. However, it is claimed that the entire burden of the reduced revenue should not be laid on the lighting consumer. That the consumer of low-priced current for power and other purposes is largely answerable for the present position, is shown by calculations, made by the "Financial Times," from last year's accounts of the London Electricity Supply Companies. The quantity of current consumed went up during the year by 10½ per cent.; and the number of new connections—lighting, power, &c.—were equivalent, expressed in eight-candle power lamps, to 7½ per cent. But—and this is the important point—the gross receipts from sales have scarcely advanced by 1½ per cent. Looking at the relation of the 10½ per cent. to the 1½ per cent., the influence of the power and other low-priced electricity is seen. The average receipts per unit during the year were 2½d. against 2½d. the previous year, or a loss of nearly ¼d. per unit. This ¼d. represents a considerable sum on the total business. The Kensington and Knightsbridge Company last year paid 8 per cent., against 10 per cent., and the Metropolitan Company 5½ per cent., against 6½ per cent.

Touching further the question of low power prices, the Newcastle-on-Tyne Company—of superlative character as is their area of supply—have proved by last year's results that power supply at close-cut rates is a speculative business in which shareholders must be prepared for some sharp variations in the income from their investment—that is to say, when a company engaging in power and bulk supply arrive at a profit-making stage, which few of them have yet done, and, in consequence, are anxious to get hold of a quantity of the fatter lighting business to give a little backing to the leaner power business. Though the Newcastle Company have the pick of territory in the whole country for power supply, they have proved in the past year that their business is done at rates so fine and sensitive that they will stand but little change towards uncharitable conditions before the return on the capital is uncomfortably curtailed. The year's working has caused the dividend to recede from 8 per cent. to 2½ per cent. The reasons ascribed for this deplorable state are bad trade (and everybody knows it has been bad on Tyneside), increased coal costs (8s. 6d., against 6s. 2d. in 1906), and labour disputes. The increase in connections in the year was from 92,764 to 111,484 horse power; but the profit was only £73,063, as against £85,252 in 1907. The number of consumers advanced by only 25—making 4839. This is the Company, we remember, that started the ineffective "Electrical Bulletins," and once burst out into a parody on a well-known nursery rhyme, under the title of "Ten Little Mantles." This happened some few years ago; but little good it has done them. Throughout the big sphere of their operations, the Company last year only sold an additional 174,000 units of electricity for lighting! The largely reduced dividend is not the only matter that is troubling the minds of those interested in the concern. There are doubts whether the Directors are doing the right thing by the future in the way they are dealing with depreciation. It is also disquieting to the shareholders to find the Board declining to publish their figures as to gross revenue and costs. The reason adduced for this secrecy is that the Company's figures were constantly being employed to their disadvantage in inducing people to put in private generating plants. What a confession of weakness! It does not say much for the Newcastle Company if they are frightened at their own figures having a bad influence in diverting custom from them to private installations. However, a hard blow has been given to centralized power supply by the Newcastle undertaking not being able to hold its head higher than this in times of stress; and it will do more than anything else has done in recent times in depressing public confidence, and in restraining the putting of capital into such undertakings. Newcastle has always been held up as an example of what may be in connection with other power concerns, though unfairly in view of the peculiarly excellent character of the district. One further point. If the power business is speculative for private enterprise, it must be even more so for municipal undertakings working on borrowed money, and treating the repayment of that money as representing depreciation.

In the "Pharmaceutical Journal" recently, a correspondent raised the inquiry as to the relative cost of gas and electricity; and in reply Mr. W. T. Gardner, of Bournemouth, published figures as to the cost per 1000 candle-hours—stating that the figures were "practical results from every-day use of both illuminants." These are the figures:

	Electricity.	Gas.
Price	6d. per unit	5s. per 1000 c.f.
Lamps and burners . .	Osrams	Bray, Kern, Mallot, or "Intense" Inverted
Efficiency	1·5 watts per candle	20 candles per c.f.
Cost per 1000 candle-hours for energy . .	1·5 × 1000 = 1500 watts 1·5 units at 6d. = 9d.	$\frac{1000}{20} = 50$ cubic feet 50 c.f. at 5s. per 1000 c.f. = 3d.
Cost per 1000 candle-hours for maintenance	One 30-c.p. Osram at 2s. 6d. = 1d.	2 mantles at 4½d. = 1d.
Total cost per 1000 candle-hours	= 10d.	= 3½

We should like the figures in the last column converted to the price of gas now existing in Bournemouth—viz., 2s. 9d. per 1000 cubic feet. If this were done, the total cost for gas per 1000 candle-hours would be brought down to a fraction under 2d.—thus showing a still greater advantage over electricity. We are glad to see pharmacists taking an interest in this practical business question of the relative cost of lighting their premises by the competing illuminants. There is an excellent margin on the figures quoted by Mr. Gardner in favour of the cost of gas lighting; and to this margin should be added the assurance of reliability that gas gives in the business premises of the pharmacist and the shops of the ordinary tradesman. There has been much disturbance of trade in the past, and consequently loss to business men, through the collapse of the supply of electricity putting their premises in darkness.

A cast-iron pipe-line 10,760 feet long and 6 inches in diameter was laid by nine men in 39 working hours in an emergency a short time since at St. Albans (Vt.). Only part of the line is under ground. No breaks or blown joints were found, though the line was tested to a pressure of 368 lbs. per square inch immediately after laying.

THE CALORIFIC POWER OF LONDON GAS.

THE acceptance by the Gaslight and Coke Company of a standard calorific power for the gas supplied by them in connection with the Bill now before Parliament, gives additional significance to the results of the "information" testings of calorific power which have been carried out in the gas-testing places of the Metropolis for the last three years. Some particulars of these results for the first six weeks of each year were given in the "JOURNAL" for March 9 (p. 687) on the eve of the settlement of terms between the London County Council and the Company for the acceptance by the latter of a standard calorific power, and of "penalty" testings for the same. Now that the terms agreed upon have become known through the proceedings in Committee of the House of Commons, as reported in last week's "JOURNAL," it will be appropriate to resume the summary of the results of the testings for previous years at the point at which it was broken off in the article in our issue of the 9th ult.

The figures there given refer to the six weeks ending Feb. 8, 1908; and the six weeks ending Feb. 6, 1909. The London County Council returns of gas testings for the next subsequent seven weeks of 1909 are now all to hand; and the following table gives the average for, and the maximum and minimum of, figures obtained during the seven weeks in question of the two years.*

TABLE I.—Testings of Calorific Power (Calories per Cubic Foot).

—	1908—Net.					
	Aver.	Max.	Min.			
Gaslight and Coke Company	131'8	140'1	121'1			
South Metropolitan Company	133'2	138'7	125'8			
Commercial Company	127'24	133'3	117'7			

—	1909—Gross.			1909—Net.		
	Aver.	Max.	Min.	Aver.	Max.	Min.
Gaslight and Coke Co.	145'8	154'7	138'5	130'0	138'8	123'6
South Metropolitan Co.	150'2	155'4	134'3	132'8	139'6	125'6
Commercial Co.	141'64	148'9	136'2	126'19	132'4	120'4

On comparing the figures in this table with those already given for the six weeks next before the periods in question, as given in the "JOURNAL" of the 9th ult., it will be seen that the average net calorific power in 1908 was in the second half of the quarter practically the same as in the first. In regard to the gas supplied by the South Metropolitan Company and by the Commercial Company, the same remark holds good also for the first and second halves of the quarter in the present year. The Gaslight and Coke Company, however, have during the last seven weeks supplied gas averaging nearly 1½ calories per cubic foot below that supplied in the first six weeks of the year. This slight falling off in calorific power is curiously enough accompanied by a rise from 16'63 to 16'81 candles in the average illuminating power of the gas as tested by the standard "Metropolitan" argand burner, and by a somewhat smaller rise in the illuminating power in the flat-flame burner. Incidentally it may be remarked also, that the gas supplied by the Commercial Company has shown an almost precisely similar rise in its illuminating power in the standard argand burner, as compared with the average for the first six weeks of the quarter, though in the case of this Company there is no perceptible change in the calorific power. The gas supplied by the South Metropolitan Company (the average gross calorific power of which is identical in the two halves of the quarter) curiously enough showed a fall from 16'40 to 16'34 candles in the average illuminating power in the standard argand burner, and from 10'93 to 10'64 candles in the flat-flame burner.

The one point which stands out prominently in a survey of these and similar figures for testings of illuminating power and calorific power is the erratic character of the results obtained with the flat-flame burner. After three years' experience of these testings for the purpose of "information," the question seems ripe for consideration whether any good purpose will be served by a continuance of them. The information they have afforded has tended only to demonstrate that the results of such testings are so erratic as to be inherently untrustworthy, and to be of no public utility.

It will now be useful to give a comparative statement [see Table II.] of the average results of the testings of illuminating power and calorific power for the first thirteen weeks, or first quarter, of 1907, 1908, and 1909.

The outstanding feature of the averages recorded in this table is the consistent uniformity of the quality of the gas supplied by the three Companies in the same quarters of the three years. But for the apparent depreciation of the flat-flame value of the gas supplied by the South Metropolitan Company in 1908 and 1909 as compared with 1907, when a different flat-flame testing-burner was in use, and the tendency of the Commercial Gas Company to reduce the illuminating power of its supply to one more nearly in consonance with its statutory standard of 14 candles, it might be said broadly that there has been no change in any respect in

TABLE II.—Average Results of Testings.

FIRST QUARTER, 1907.			
	Illuminating Power.		Net Calorific Power.
	Argand.	Flat-Flame.	
	Candles.	Candles.	Calories per Cubic Foot.
Gaslight and Coke Company	16'7	11'8	133'7
South Metropolitan Company	16'2	11'13	134'4
Commercial Company	15'25	9'35	127'35

FIRST QUARTER, 1908.			
	Illuminating Power.		Net Calorific Power.
	Argand.	Flat-Flame.	
Gas Light and Coke Company	16'77	11'99	132'1
South Metropolitan Company	16'24	10'81	133'0
Commercial Company	15'048	9'074	127'35

FIRST QUARTER, 1909.			
	Illuminating Power.		Net Calorific Power.
	Argand.	Flat-Flame.	
Gaslight and Coke Company	16'73	11'77	130'6
South Metropolitan Company	16'37	10'77	133'1
Commercial Company	14'816	9'018	126'07

the quality of the gas supplied. It has been pointed out, in a former article, that the present flat-flame testing burner appears to be less suited for developing the full lighting value of the gas than that which was prescribed for the testings in 1907; and it is now clear also that the flat-flame testings generally give somewhat erratic results. Consequently, practically no significance need be attached to the falling off in the flat-flame values. In regard to the relation between the standard argand illuminating power of the gas and the net calorific power, which, in view of the standard of calorific power which the Gaslight and Coke Company have considered it expedient to accept, is of special interest at the present time, it may be noted that with a mixed gas supply such as that afforded by the Commercial Gas Company, if the illuminating power of the gas were in fact 14 candles instead of nearly 15, the net calorific power would certainly be below the standard of 125 calories per cubic foot which the Gaslight and Coke Company have accepted. On the other hand, it may be inferred from the following statement of the minimum results of testings of illuminating power and calorific power in the first quarters of the three years, that there is not much likelihood of the calorific power falling below the value of 112½ calories per cubic foot, which is the limit above which the Gaslight and Coke Company must maintain the value of their gas to avoid the risk of incurring a penalty.

TABLE III.—Minimum Results of Testings.

FIRST QUARTER, 1907.		
—	Illuminating Power, Argand.	Net Calorific Power.
	Candles.	Calories per Cubic Foot.
Gaslight and Coke Company	15'6	119'3
South Metropolitan Company	14'3	122'8
Commercial Company	14'1	118'5

FIRST QUARTER, 1908.		
—	Illuminating Power, Argand.	Net Calorific Power.
	Candles.	Calories per Cubic Foot.
Gaslight and Coke Company	15'79	121'1
South Metropolitan Company	14'06	125'4
Commercial Company	13'90	117'7

FIRST QUARTER, 1909.		
—	Illuminating Power, Argand.	Net Calorific Power.
	Candles.	Calories per Cubic Foot.
Gaslight and Coke Company	15'61	122'7
South Metropolitan Company	14'50	122'3
Commercial Company	13'07	119'2

Having regard also to the fact that the gas may on a single testing fall slightly below 112½ calories net per cubic foot (provided the average of three days' testings is above that figure, without a penalty being incurred), it would seem that the Gaslight and Coke Company should be able, in all ordinary conditions of working, to escape that indignity. There is, however, the catch penalty limiting-value of 106½ calories per cubic foot, which must not be underpassed in any single day's testings if a forfeiture is to be avoided. As suggested in our editorial columns last week (p. 13), in conceivable circumstances of manufacture and supply this catch penalty testing may prove a real burden to the Company's Engineers, and can scarcely be held to afford any further real protection to consumers than the general provision that the average of any three consecutive days' testing must not fall below 112½ calories.

There are some other points in connection with the summaries of the results of testings made in the testing-places under the control of the London County Council to which we propose to revert in a subsequent article.

* The precise periods are seven weeks ending March 28, 1908, and seven weeks ending March 27, 1909.

NOTES FROM WESTMINSTER.

"I OBJECT," said Mr. William Thorne when the Gaslight and Coke Bill was introduced for third reading in the House of Commons on Wednesday night; and thereupon further consideration of the measure was formally postponed to the 20th inst., after the recess. Mr. Thorne only represents the views of the labour members of the West Ham Town Council, who oppose the amalgamation of the West Ham Company to the Gaslight and Coke Company solely on one ground, treating all other considerations as relatively of small moment. We anticipate, in view of what has taken place before the Select Committee, that the House will not agree with Mr. Thorne and those he represents.

Water Bills. On Monday and Tuesday of last week, there was almost desolation in the Committee rooms, and absolutely so on Wednesday. The water section of the Oldham Bill has been drawn out to a length that has become somewhat wearisome; and it was still on when Section A of the Local Legislation Committee thankfully adjourned their deliberations to April 20. The Llanelly Bill is the only water measure (in addition to those noticed last week) upon which there was pronouncement. As mentioned in the "Notes" a week ago, this Bill—the promotion of the District Council—has been considered by Mr. Rose's Committee. There was discussion on Monday of the objections of the Crawshay Bailey Trustees and the Burry Port Council. The Trustees were averse to the compulsory taking of a strip of land from their property for the purpose of preventing pollution from a farm; their objection being on account of the mineral value of the land. The sensible alternative was suggested by them that the source of pollution should be removed without compulsory acquisition. As to the Burry Port District Council, they did not want the Llanelly Council supplying in their area. Last year Burry Port joined hands with the Llanelly Rural District Council in promoting a Bill for obtaining a supply of water; but the scheme was rejected. The Burry Port Council have lately had a pumping scheme in prospect of their own, at a cost of £14,000. Of course, they could not see any economic advantage in allowing another authority to supply them. These small authorities very rarely can, owing to jealousy of their own dominant authority. But up to now, Burry Port has no drainage, gas, or water system; so that the local governors have not been active. The upshot of the discussion before the Committee was that the Llanelly Council have got their Bill for extension of limits, the construction of a large scheme of filtration plant, and other purposes. But there is to be the insertion of a purchase clause similar to the model one in favour of the Llanelly Rural District Council, but applying only to distribution plant in their area, on the condition that seven years is the limit for the introduction of a Bill for the purpose. The clause is to be approved by the Speaker's Counsel (Mr. Ernest Moon, K.C.) after Easter; and, by the way, Mr. Rose expressed the views of the Committee that the model clause is by no means a model clause. The curious manner of statement is effective. Another condition is that the promoters are to introduce a clause satisfactory to the Committee dealing with the water pumped from mines that may be sunk in the gathering area, to give protection to the dormant interests of the mineral owners.

THE FUTURE OF TAR AND THE MANUFACTURE OF COMPRESSED FUEL.

[COMMUNICATED.]

To those interested in gas undertakings who have given any consideration to the subject, the present position and the apparent prospects of the tar market must induce a feeling of grave concern. True, there is a brightening just now; but there can hardly be a man optimistic enough to believe it is more than momentary, or that it will gradually lead to such a resuscitation of prices as was experienced five years back. The present position is not due to causes that can easily be removed. Over-production is at the root of the slump in prices; and any remedy must be in the way of providing a ready means of absorbing the excess at not less than the same ratio of increase. How far values have dropped can be readily gauged from the following table of prices ruling at the beginning of each of the last fifteen years, according to the quotations given in the market reports of the "JOURNAL."

Year.	Range of Prices.		Mean.
1895	18s. od. to 22s. od.	..	£1 os. od.
1896	18 0 " 24 0	..	1 1 0
1897	17 6 " 23 6	..	1 0 6
1898	13 0 " 17 6	..	0 15 3
1899	14 0 " 19 6	..	0 16 9
1900	16 6 " 25 6	..	1 1 0
1901	14 0 " 18 0	..	0 16 0
1902	15 0 " 18 0	..	0 16 6
1903	21 6 " 26 6	..	1 4 0
1904	22 6 " 27 0	..	1 4 9
1905	18 0 " 22 0	..	1 0 0
1906	18 0 " 22 0	..	1 0 0
1907	14 0 " 18 0	..	0 16 0
1908	13 6 " 17 6	..	0 15 6
1909	10 9 " 14 9	..	0 12 9

In all this period, there has not hitherto been such a long-continued slump as we have experienced the last four years.

The mean price has gone down no less than 7s. 3d. per ton, or at the rate of more than 36 per cent. The greatest previous slump was much more rapid; for within twelve months from January, 1897, to January, 1898, the mean price dropped 5s. 3d. per ton, or about 25 per cent. Even this, however, left the price half-a-crown higher than it was at the commencement of the present year. Be it noted that the depreciation in value of recent years synchronizes with the development of bye-product recovery works in connection with colliery coking plants.

It has been fashionable of late to anticipate a substantial increase in prices through the expanding demand for tar products in the construction of roads or the protection of road surfaces. But the optimism that developed out of the cry for a mitigation of the dust nuisance consequent on motor traffic, must surely by this time have faded away. It is a trite saying that "every little helps;" and in this connection the use of tar for roads must be viewed as a "little." Local authorities are seldom pioneers. This being so, the development of the use of tar on the highways is unlikely to proceed rapidly, and certainly not at such a rate as to absorb the increased quantity of tar produced.

Let us examine the matter in the light of tar production. The last Board of Trade returns (for the year 1906 for authorized companies and the year 1906-7 for authorized local authority undertakings) showed that 14,846,257 tons of coal were used for gas making in the United Kingdom. Unauthorized undertakings would doubtless bring this figure up to 16 million tons. Though the quantity of carburetted water gas made during the above-named period was about 11 per cent. of the total, the tar produced in its manufacture may be ignored, as the quantity is comparatively trifling, and it is used to a considerable extent as fuel for steam raising. Taking the production of tar on the basis of one ton for every 18 tons of coal, we have an annual production of about 888,000 tons. The trend of carbonizing practice is to gradually increase the yield of gas, and lessen that of tar per ton of coal; so that though the quantity of coal carbonized may increase, it is more than likely that for a number of years the production of tar will not materially exceed this figure. If there were no outside influences, therefore, the prospect of a continuously hardening market would be roseate.

The "fly in the ointment" is the bye-product coking-oven. In his paper read in 1907 before the Institution of Gas Engineers,* Mr. Ernest Bury gave 3,317,000 as the minimum estimated quantity of coal carbonized in these ovens in the year 1905; so that it is safe to say that the annual quantity is now not less than 4 million tons, or 25 per cent. of the quantity carbonized in all the gas-works in the kingdom. As bye-product ovens yield tar at the rate of 4.5 per cent. of the coal carbonized, the tar placed on the market from this source is 180,000 tons. But there is a more gloomy fact. Mr. Bury calculated that 16 million tons of coal were carbonized in beehive and non-recovery ovens of other types; and he gave good reasons for believing that these afforded an enormous field for the extension of bye-product recovery plants, apart altogether from the ordinary development of the process of coking. As a matter of fact, though these figures were presented less than two years ago, there has already been a substantial supplanting of non-recovery ovens by those of the recovery type; and this will probably go on till the wasteful ovens entirely disappear. There is, therefore, in contemplation from this source a further production of 720,000 tons of tar, which, however, will be a gradual process extending over a number of years. The effect, too, which will be produced by any increase in coking at the collieries will obviously be to further increase the supplies of tar. The time when more tar will be produced at bye-product works than at gas-works may, indeed, be not very far distant.

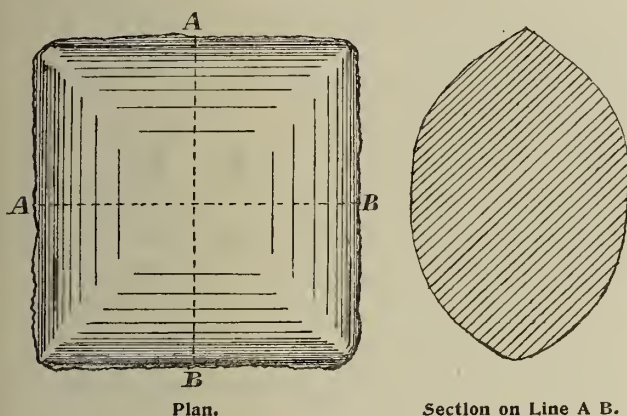
Having regard to the foregoing facts, the possibility of an appreciable advance in prices would appear to depend upon how far new outlets for tar products can be opened out. Of these pitch is the chief determining factor. It is a singular fact that, though pitch is exported in large quantities for the purpose of briquette manufacture on the Continent, very little has yet been done in this direction in the United Kingdom. The cheapness of other fuels is, no doubt, chiefly responsible for this; but the present price of pitch considerably alters the financial aspect of the process. At the present time there are in South Wales about half-a-dozen firms who manufacture briquettes, and the total daily capacity of the plants at work will be approximately 2500 tons. Small coal, with a certain proportion of anthracite "duff," is mixed with pitch in the proportion of 9 to 1. The briquettes are nearly all sold for marine fuel in this and other countries—a considerable percentage being exported to Italy. Other large installations are about to be put down in the same district, which indicates that there is a growing demand for such fuel for the purposes named. It is doubtful whether there are more than half-a-dozen other installations in all the rest of the kingdom; and where they exist, export trade largely commands the produce. Is it not possible to cultivate a demand for compressed fuel in this country?

In his book on "The Design, Construction, and Equipment of the Granton Gas-Works," Mr. Herring describes briefly the coke-dust briquette plant which has been installed there. The plant is capable of turning out briquettes at the rate of 40 tons in a nine-hour day. Taking the cost of breeze at 2s. 6d. per ton in each case, the cost of manufacture worked out at 9s. 0½d. per ton with pitch at 52s. 6d. per ton, and at 6s. 8½d. with pitch at 31s. 6d.

* See "JOURNAL," Vol. XCVIII., p. 982.

The briquettes consisted of a mixture of nine parts by weight of breeze to one part of pitch. Taking the current price of pitch at 21s. 6d., the cost would now work out at 5s. 8½d. per ton. Though only a few thousand tons of briquettes were made altogether, some of these were shipped as far as Egypt. We are told that, from a practical point of view, the plant was quite a success, but that one disadvantage was the high percentage of ash in the residue; Scotch coal containing much more ash than average English coal. No figures as to the cost of the plant are given; but the price of production based upon current values of pitch is so phenomenally low that, so far as English works are concerned, it seems to be a matter well worth going into.

One great objection to briquettes, from the aspect of domestic use, is that they require breaking. Machines are now designed, however, to produce a compressed fuel of smaller dimensions. These are termed "eggettes," and the accompanying diagram shows a plan and section of one lump of such fuel, the weight of which is slightly less than 4 oz.



It is claimed by one of the largest makers of plant for manufacturing compressed fuel that the fuel fetches the same price as is obtainable for "best" coal, and that consumers seem to prefer it on account of it being cleaner, more durable, producing less smoke, and capability of being stacked out of doors without suffering injury from the weather. We are also told that colliery owners realize how profitably their otherwise unsaleable small coal can be utilized and disposed of. If this is so, is it not possible for the process to be commercially successful when applied to the incorporation of coke breeze and pitch in the form of "eggettes?" The satisfactory application of such a process would secure many advantages. It would raise the price of pitch, the chief residual of tar; it would improve the receipts from coke, for, on the Edinburgh basis of 2s. 6d. per ton for breeze, it would secure a better return than is at present obtainable for coke breeze in many large works; and it would give the public the choice of another almost entirely smokeless fuel. One of the most crucial points seems to be the percentage of ash which the coke breeze contains, as, if this is large, a "dirty" fire will be produced. This objection, however, applies with little greater force to compressed fuel produced from coke breeze than to ordinary gas coke. If the objection is fatal in the one case, why not in the other?

The essential parts of a briquette plant are: A pitch cracker for breaking up the pitch; a mixer or measurer for mixing the coal or coke breeze and pitch in the proper proportions; a disintegrator for pulverizing the mixture; a superheater for superheating steam; a heater for producing the proper amalgamation of the mixture; a briquette or compressing machine; and the necessary elevators, conveyors, shafting, steam-raising and power plant. Machines can be obtained that exert a pressure of 2 tons per square inch. Unfortunately, the size of the plants obtainable is such as to limit their prospect of financial success to medium and large-sized gas-works. Four sizes are offered in the catalogue of one maker; the productive capacity per day of ten hours being 25, 50, 100, and 200 tons respectively. The smallest, therefore, is capable of turning out no less than 7500 tons of compressed fuel per year of 300 working days. There is available a smaller plant, of 10 tons per ten-hour day capacity; but the compression is not so great. Even this, however, is equal to an output of 3000 tons per annum; and assuming a works produced 10 per cent. of coke breeze, it would take a gas-works carbonizing 54,000 tons of coal per annum to keep it fully employed. At nearly all gas-works coke breeze is used for raising steam; and therefore even the 10-ton plant would probably meet the full requirements of works carbonizing not less than 80,000 tons of coal per annum.

In his recent paper before the Manchester District Institution, on "The Make and Sale of Coke," Mr. Watson, of Doncaster, showed that, after making due allowances for the quantity absorbed by the manufacture of carburetted water gas, the gas industry of the United Kingdom has approximately 7 million tons of coke to dispose of every year. Assuming that the handling of this quantity of coke resulted in a surplus of breeze, after providing for steam-raising purposes, of 5 per cent., the quantity would be 350,000 tons. To manufacture this into "eggettes" would require close upon 40,000 tons of pitch, or what is yielded by 66,000 tons of tar. Clearly, then, if the whole of the surplus breeze in gas-works were made up into compressed fuel, it would

not of itself permanently relieve the situation. The introduction and proved success of such a process, however, would indirectly accomplish a good deal. It would demonstrate that the commercial success of such a venture by gas undertakings could be emulated with confidence by the owners of collieries with coking plants, where similarly a large percentage of breeze is made. In short, the manufacture of "eggettes," both by gas undertakings and collieries, would absorb such a large quantity of pitch as to materially improve the prospects of tar for all time.

It may be contended that the general adoption of the manufacture of compressed fuel would, by absorbing such a large quantity of pitch, so improve the market price of the latter as to make it no longer remunerative to work the plants. Once the market for such fuel had been created, however, the price would be fixed according to any such altered conditions. The price of pitch being up, the price of "eggettes" would go up also. For a time, possibly, any such advance would produce a decreasing demand, which would lessen the "draught" on pitch, and so each would continue to react upon the other. This assumes that all other factors would remain the same. In any event, such a contingency may, in the present despondent condition of affairs, be viewed with equanimity. An advance of £1 in the market price of pitch, too, would only add 2s. per ton to the raw material costs of the "eggettes," which is less than the fluctuations experienced every year in the price of house coal.

Compared with the size of the works, the cost of an installation for producing compressed fuel cannot be regarded as great. Inclusive of engine and boiler, the following have been given to the writer as the approximate costs: For a daily capacity of 25 tons, £1100; 50 tons, £1750; 100 tons, £2425; 200 tons, £4500. It has already been observed that the plants at present available are obviously too large for small works. If the largest works, however, succeeded in making such a manufacturing departure a commercial success, ingenuity in the way of producing practicable smaller plants would probably be quickly forthcoming. The cost of briquetting as given to the writer (when 100 tons are made per day) is about 8d. per ton for labour, to which have to be added the establishment charges and the cost of the raw materials.

This matter seems one that may well receive attention from engineers in charge of the largest works. For anything the writer knows, it may in many cases have received such attention already. But beyond the Granton experience there does not appear to be any published information on the subject. If the process on a large scale has been found impracticable, it would save a good deal of optimistic speculation if the actual results were forthcoming. The utilization of tar as a fuel under gas-retorts has frequently been advocated as a means of avoiding a glut of supplies. With the evolution of the bye-product recovery plant, however, a new factor has become established; while the economy of modern regenerative settings does not lend encouragement to the substitution of tar for coke as the fuel for carbonizing.

The subject of tar disposal is one which, in all its aspects, may well merit general attention. It is true that many undertakings dispose of their tar to private firms for distillation; but this does not lessen the financial interest which the gas industry has in the prices obtainable for the various residuals produced in connection with it, and in the creation of new outlets for them.

Corrosion of Steel Reinforcement in Concrete.

At the Meeting of the Society of Engineers on Monday last week, Mr. Ernest R. Matthews, Assoc.M.Inst.C.E., the Borough Engineer of Bridlington, read a paper on the above subject, in which he explained in detail various tests he had carried out in connection with the rusting of steel in concrete. The conclusions arrived at may be briefly stated as follows: Rusty steel embedded in concrete will in a very short time become bright, regardless of whether the concrete is in water or air. (This point, in the author's opinion, was conclusively proved by his experiments.) That the application of cement grout to steel is an effectual safeguard against corrosion, but that the greatest care should be taken in the grouting process to see that every portion of the steel is well coated, and that before the steel is embedded in the concrete the cement grout is allowed to dry upon the steel. That if the aggregate used for the concrete is not porous and the concrete is well mixed, the reinforcement being well embedded, no cement coating is needed. This also was proved by experiment. That no porous materials, such as coke breeze or slag, should be used in connection with reinforced concrete work if such concrete is intended to be under water or exposed to the air. That linseed oil or turps, or probably any other coating except cement or lime, applied to steel before its insertion in concrete, facilitates rather than prevents the rusting of the metal. That it is of great importance to ensure that the reinforcing steel is well embedded in the concrete, so that every portion of it is covered with cement. That the best results were obtained when the aggregate consisted chiefly of broken stone or brickbats; though gravel would no doubt answer equally well.

Mr. Samuel Lee Rymer, J.P., of Croydon, the Deputy-Chairman of the Worthing Gas Company and a Director of the Bournemouth Gas and Water Company, left £25,976.

THE CONDITIONS FAVOURABLE TO THE PRODUCTION OF METHANE.

By THOMAS HOLGATE, M.Inst.C.E., F.C.S.

(Concluded from p. 28.)

FROM what has already been said, it will appear that our inquiry is directed towards answering the following problem: How is it that, despite the fact that hydrocarbons—the most valuable constituents of coal gas—are decomposed by the temperatures prevailing in horizontal, inclined, or vertical retorts, yet the best results calorifically—and often illuminating—per ton of coal are coincident with the higher temperatures worked.

If we may judge by a comparison of the three tests made at Nottingham upon the same coal at red heat up to bright orange heat, the total gain in calorific value of 1,388,700 B.Th.U. was nearly all provided by increased quantities of carbon monoxide and hydrogen. The gain in the former was 132 per cent.; in the latter, 83 per cent.; while the C_nH_m were stationary, and the methane almost so—the gain being only 4.6. Of course, some of the carbon monoxide and hydrogen may have come from the water-gas reaction; but this would have given an increase of equal volumes. The actual gains were more nearly 3 of hydrogen to 1 of carbon monoxide, agreeing with the equation given on p. 28. The ratio of H:CO in the Nottingham tests is quite different to that for Dessau, and to that for Nine Elms—being about 3.7 for the first-named, and 10.1 and 6.1 respectively for the latter.

These striking contrasts cannot be without significance, and

TABLE VI.

Origin of Data.	Per Cent. of Total Combustibles.				Ratio of Hydrogen to Carbon Monoxide by Volume.	Calorific Value (Gross) per Ton of Coal Carbonized in Thousands of B.Th.U.				
	CO.	H ₂	CH ₄	C _n H _m .		Due to CO.	Due to H ₂ .	Due to CH ₄ .	Due to C _n H _m .	Total.
Nottingham, a . .	8.98	39.24	44.00	7.78	4.3	246.0	1080.9	3771.1	1248.0	6346.2
" b . .	12.94	45.30	35.72	6.04	3.5	414.4	1459.4	3578.2	1209.5	6661.5
" d . .	14.26	49.41	31.59	4.64	3.4	573.2	1983.2	3943.8	1234.6	7734.9
d-a	+ 5.28	+ 10.17	- 12.41	- 3.14	—	+ 327.2	+ 902.3	+ 172.7	- 13.4	+ 1388.7
Dessau, vertical . .	5.87	59.85	31.25	3.03	10.1	216.8	2224.0	3612.3	746.2*	6799.3
Nine Elms " . .	8.13	50.28	38.44	3.15	6.1	314.8	1959.4	4659.0	478.3	7411.5

they suggest the question as to whether, if the aforesaid explanation have some degree of validity for the Nottingham tests, then that Dessau, with its low carbon monoxide and high hydrogen contents, may be accounted for by the decomposition of methane into twice its volume of hydrogen, with the deposition of carbon improving the commercial value of the coke. Perhaps this is not an unsupported explanation; for Messrs. Bone and Coward, in their recent Chemical Society paper, show that surface of contact promotes the decomposition of methane into its elements more quickly than rise of temperature in an unpacked tube. The Nine Elms figures are notable in their high content of methane and low value for C_nH_m ; the two giving a satisfactory total. The ratio of hydrogen to carbon monoxide is intermediate to those of Nottingham and Dessau. The rise in hydrogen and carbon monoxide in the three tests at Nottingham is notable; but when we examine the figures relating the analyses of gas taken at successive intervals in the same distillation of another example, we do not find so marked a difference. So that it would be an advantage if this progression with elevation of temperature could be closely watched experimentally, and its favourable conditions defined.

The change from methane into carbon monoxide and hydrogen would require an absorption of heat which would be again available on the combustion of the new gases, showing a gain of 28 per cent. Thus $CH_4 + H_2O = 3H_2 + CO$. A cubic foot of methane, yielding 1070 B.Th.U., would be replaced by 3 cubic feet of hydrogen, each yielding 344 B.Th.U. and a cubic foot of carbon monoxide yielding 342 B.Th.U.—a total of 1374, or a gain of 304, equal to 28 per cent. Such an explanation appears to provisionally answer the thermal aspect of the question.

Usually carbon monoxide is regarded as a non-illuminant; but in the tests referred to, Mr. L. T. Wright found that there was a ratio between the luminosity ascertained and the total carbon vapour, which included carbon present as monoxide. Seeing that in the last of the series [line 4] there was a considerable proportion of the carbon present in that form, it seems desirable to ascertain whether such a fact was anything more than a mere coincidence. It has been claimed that, in developing luminosity—more especially in carburetted water gas—carbon monoxide had advantages that remained unexplained. Seeing, however, that methane is intimately affected by the presence of suitable ratios of carbon monoxide and hydrogen in a flame, it is not impossible that a clue to the unexplained may be found in the known luminosity of methane.

Mr. L. T. Wright's tests appear to corroborate his view; but the confirmation is not so unequivocal when we apply the rule to

the samples of gas from vertical retorts. Further, while it is true that in the four Nottingham tests, the average value of carbon vapour was nearly the same, yet it can be shown that this average was compounded of three different values for (a) unsaturated hydrocarbons, (b) methane, (c) carbon monoxide. The details

TABLE VII.

Cubic Feet of Gas Per Ton.	Volumes of Carbon Vapour Per 100 Cubic Feet of Gas.				Illuminating Power in Candles.		Origin of Data.
	CH ₄ .	C _n H _m .	CO.	Total.	Per 5 Cubic Feet of Gas.	Per Cubic Foot of Carbon Vapour.	
8,250	42.72	20.61	8.72	72.05	20.5	5.69	Nottingham horizontals a
9,693	34.50	16.96	12.50	63.96	17.8	5.57	" " b
10,821	..	..	..	60.66	16.7	5.51	" " c
12,006	30.70	11.81	13.96	56.47	15.6	5.53	" " d
11,259	29.985	8.709	5.63	44.324	16.453	7.424	{ Dessau verticals, non-steaming
12,423	35.05	4.32	7.41	46.78	15.82	6.763	Nine Elms verticals

for three of these tests give 7 candles per hour per cubic foot of carbon vapour in the unsaturated hydrocarbons, 5.33 candles in methane, and 4.525 candles in carbon monoxide. As these empirical values are derived solely by computation, the figures that show their concordance with the observed illuminating values are set forth in Table VIII.

There is some uncertainty attaching to (*) for Dessau and Nine Elms, owing to the absence of carbon density in the analyses. They have been calculated as below, in Table VIII., from the calorific values observed in the respective tests. It is, of course, possible that carbon monoxide may influence luminosity, and be itself affected by other factors; and it would be unreasonable to expect samples of gases made in diverse modes to yield figures identical with the average that Mr. Wright found—viz., 5.575 candles per cubic foot of total carbon vapour. One reason in his case for the uniformity would be that the heating power of the unsaturated hydrocarbons in each member of the series of tests was almost exactly the same (as shown by Table VI., Column 10). The carbon volumes of the same series of gases (see Column 3, Table VIII.), was not, however, quite so uniform, though still not very divergent. Submitting the analyses of gas from vertical retorts to the same rule, we see at once the difference in the composition and the difference in the total candles

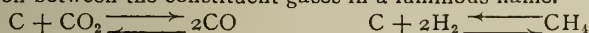
TABLE VIII.

Origin of Data.	Volumes of Carbon Vapour per Ton of Coal.					Illuminating Power in Candles.		Candles per Ton, Calculated, Due to					
	Due to CH ₄	Due to C _n H _m .	Due to Hydrocarbons.	Due to CO.	Total.	Per Ton.	Per Cubic Foot of Carbon Vapour.	CH ₄ .	C _n H _m .	Hydrocarbons.	CO.	Total.	Difference from Observed.
Nottingham, a . .	3524	1700	5224	719	5944	33,950	5.69	18,800	11,900	30,700	3255	33,955	+ 5
" b . .	3344	1644	4988	1212	6200	34,510	5.57	17,835	11,507	29,342	5482	34,824	+ 314
" d . .	3686	1418	5104	1676	6780	37,460	5.53	19,657	9,925	29,582	7584	37,166	- 294
Dessau	3376	980*	4356	634	4990	37,049	7.42	18,005	6,864	24,869	2868	27,737	- 9312
Nine Elms . . .	4354	537*	4891	920	5811	39,306	6.76	23,223	3,757	26,980	4165	31,145	- 8161

obtained from smaller volumes of carbon vapour, and notably of that assigned to C_nH_m (Column 10, Table VIII.). The observed values for Dessau and Nine Elms exceed those computed on the same bases as the other three by 9312 and 8161 candles, or 33 and 26 per cent. respectively (see Column 14). A good share of this difference must be due to the testing of the later samples in the No. 2 burner. The wide difference between the calorific values of the unsaturated hydrocarbons from Dessau and Nine Elms retorts must correspond to a difference in carbon density, and hence to a difference in the carbon volumes in the most desirable combination. But, allowing for all these considerations, it appears that we can scarcely calculate the illuminating values to be in accord with the observed values without attributing some lighting value, of an indirect character, to carbon monoxide. From Table VI., we saw the ratio of hydrogen to carbon monoxide as being greatest for Dessau, much lower for Nine Elms, and still less for Nottingham—figures which suggest some connection with the abnormality as to the illuminating values just discussed.

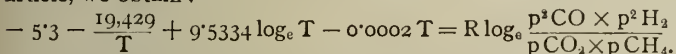
The writer has already said that he knows of no experiments upon the luminous effect of carbon monoxide in argand or flat flames; but he is aware of some in connection with bunsen flames for incandescent lighting that have some bearing upon the subject. Baur, for instance, explains the intense green light which the inner cone of the bunsen burner sends out when the primary air supply is large by the hypothesis that, under these conditions, methane is present in the brightly radiating layer. Professor Haber states that in such a case the unburnt gas-air mixture contains 7 per cent. of methane which is not present in the burnt mixture; but, after a theoretical investigation, he gives the opinion that any methane found in the flame must represent simply traces of the original substance which have escaped oxidation and decomposition in the inner cone.

The following outline of this theoretical investigation does not, however, in the writer's opinion, negative the possibility of interaction between the constituent gases in a luminous flame.



By combining the carbon dioxide equilibrium with the methane equilibrium (see *ante*), we obtain the following: $2CO + 2H_2 \rightleftharpoons CH_4 + CO_2$, which distinctly is germane to the question here discussed. The carbon dioxide equilibrium has been carefully studied by Mayer and Jacoby; and using the values obtained below 750°, the following expression is derived:—

$15.8 - \frac{37,936}{T} + 3.54 \log_e T - 0.003136 T = R \log_e \frac{p^2 CO}{p CO_2}$. Subtracting from this the methane equilibrium given earlier in this article, we obtain:



Professor Haber regards this thermodynamic relation as showing that in hot water gas containing a few per cents of CO_2 , CO , and H_2 no perceptible amount of methane (CH_4) can exist in equilibrium, even at a red heat. But (he goes on to say) the fact that traces of methane do nevertheless persist above the inner cone is evidence of the extraordinary slowness with which methane reacts at high temperatures. This reasoning as to the possibility of the existence of methane, apparently applies where there are a few per cents of CO_2 , CO , and H_2 , such as the bunsen flame amply supplied with oxygen and nitrogen, but would doubtless lead to a different conclusion where the per cents of CO_2 , CO , and H_2 are much larger, such as in the luminous flame of the standard argand. Professors Bone and Lowey have recently uttered cautions against accepting the conclusions of thermodynamic reasoning, without putting them to the touchstone of experiment. The case we are now considering appears to be one for such a suspension of judgment, seeing that the presence of methane above the inner cone of a bunsen burner has quite recently been confirmed by Mr. B. S. Lacy. Certainly, from the figures given in this article, we are under the necessity of accounting for some luminosity in an argand, emanating from carbon in the form of monoxide. Professor Haber's conjectural explanation of the presence of the methane may not necessarily be correct; and we have the alternative of the interaction of hydrogen and carbon monoxide, as mentioned above. If this latter view be legitimate, then it is reasonable to accept Mr. L. T. Wright's rule as being one that is in accord with the chemical and physical possibilities of the case.

The lecture of Professor Bone before the Institution of Gas Engineers (see "JOURNAL" for Aug. 4, 1908), contains much that is valuable in relation to the generation and the preservation of methane in the gas-retort; but the paper of Messrs. Bone and Coward, since published, contains more detailed information thereupon. The behaviour of methane under heat in a plain tube and in a packed tube has been compared and the results embodied in Diagrams Nos. IV and V. The results agree with those of Mayer and Altmayer on the conditions of equilibrium; but their further value resides in the fact that they show clearly the influence of time and surface in determining the rate of approach to equilibrium. The important practical lesson to be drawn from Diagram No. IV. is that, at 600° to 700° C., the quantity of methane decomposed in an unpacked tube for one hour was almost nil. The significance of this will be apparent when we remember that, according to the equilibrium curve in Diagram No. III., this is the temperature at which the decomposing effect of heat per degree rise of temperature is at a maximum.

The explanation of the apparent contradiction probably lies in the extreme slowness with which equilibrium is reached in an unpacked tube that is favourably disposed towards this delay.

In Unpacked Tube Percentage of Methane Decomposed by Heating One Hour

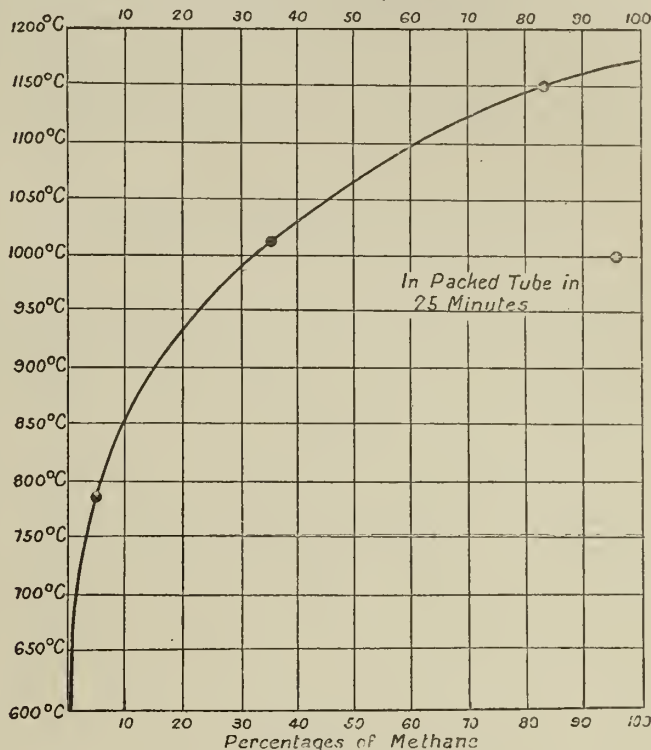


Diagram IV.

Diagram No. IV. shows that at 1000° C., using a packed tube, 96 per cent. of the methane would be decomposed in 25 minutes; but in an unpacked tube, at the same temperature, 32 per cent.

only would be decomposed in an hour. $\frac{96}{25} = 3.84$ and $\frac{32}{60} = 0.53$

give the percentages per minute, and show the former to be 7.2 times the latter. But unpacked tubes vary; and the effect of two different ones is compared with a packed one in Diagram No. V. The large difference in the results from an unpacked tube recorded by Professor Bone in 1901 and those recorded last year, led to an inquiry by the writer, which elicited from Dr. Bone the valuable information, kindly given in a private communication, that "two different tubes have different 'surface factors,' and even with one and the same tube differences are often found, according as the tube is new or has been used for some time." If minute rugosities such as these can have such a powerful influence—vouched for, as they are, by most careful observation—it is easy to believe that methane in a retort may be greatly affected by the internal disposition in the retort of the charge of coal.

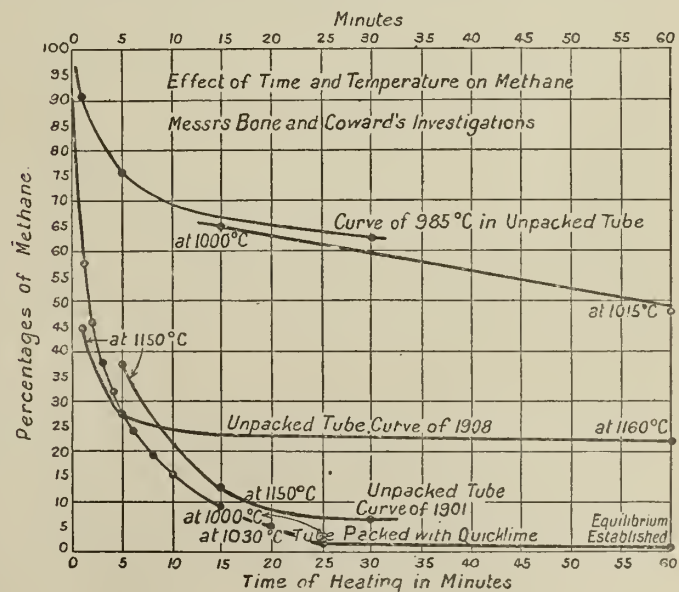


Diagram V.

Diagram No. V. shows that, although at 1030° C. decomposition of methane begins at once, yet it only reached the condition of equilibrium for that temperature after an hour's heating, when only 0.7 per cent. of methane was present, or about 1.4 per cent. of the original methane remained undecomposed. The

behaviour of methane in the unpacked tubes is given for a number of temperatures and for varied times of heating, especially for the two tubes with the different surface factors just mentioned. They are marked 1901 and 1908 respectively. It is important to note that the 1901 unpacked tube gives a curve that is nearly parallel to that of the packed tube. The curves show that the effect of temperature is modified by surface, even more than by time, though the importance of the latter is quite large. The applicability of these researches of Messrs. Bone and Coward, and Herren Mayer and Altmayer, to present-day retort problems is of the greatest value; and the writer desires to express his great indebtedness to these gentlemen for their careful work, which has enabled him to get a clearer insight into the complexities of coal distillation.

TESTINGS FOR CALORIFIC POWER.

[COMMUNICATED.]

THE calorific power standard which has been introduced into the Gaslight and Coke Company's Bill has come sooner than was expected; but it cannot be said that, in the interests of the enlightenment of the public, it will be in any way an unwelcome introduction—provided that in the question of forfeitures it supercedes the illuminating power standard.

A calorific power standard of 125 calories net for a mixed supply of 14-candle power gas is undoubtedly too high. This is plain from an examination of the Commercial Gas Company's tests—the only Metropolitan Company supplying this quality of gas—published by the London County Council. From the figures reproduced in the "JOURNAL" for March 9, it will be noticed that, during 1908, this Company supplied an average quality of 14.83-candle gas, giving calorific power tests varying (in the comparatively large range of 16.7 calories) from 119.3 to 136.0 net, with an average of 127.5; while for 1909 to date, the average has been reduced to 125.9, with tests varying from 119.2 to 132.2. It is plain from these results that, while supplying a perfectly satisfactory quality according to the (illuminating power) standard of the present time, the quality as regards the new standard accepted by the Gaslight and Coke Company must constantly have been under the prescribed limit of 125 calories. The weekly published figures from two testing-stations show that, during the twelve weeks of the current year, the average supplied during any one week was lower than 125 calories net on five occasions, while the minimum during any one week was lower than the new standard on nineteen occasions out of a possible twenty-four. In a few cases even the maximum test was only a fraction above 126.

It would at least be thought that the supply of a mixed 15-candle power gas would ensure a calorific power test up to the standard of 125 calories; but that this is by no means certain is proved by the fact that for the week ending Jan. 9 the average illuminating power at one of the Commercial Gas Company's testing stations was returned as 15.18; while the average (net) calorific power was only 123.4—the highest for the week being 126.1, and the lowest 121.2. Again in the following week, at the same testing-station, the lowest illuminating power test was 14.8; and yet a calorific power test of no more than 119.2 was reported on one occasion during that week.

These few instances are quite sufficient to show that the standard of 125 calories accepted by the Gaslight and Coke Company will be impossible to maintain regularly unless they supply a quality very slightly inferior to that which is now supplied under the 16-candle standard; and in this case the estimated saving of $\frac{1}{2}$ d. per 1000 cubic feet (presumably on oil) as a result of a reduction in the illuminating power by two candles must be quite problematical—at least, to outsiders.

In making a mixed gas of 14 or 15 candle power, as would be supplied by a company under a 14-candle standard with the Carpenter burner, it is necessary to dilute the coal gas (which will vary from 15 to 17 candle power), with an average of about 16 candles. If, for instance, 30 per cent. carburetted water gas is being made to mix with the coal gas, it must be of no more than 12.66-candle power to dilute the mixture to an average of 15-candle power. Should the supply of 15-candle power gas be considered too high, it is an easy matter to reduce the water gas to 11-candle power, and so supply an average mixture of 14.5 candles. This would, however, be cutting it too fine, and would not allow sufficient margin for a variation in the coal gas. With some coals, and working with high heats, the candle power of the coal gas will average little more than 15 candles; while with other coals, it will average fully 2 candles higher. Under these conditions, it is a great boon to be able to vary the water gas to maintain the quality of the district supply within wide limits. It is a well-known fact that carburetted water gas is of much lower calorific value than coal gas of equal illuminating power; it would, indeed, have to be very rich to reach the standard of 125 calories. Low-grade water gas of 12 or 13 candles gives a heating value of about 110 or 115 calories; so that it is quite clear that the proportion of gas of this quality must be restricted if the standard of 125 calories be maintained.

Further, it is the usual policy among gas undertakings supplying a mixture of coal gas and water gas to limit their reserve plant entirely to water gas. Thus a gas company supplying (say) 30 per cent. of water gas under normal conditions would probably in times of foggy or frosty weather increase their output of water

gas by as much as 100 per cent.—making for the time being 46 per cent. of water gas to 54 per cent. of coal gas. Though the normal mixture might conceivably be maintained at the standard, it would be a difficult and an expensive matter to supply a 14-candle power gas of the above-mentioned mixture at the figure of 125 calories. To regularly maintain this calorific quality, a gas company would be compelled to spend on oil a sum of money which would by no means be represented by the infinitesimal gain in heating power. This waste of money would in any case, under the sliding-scale, come almost entirely out of the consumers' pockets.

While the standard of 125 is much too high, the limit of 112.5 before a penalty is incurred is reasonable; and it should not be difficult to exceed this figure on all but exceptional occasions. But the fact does not do away with the objectionable introduction of an additional penalty test at a time when gas undertakings merely need freedom to give the public the service which most closely represents their requirements. Restrictions are wholly unnecessary in these days of strenuous competition; and, besides, the sliding-scale absolutely ensures fair treatment to the consumer.

There are one or two features of a calorific power test which are not likely to commend themselves to a gas company. Firstly, the unreliable character of a calorimeter—and this fact has been conclusively demonstrated by the frequent repairs necessary to keep the Boys calorimeter in working order. For the benefit of those who have not had the opportunity of seeing the weekly reports published by the London County Council, it may be stated that on no occasion during the current year have there been less than two calorimeters out of a total of twenty-two under repair. Frequently there have been seven or eight under repair at the same time; and during one week no less than eleven (or half) were *hors de combat*. This speaks ill for an apparatus on the results of which a penalty may be incurred. What faith may be put in the tests immediately preceding the day—and a day which will be frequently recurring—on which the calorimeter is sent away for repairs? Those who have had experience of the apparatus will appreciate this point.

Secondly, any error in the working of the calorimeter must of necessity be against the gas company; for it is obviously an apparatus which gives a correct reading when working at its maximum efficiency. As soon as any defect presents itself, it at once works below its proper efficiency; and the result is naturally against the gas company. For instance, should the coils become slightly corroded (either internally or externally), or should the coils contract a leak, or should the burners be coated with a slight covering of carbon, the fault will cause a reduction in the calorific power of the gas. No defect in the calorimeter itself could increase its efficiency. The writer has in his own experience of the apparatus found the faults just mentioned; and the cause of their discovery was in each case the registering of a low test.

The introduction of a standard in calorific power, though its application is at present only intended for the Gaslight and Coke Company, was, of course, expected sooner or later; and its arrival a year or so earlier than was anticipated does not make much difference to anybody. But the imposition of a standard which is obviously too high to apply to a mixed gas of 14-candle power is a matter of great importance to the companies now supplying, or who hope shortly to supply, this quality of gas. Whether or not it be the intention of the Gaslight and Coke Company, it will certainly create a precedent for other gas companies—and gas companies who will have no occasion to accept the calorific standard as a *quid pro quo*. The Gaslight and Coke Company stand to gain considerably from their amalgamation with the West Ham Gas Company; and, doubtless, from their point of view, it was good business for them to concede a point which, with their usual policy of limiting their percentage of water gas to a moderate extent, may not occasion them either expense or trouble. It may, however, resolve itself in the future into a most unfortunate precedent for other companies differently situated; and for this reason the action of the Gaslight and Coke Company is to be deprecated in accepting the standard named in spite of the fact that the experience of the published calorific power tests of the Commercial Gas Company—the only Metropolitan Gas Company (as already remarked) supplying a mixed 14-candle power gas—plainly shows that this standard cannot be regularly and, it should be added, profitably maintained.

Dr. J. B. Readman recently read a paper before the Royal Scottish Society of Arts, in Edinburgh, on "Liquid Fuels for Motor-Car Engines." In the course of his communication, he dealt with experiments he had made with 90 per cent. benzol—a substance which, he said, gave good encouragement from the beginning, as a substitute for petrol.

"Electric Power for Gas-Works" is the title of a little book by Mr. H. Staniforth, of Nottingham, which has just been published by Messrs. John Allan and Co., 8, Bouverie Street, E.C. The author has had several years' experience in both electrical works and in large gas-works, and in writing his book, which is intended for gas engineers and students, he has confined himself to plant adapted for use on gas-works. He begins with the dynamo, passes on to deal with switch gear, motors, and starters, and concludes with some remarks on wiring; the text and diagrams, which are numerous, occupying only 31 small pages. The price of the book is 2s. net.

IRON CARBONYL IN COAL GAS.

By J. N. E. TEUNE, JUN.

IN a new Dutch gas-works, where coal gas is produced, it had been found that after a short time the mantles lost a great deal of their illuminating power, and that a yellow-brown deposit appeared on them. I was called upon to investigate the cause of this phenomenon; and I found, by examination, that the deposit was oxide of iron.

The following investigation is similar to that carried out by Heeren M. van Breukeleveen and A. ter Horst, and published in the "JOURNAL" for Nov. 21, 1899. In the first place, I had to determine whether the gas contained iron in mechanical suspension, or a volatile compound of it. Consequently, 60 litres (2·12 cubic feet) of gas taken from the holder were filtered by being passed through cotton wool, and allowed to flow through a burner made of glass, where it was consumed; the issuing gases being subsequently scrubbed by dilute hydrochloric acid. On this being examined, no iron was discovered in the solution. Next, 1500 litres (53 cubic feet) of gas taken from the holder were scrubbed directly with hydrochloric acid; but it was impossible to remove the iron. The result of this investigation indicated also that the coal gas did not contain iron in a state of mechanical suspension, but as a volatile compound of iron carbonyl.

Mond, who discovered this volatile compound of iron carbonyl, made several examinations of it some years ago.* He found that on being exposed to the air it slowly decomposed, with formation of a brown precipitate consisting mainly of hydrated ferric oxide. The vapour density was determined in a Victor Meyer apparatus filled with hydrogen, and heated in a bath of xylene. Mond obtained the following figures: 0·1912 gramme of the substance displaced 25 c.c. of hydrogen at 17·7° C., air pressure 751 mm., and density, 6·5; 0·1249 gramme displaced 16·4 c.c. of hydrogen at 17·7° C., air pressure 759 mm., and density 6·4. This corresponds very nearly with the calculated density of Fe(CO)₅, 6·7; while Fe(CO)₄ would require 5·7, and Fe(CO)₆ would require 7·25. The formula Fe(CO)₅ is also corroborated by an analysis of the substance; the compound containing 29·08 per cent. of iron and 70·92 per cent. of carbonic oxide. Mond proposed to call this compound "ferropentacarbonyl." It is isomeric with ferrous croconoite (C₅FeO₅).

After this, the coal gas was examined in the manner described at the following points: (1) At the outlet of the "Standard" washer (the inlet to the purifier-house); (2) at the outlet of the Pelouze tar-extractor (the inlet to the washer); and (3) at the outlet of the hydraulic main. The gas from the main was free from iron; that from the tar-extractor contained iron carbonyl; and in the water in the washer there was a very small quantity of oxide of iron. One litre (1 $\frac{1}{4}$ pints) of water contained 0·0010 gramme of oxide of iron. On account of the small quantity of iron carbonyl in the coal gas, I have not been able to determine exactly the amount of iron, but the gas from the tar-extractor contained less iron than that from the purifier-house.

Finally, the gas was analyzed with the following result:

	Per Cent.
Carbonic acid.	1·0
Hydrocarbons	2·8
Oxygen	0·5
Carbon monoxide	7·0
Methane	27·4
Hydrogen	56·9
Nitrogen	4·4
	100·0

This analysis indicates that the sample taken was quite an ordinary one; the gas containing also a normal quantity of carbon monoxide.

The results of the foregoing researches justify the following conclusions:—

- 1.—The coal gas produced at the works in question contained a volatile compound of iron carbonyl.
- 2.—The gas had not taken up iron from the elements.
- 3.—Iron carbonyl was not produced at high temperatures, because the gas from the hydraulic main was free from iron.
- 4.—The small quantity of carbon monoxide in coal gas, when left in contact with the iron of the mains at low temperature, may produce a compound of iron carbonyl.
- 5.—On heating the iron carbonyl at a high temperature in the burners, the compound is decomposed into iron and carbon monoxide.
- 6.—Iron carbonyl is not acted upon by dilute hydrochloric acid.

Some weeks after these researches were carried out, the examination of the gas from the holder was repeated, and I found a decreased production of iron carbonyl. I therefore concluded that the inside of the mains had been slowly covered with tar and naphthalene as the iron was removed from the action of the carbon monoxide.

Laboratory, Eastern Gas-Works, Amsterdam,
March 30, 1909.

* Vide "Journal of the Chemical Society" for 1891.

PROGRESS IN ILLUMINATING ENGINEERING.

THE issue of our American contemporary the "Illuminating Engineer" for last month marks the beginning of the fourth year of the existence of that publication; and, in conformity with custom, the Editor (Mr. E. L. Elliott) devotes the first article to a review of the past year's doings in the field of illuminating engineering, and offers an opinion on the outlook for the ensuing twelve months. The conclusion arrived at from his review is that "illuminating engineering, as a distinct branch of applied science and a separate profession, has made very substantial and satisfactory progress;" and he ventures to predict equally good progress in the year on which we have entered. Though in the field of light sources nothing radically new was developed in the period under consideration, Mr. Elliott points out that it was marked by the very rapid introduction of the tungsten lamp and the inverted gas-burner; the latter being, in gas lighting, the "chief feature of progress." He says it has now been thoroughly adapted to American conditions; and its reliability and practicability have been demonstrated beyond any question of doubt. The so-called "gas arcs," constructed on this principle, made their commercial appearance during the past year; and, having undergone the trial of use at the hands of the public, they are destined, in the opinion of the writer, to advance very rapidly during the current year. He remarks on this matter: "It is rather curious to note the parallel progress in the production of light by gas and electricity. Thus, the inverted incandescent gas arc, in its distribution of light and higher efficiency, has striking similarities to the flaming arc lamp. While a single inverted burner apparently gives no higher absolute efficiency than the best forms of upright burner, it has a better natural distribution; and with its lower cost of maintenance, together with its novelty, has given to gas lighting a very substantial means of meeting the inroads which the tungsten electric lamp is in a strong position to make."

Mr. Elliott goes on to point out that a new form of gas-mantle, having remarkable qualities in regard to strength and maintenance of candle power, has passed the experimental stage, and been tested to a limited degree in practical use, so that it will undoubtedly become a commercial factor in gas lighting during the year. It is said that these mantles will run 1000 hours with a mere trifling reduction in light power, and that they are so strong mechanically as to even stand collapsing after they have been burned off. If these features hold good in commercial use, as there seems no reason for doubt they will, the writer says "they will afford an improvement in incandescent gaslight that will be not far short of revolutionary." The fact is also worthy of mention that in the new inverted clusters or "arcs" more elegant lines of construction are used; thus keeping the progress in the artistic side of light production on a par with the mechanical.

Attention is next directed to the fact that small upright gas-burners turned out as single units—i.e., with burner, mantle, and chimney complete and self-contained, and sold at so low a price as to be within the reach of everyone (less than twice the cost of an ordinary 16-candle electric lamp)—have come into considerable use; and it is thought they will certainly have a large field of usefulness, and play no small part in maintaining the present position of gas and electric lighting. Mr. Elliott says it is interesting to observe that recent tests seem to prove that these small burners are the most highly efficient of any form of incandescent gas-lamp; and, on the whole, he considers it is safe to say that improvements in gas-lamps during the past year "have fully kept pace with improvements in electric lamps."

In conclusion, Mr. Elliott expresses the opinion that the past year was one which will be long remembered by the lighting interests of all kinds; and, without going into details, he considers that progress in the current year is likely to be most pronounced in the following lines: The installation of better systems of street lighting, both from the decorative and the practical standards; more aggressive action on the part of the gas interests to maintain the present status of gas lighting; more extended recognition of illuminating engineering principles both in the manufacture and the sale of lighting fixtures and accessories; and, finally, the continued increase in the recognition of illuminating engineering by those largely interested in the subject of illumination, including the users of light, architects, contractors, and the producers of all illuminants.

American Gas Coal for the Mediterranean.—According to a telegram from Pittsburg which reached London through Reuter's Agency, a Company has been formed for the transport of gas coal to the Mediterranean; the ships returning with cargoes of Spanish iron ore. The company expect to handle on an average 20 million tons of coal and half that weight of ore annually. It is stated that the new service will begin in a few months' time.

London and Southern District Junior Gas Association.—The members of the Association will pay a visit to the Croydon Gas-Works next Saturday afternoon. On the 23rd inst. a meeting will be held at the Cripplegate Institute, when Mr. T. V. Fenn, of the Gaslight and Coke Company, will read a paper entitled "Gas Consumers' Accounts: On Avoiding and Settling Disputes." The long anticipated visit to Woolwich Arsenal has now been arranged for Wednesday, May 12.

GAS MAKING WITH COAL BRIQUETTES.

The specification has lately been published of a French patent taken out by MM. Bieuaime and Requier for improvements in the manufacture of illuminating gas, with the view of effecting greater economy than is possible with the methods now in use. The patentees point out that, under existing arrangements, coke loses some of its value as a marketable commodity owing to the fact that it has to be broken for sale, with the consequent production of useless dust. This is obviated by the patentees' process, which, they claim, allows of the utilization of the breeze for the production of gas, and facilitates the charging and drawing of retorts, especially those set on the inclined system.

The process consists in first screening the coal and then breaking the lumps. The dust is mixed with a small quantity of pitch or tar (4 per cent. as a maximum), or a combination of both, or any other suitable binding material, compressed into block, and carbonized. The process cannot be employed with all kinds of gas coal, as some intumesce too much during distillation; but it is stated to be very profitable with those which do not swell after compression. It has also been found advantageous in gas-works in which leaner coal than that which is obtained in the locality is carbonized. The solid residual produced by the patentees' process is a well-proportioned compressed coke making no dust in handling, and selling at prices which it is considered would amply repay the cost of compressing the raw material. Another feature of the process is that no caked residue is left on the retorts, necessitating its detachment by special tools.

HIGH-PRESSURE GAS SUPPLY IN INDIANA.

At the recent Annual Meeting of the Indiana Gas Association, one paper was by Mr. W. B. MacDonald, the General Manager and Vice-President of the Evansville Gas and Electricity Company, in which he gave an account of the installation of high-pressure gas supply in some of the outlying districts of the city. The following are some extracts from the paper.

During the summer of 1906, owing to a systematic and energetic canvass of the city, especially the residential section, a large number of houses were piped for gas, and a great many gas-stoves, gas "arc" lamps, and water-heaters installed, which resulted in such a material increase in the output that the situation in Evansville for a proper distribution of gas had, by the middle of August, become acute. With a pressure of 4.2 inches at the station governor, only about 1.5 inches was available at the three outlying districts—viz., West End, South End, and Howell. Perhaps the greatest sufferer was the second, inasmuch as a house-to-house canvass showed that there was a gas-range, a water-heater, or some other domestic gas appliance besides the house illumination in practically every household. With this increased load, the season for lap loads was drawing near; and to be ready for the demand that was inevitable, and meet the situation quickly, was the problem that confronted me.

Three plans for an increased distributing plant were considered: (1) To increase the number of the trunk mains from the works to the outlying districts; thus feeding into the distributing main a larger volume of gas with the holder pressure. (2) To erect gasholders in each affected district. (3) To break away from the old and established practices, and instal a high-pressure system. Calculation and investigation showed that the last-named plan was the only one that held out reasonable hopes of completion in time to meet the situation.

The high-pressure system was accordingly adopted; a very favourable route laid out; and work commenced on the 1st of September. From that date until its practical completion—a period of 26 working days—the work was pushed on with feverish haste; and not till the last regulator was installed and the last record taken, was there any diminution in the call for speed. The line is 25,344 feet in length, of 4-inch wrought-iron pipe; the lengths averaging 22 feet, connected with Dresser couplings.

Simultaneously with the starting of the work of laying the line, a 9½-inch by 14-inch Westinghouse compressor was installed at the gas-works. This compressor supplied the air pressure with which the line was tested—each day's work being subjected to 40 lbs. pressure from 6 p.m. until 7 a.m. the following morning; and not until the line showed a perfect test for these hours was it back-filled. By the 1st of October, the pressure had so materially increased on our outlying districts—i.e., 15-10ths to 27-10ths—that my anxiety for the lap load was relieved; and thereafter the finishing touches to the work were prosecuted in a less feverish manner.

As the stove and heater load drew nearer to the lighting load, and the reports from the complaining districts showed that the pressure was being maintained at 36-10ths; the point at which the regulators were set to deliver, the relief and satisfaction apparent in the General Manager's office was reflected through all the various departments.

Bristol recording pressure gauges are maintained at four points on the low-pressure mains—one in the South End, one in the West End, one at the office of the Superintendent of Distribution, and one in the business district. These charts reach me by

9 a.m. the following morning, at the same time that the compressor, steam, and works charts are given to me; so that the previous day's record is at hand in order that any corrections or changes for the day may be intelligently considered.

Simultaneously with the work of laying the line, the installation of the compressors and attachments was carried out at the works with the same push and energy that characterized the work on the outside. A Westinghouse 9½-inch by 14-inch steam-driven compressor, with a capacity of 0.5 cubic foot per stroke and a maximum speed of 140 strokes a minute working against 10 lbs. pressure, was installed. This compressor and the one used for line-testing was connected by a 2-inch suction line leading to the outlet of the storage holder. Cut in on this line is a 12-inch by 18-inch steel tank.

The discharge side of the compressors is connected to a 4-inch line which discharges into a 66-inch by 190-inch steel tank conveniently situated. The tank takes up the pulsation of the compressors, and ensures a steady pressure on the lines—also collecting a great portion of the condensation. We have a Bristol recording gauge in the exhaust-room near the compressor, which gives a daily record of the pressure; and during the first year a steady pressure of 10 lbs. was maintained.

During the summer of 1907, the increase in business—much of which was secured on the high-pressure line—sounded the alarm signal that the maximum capacity of delivery was again being reached; and, to take advantage of this warning, an 8-inch by 14-inch by 8-inch steam-driven double Clayton compressor, having a capacity of 2 cubic feet per revolution—approximately 25,000 cubic feet per hour—as the maximum, working against 10 lbs. pressure, was installed. The suction and discharge lines were arranged similar to those of the Westinghouse compressors. With this equipment, we have been enabled to meet all demands, and at the same time maintain a pressure on our low-pressure mains with a variation of 12-10ths in the West End, 10-10ths in the South End, and 5-10ths in the business district; while the North End, where the other recording gauge is located, shows a variation of 7-10ths. All these variations occur at the peak load. At other times the pressure is uniform, and maintained at that of the holder.

A test for the cost of compression, made two months after the Clayton compressor was installed, gave a cost of 0.85 c. per 1000 cubic feet; this cost being for coal only. Maintenance and repairs were not considered. The coal used was West Kentucky pea and slack, at 88 c. per ton laid down on the boiler-room floor, and giving an efficiency of 6 lbs. of water evaporated to 1 lb. of coal consumed. The repairs to the compressors have been trifling, and such as could be done by our own employees.

I am not prepared to say that the quality of gas suffers in candle power by compression, inasmuch as we have not made tests on the high-pressure gas for it. The gas compressed in Evansville is 18-candle coal and water gas, mixed in the proportion of one-fourth water gas to three-fourths coal gas.

Rating of a Tenant's Machines and Tools.

The Secretary of the Machinery Users' Association (Incorporated) calls attention to the case of *Edmund Evans, Limited, v. Assessment Committee of the Southwark Union*, which, he says, affords a striking instance of the failure of an attempt to rate an occupier's machines and machine tools. The appellants, a firm of colour printers in Southwark, shortly after the quinquennial revaluation of 1905, removed some of the printing-machines and paper-cutters then upon the premises, and substituted for them others of a similar nature, but of an improved type, of which the cost was greater than that of the plant removed. The respondents thereupon increased the assessment, and when the appellants appeared before them in support of their notice of objection, it appeared that the increase had been arrived at by putting a percentage upon the increased value of the machinery. The firm appealed to the London Quarter Sessions, alleging that there had not been any alteration in the value of the rateable hereditaments within the meaning of sections 46 and 47 of the Metropolitan Valuation Act, 1869, and that therefore the assessment should be struck out. Apart from the technical point, the case raised the direct question of the rating of a tenant's machines and machine tools in such a manner as the appellants were advised would best allow of a decision being obtained which would put a check on the rating authorities attempting to extend in any way the principle of earlier decisions affirmed by *Kirby v. Hunslet Union*. In order that this point might not be obscured by any technical considerations, the appellants' solicitor withdrew all technical matters. Nevertheless the respondents declined to proceed further with the case, and consented to an order that the new assessment should be struck out, and that they should pay the appellants' costs. A direct attempt to rate an occupier's machinery and machine tools was thus effectually frustrated. The appellants were advised by the Association, through their Solicitor and Surveyors, Mr. B. Duncomb Sells and Messrs. Humphreys-Davies and Co.

A recent issue of the "Mining Journal" contained an article on "Gas Producers and Gas Firing," setting forth the advantages of the latter over the direct use of coal. The author was M. Ernest Schmatolla, a metallurgical and chemical engineer and a specialist in gas-firing; and he has had the article reprinted as a pamphlet, which is published at the office of the paper named, No. 46, Queen Victoria Street, E.C.

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

Annual Meeting in Glasgow.

[FROM OUR OWN CORRESPONDENT.]

A PLEASANT, and there is reason to believe, profitable, Informal Meeting of Scottish Gas Managers was carried through in Glasgow on Wednesday, without, it is to be observed, any vocal assistance from either Edinburgh or Glasgow. Probably the leaders of the gas world in those cities are busy in the solution of the problem of carbonizing in vertical retorts, and have no time to discuss lesser questions. It was another noticeable feature of the meeting that vertical retorts were not once mentioned, from which it is to be gathered that the gas managers of all except the very largest undertakings are not, as yet, troubling their minds very much about them. There was no mention of the enriching of gas, except the statement that at Alloa the effect of the working of retort-house governors has been to enable Mr. Napier to almost altogether dispense with enrichment. Neither was there any reference to high-pressure distribution of gas, further than the regret of the President that time did not allow them to discuss it; nor to high-pressure lighting. Comparisons with electricity were also wanting. This is a heavy roll, on the negative side, of subjects of importance at the present day, which the meeting did not take up. At the Informal Meeting the discussion is on the President's Address. As he leads, so the speakers follow; and we have to turn to the address to find the positive side of the proceedings. Though the subjects enumerated were omitted from Mr. Vass's excellent production, there was no lack of subjects of interest in it. His reflections on company management of gas undertakings, as compared with corporation management, was particularly fitting at

the present time, as the period is approaching when many corporation undertakings will, through the operation of sinking funds, be set free from their original capital obligations. The part of Mr. Vass's address which went farthest home in the minds of his hearers, was his narrative of the exceedingly successful campaign he has carried through against the non-users of gas. This was an educative record of work deliberately planned, and resolutely carried out, with results which have been most gratifying, both in the amount of new business which has been gained and in the almost infinitesimal cost which has been incurred in gaining it. On this subject, the remarks of the speakers centred round the granting of gas-cookers free—a practice which, it seems, is much more extensive than could have been supposed, from previous references to the subject. There was some allusion to automatic street lighting, but nothing authoritative, only speculations as to the adaptability of the two systems of pressure and clockwork operating devices, both of which, in the opinion of most, have serious drawbacks. Other subjects of less importance were handled; the result being an extensive interchange of views. There was a very gratifying attendance of managers at the meeting. It must not be omitted to mention that the gold medallion and chain which has been procured by subscription, in memory of the late Mr. James M'Gilchrist, of Dumbarton, was worn by the President for the first time; being appropriately handed over by Provost Macfarlan, of Dumbarton, in a fitting appreciation of Mr. M'Gilchrist's personality and the work that he carried on for the "Informal Meeting" for so many years.

The Twenty-Sixth Annual "Informal Meeting" of Scottish Gas Managers was held in the Alexandra Hotel, Bath Street, last Wednesday, under the presidency of Mr. D. VASS, of Airdrie. There was a very good attendance.

THE M'GILCHRIST MEMORIAL.

Mr. W. B. M'LUSKY (Perth), the Convener of the meeting, said their first business had to do with the M'Gilchrist Memorial. Provost Macfarlan, of Dumbarton, had kindly agreed to take part in the proceedings. The Committee considered the medallion (reproduced in the "JOURNAL" a year ago) a work of art, and a very fitting memorial to their old friend. They recommended the appointment of Trustees to have the custody of the medallion from year to year; and, to simplify matters, they selected the late Convener (Mr. A. Yuill), himself, and the three Past-Presidents—Mr. Vass, Mr. G. R. Hislop, of Paisley, and Mr. J. W. Napier, of Alloa. The memorial was there; and he had only to say that the work was just the kind which Mr. Macgregor had done for the Royal Family—neither better nor worse. It was a perfect likeness of their late colleague. In their name, provided they agreed, he had to ask Provost Macfarlan to receive it for Mr. M'Gilchrist's friends.

Provost MACFARLAN said that Mr. M'Gilchrist was a "bairn" of Falkirk, and he well maintained, through his long career, the traditional reputation of the "bairns." They could read in every line of him, "*Nemo me impune lacessit*," that was to say, "No one touches me with impunity." He came to Dumbarton a young man—and was there for thirty-two years—after he had had some experience at Maryhill and elsewhere. They knew him as a gas manager, and they knew him as a man. His career was cut all too short; and yet they were safe in saying that he crammed—he used the word advisedly—into that short existence of his more than many of them would be able to do, although they should reach the promised span of life. He was an enthusiast in his profession; and never for a moment did he falter in the conviction that, in spite of electric lighting or anything else, there was always a future in store for gas lighting. This led him to observe that the advent of electricity, while it was a matter of great concern for some of them, had really been, in the end, a big service done to the gas profession, because it stirred everyone up to see whether something was not left latent in the possibilities of gas lighting; and they knew, without boasting, that they were now, at least, level with the electric light once more. In such a handsome presentation as was there, to commemorate Mr. M'Gilchrist's memory, they saw and felt that the whole proceedings of that day, and the preparatory proceedings, were thoroughly justified. Sometimes testimonials were apt to be questioned—that was to say, there was no open revolt against them, but there were smouldering observations of a contrary character. He was quite sure there was nothing of this kind among those present. Mr. M'Gilchrist was no ordinary man. They could not be in his company for long without realizing that there was strong virility in him. He had his profession thoroughly at heart; and to the end of his days he continued to

labour at the problem of the best that could be done with coal gas. He was, they might say, the father of the Informal Meeting of Gas Managers. In 1884 they started the meetings; and for a number of years Mr. M'Gilchrist was the Convener of them. He was succeeded by Mr. Yuill, who was, in turn, succeeded by their present professional-like Convener, Mr. M'Lusky. There was no labour too great for Mr. M'Gilchrist in ensuring the success of the meetings. He was a man—without in the least detracting from anyone—who was a recognized authority in his profession; and he could say this from direct personal intercourse with him for a long period of years. It was, therefore, with the greatest satisfaction that he added his little tribute of respect to his memory. In the town in which he spent the greater part of his busy life, Mr. M'Gilchrist was no cipher. He did not confine himself merely to the routine duties of gas manager, but he did good to Dumbarton in his day and generation. He served for quite a number of years as the Quartermaster of the local Artillery Volunteers, and was on parade within but a few days of his death. Then he gave service in the School Board of Dumbarton. He stood a contested election upon his own individual person, and was successful; and he continued his membership to the close of his life. In addition to this, there was no good object in their community that had not in him the warmest supporter. To the close of his life he was engaged in as many schemes for the help of his fellow mortals as would have kept any ordinary man fully occupied, without any managership of any other kind. They knew how quickly many men passed away from memory, and passed away from being even spoken of; and yet, at the lapse of close upon three years, he might say that Mr. M'Gilchrist was almost with them—at all events, they had a vivid idea of him, and imagined that he only passed from them the day before yesterday. It was, therefore, very fitting that they should take upon themselves the idea of commemorating him in the handsome medallion and chain of office which was to be worn by their Presidents, year by year, as time rolled on. He was delighted to think that the work of preparing the memorial was entrusted to his old friend Lord Provost Macgregor, of Perth, because everyone who knew him and his work knew that he would never turn out anything but the best workmanship. Therefore, they had before them that article of beauty, embracing, as it did, what he would call a lifelike representation of Mr. M'Gilchrist upon the medallion. Mr. M'Gilchrist was a man who could never listen to a story of hardship without instinctively, as it were, going to the assistance of those who appealed to him in distress; and in this way he could tell them he was a generous giver for every good object, and a generous giver in private, which the bulk of them knew nothing about—a man who never failed within his powers to come to the help of the needy. He had a son, the Manager at Gourrock, in whom he justly had pride. Unfortunately, about a couple of years later, he passed away also, when he was on what he would call the first rung of the ladder for success. This was a great grief to him (the speaker) and others, because they had fondly looked forward to the son getting forward to, perhaps not exactly the high pinnacle that his father had attained to, but to an honourable position in the gas profession. He was sorry

to say that Mr. M'Gilchrist's widow had not been in the best of health for some time. He had made her and the family aware of this meeting, and of what was likely to take place at it; and he was sure it would afford her a gratification of the highest kind, although it should be tinged with the melancholy remembrance of the loss of her invaluable husband—for he was a devoted husband, and looked to his family up to almost the degree of indulgence. He was speaking with a certain amount of weight on his shoulders, because Mr. M'Gilchrist and he for a long period of years were closely associated with one another in various departments. He was his Convener for a long time, and they sometimes differed; but he might say they never had a bitter quarrel, and never had anything that prevented them being on the most cordial of terms beyond a single hour. He felt that he had not given justice to the subject in hand; but he had done what he should have liked to have done for Mr. M'Gilchrist. He had done his very best in addressing them in these disjointed sentences; and he was quite sure that they never were engaged in anything more meritorious in the shape of the commemoration of any worthy individual than they were that day. He had the honour and privilege of placing the medal upon the shoulders of the President. He trusted that it might be handed down to many generations of Presidents, and that, as time went, new members coming in would ask: "What means this?" and they and their successors would be able to tell, and to tell truly, that the medallion was in memory of a worthy man who was one of themselves in the days gone by. He had also to formally say that, in so far as the widow and family were concerned, should they at any time be entrusted with the medallion, it would be held by them as next to sacred, and returned to the proper quarter. He suggested that it might be allowed to go to Dumbarton, to be shown to Mr. M'Gilchrist's widow and family; and that then they might permit him to exhibit it—perhaps in one of the principal windows in the town—for a little time, after which it would be returned to the proper custodian for the time being.

The meeting having signified their agreement, Provost Macfarlan placed the chain round the neck of the President.

The PRESIDENT expressed himself as feeling it a great honour to be the first President to be called upon to preside over a meeting adorned with such a memento of the founder of the Informal Meeting. He felt it also an honour to be elected one of the Trustees whose duty it would be to see that Mr. M'Gilchrist's memory was kept green by the adornment of their future Presidents from year to year, and that the Informal Meeting might be kept long in existence. He felt sure that the memento was the touchstone to secure such an end. Provost Macfarlan had very well laid before them their ideal of Mr. M'Gilchrist. They all cherished his memory; and it would be ill-befitting in him to add anything to the words he had so well spoken. He had, therefore, on their behalf, to ask Provost Macfarlan to convey to Mrs. M'Gilchrist and her family their feelings on this memorable occasion, and to say that they, as an Informal Meeting, would always hold green, and revere, the memory of its founder.

Mr. R. M. SUTHERLAND (Falkirk) said it gave him great pleasure to be present to take part in this function, and to feel assured that the memory of his old schoolmate, Mr. M'Gilchrist, was going to be continued at the meetings of the gas managers of Scotland. Provost Macfarlan, in fitting language, had adequately described the character he had spoken about as one who desired to help wherever help was needed. As an old schoolmate of their late friend, he could endorse the remarks—they were so true of the character of their late friend. He felt it was a very kind thing of gas managers to resolve to commemorate the active business career of Mr. M'Gilchrist in so appropriate a manner. Mr. M'Gilchrist always had the interest of the gas profession at heart. No one did more to hold aloft the lamp, as it were, of his profession; and he was for ever striving to do what he could to help forward the industry. Even in the days when the electric light was threatening to extinguish gas, their friend never lost heart, because he had always plenty of courage. He said that gas would hold its own; and his forecast had proved true.

The President then delivered his

INAUGURAL ADDRESS.

I have to thank you for the honour you conferred in electing me to preside at this the Twenty-Sixth Annual Informal Meeting. I have a veneration for old institutions, for the legacies of good work handed down from the past years; but I also hold strongly to the belief that the continuity of the life of our old Associations depends on their adapting themselves to the needs of the times. Our Informal Meeting would lose all its charm if it departed from the free-and-easy style of discussion which has hitherto characterized it. It best serves its purpose when current topics are brought under discussion, whether they are called out by the Presidential Address or by a leading from the "floor of the house." So far so good; but in other matters it may be found advisable from time to time to trim our sails to the prevailing wind. To-day I deal chiefly with matters which have come before me during the past year or so, in the hope that the discussion thereon may exceed the address in value and importance.

CORPORATION V. COMPANY OWNERSHIP.

Some of us who are managers of corporation works are frequently asked why it is that gas companies, as a general rule, can sell their gas cheaper than corporations, especially where works

have only recently been acquired by the authorities. We all know that it is the burden of the sinking fund for the redemption of capital which a corporation is bound to provide, and for which a company has no equivalent charge, that makes the difference. Then follows the natural question: Is it not better to allow the gas supply to remain in the hands of a company than burden the gas consumers of the present day in providing a "bond free" concern to a future generation, and wherein does the inducement for corporations to become owners lie?

This is best expressed by taking a supposed case—let me say a gas company with a capital of £100,000, and paying a dividend of 5 per cent., equal to £5000 per annum. If this were a statutory company, they would be entitled to a price of something like 28 years' purchase, and would therefore cost the corporation the sum of £140,000. The corporation then borrowing (say) at 3½ per cent. would have an annual charge of £4900, or nearly equal to the full dividend of the company, but in addition would require to provide a sinking fund to redeem the capital sum within a given period. Recently the "powers that be" have greatly reduced the period of such repayment; for whereas in earlier days fifty years were allowed, it is now difficult to get more than thirty years. Taking thirty-five years, it requires 1½ per cent. per annum accumulative on the capital sum of £140,000, which amounts to £2100. Then, owing to the present mode of rating, the rates and taxes on this sum fall to be added as an annual charge, making at 5s. in the pound, £425, or a total of £2525 per annum, which the gas consumers of to-day have to pay for the privilege of "owning the gas-works."

Taking the sales of gas to be 140 million cubic feet (which gives a million per £1000 of capital), the charges work out as follows:—

	Pence per 100 Feet.
Gas company's dividend, £5000	= 8'578
Corporation interest on loans, £4900	= 8'400
Sinking fund for redemption of loans, £2100	= 3'600
Rates and taxes on sinking fund, £525	= 0'900
	12'900

A difference of 4'322d. per 1000 cubic feet in the selling price of the gas. Under such conditions, one would say that it is folly for a corporation to think of acquiring the control of the gas supply; and so it is, if the business is a stationary concern—one which has reached its limits. But when the undertaking is a progressive one, and one which requires new capital to keep pace with that progress, it is then that the corporation ownership will have telling effect, and will justify a transfer to municipal management, as the charge on new capital, under a corporation, for interest on loans, as shown above, is less than the amount required for dividend under company management—the difference being usually sufficient to provide for the necessary sinking fund; as, for example, in an undertaking on the lines already laid down, and which requires to provide for a capital increase (say) in the next fourteen years' time or so of £60,000, which would be sufficient to meet an output of double the present manufacture. The annual charges then adjusted on an output of 280 million cubic feet would be—

	Pence per 1000 Feet.
For company, on £160,000—	
For dividend at 5 per cent.	£8,000 = 6'857
For corporation, with loans amounting to	
£200,000, at 3½ per cent.	£7,000 = 6'000
Redemption of loans, at 1½ per cent.	3,000 = 2'571
Rates and taxes on £3000	750 = 0'643
Total	£10,750 = 9'214

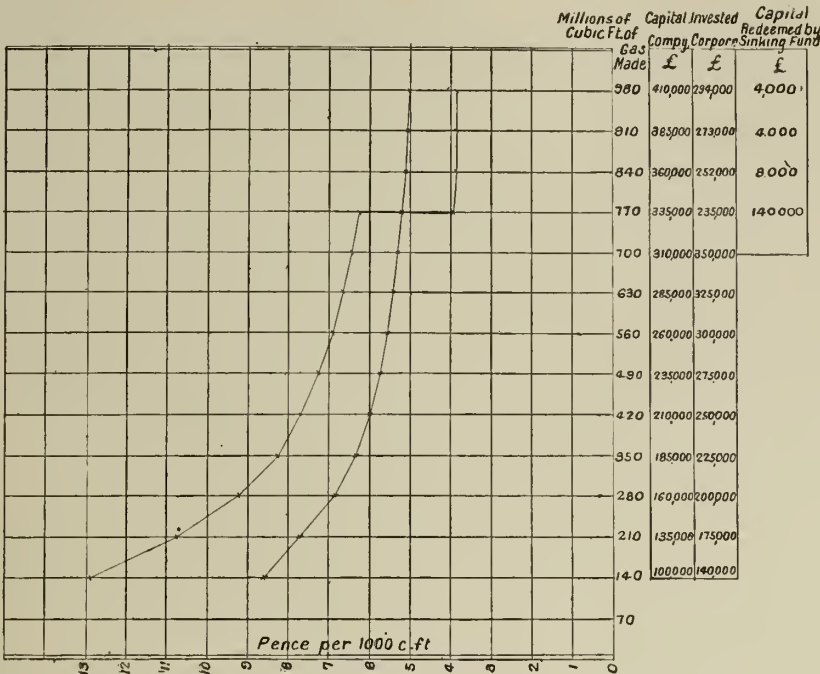
Now the difference in the selling price is only 2'357d. with the prospect of a gradual reduction of the difference as the sale of gas increases, and of a substantial fall when the period for the redemption of the loans comes round.

It will, however, be found that, under the conditions cited as our example, though the difference in capital charges gradually narrows, the charges under corporation management will not go below those of company management until the period of thirty-five years, when the sinking fund on the purchase price falls out of account. This will be better followed by a glance at the charges based on a regular annual increase of 5 per cent. per annum in manufacture, and the probable capital to meet the periodical increase.

After the thirty-five years, the difference would then be in favour of the municipally-owned undertaking. Circumstances would vary as the ratio of increase in manufacture varied; but I have only taken an example to show the ultimate end after a shorter or a longer period, according to the development of the locality, &c. I also give, in diagram form, the results named in the table.

EXTENSION OF BUSINESS.

For several years the undertaking of which I am now in charge had been run with very insufficient gasholder accommodation, and no surplus of retort power. Circumstances led to both matters being righted, and a good margin allowed for expansion in each case. Other parts of the plant being also brought into line, my Committee found themselves with heavy capital charges for the extensions on the one hand, while against this there were works capable of expansion. Realizing that development of sales



Annual Manufacture.		Capital.		Capital Charges per 1,000 Cubic Feet.		Difference in favour of Company.
		Company.	Corporation	Company	Corpn.	
Beginning with	Cub. Ft.	£100,000	£140,000	8'578	12'900	4'322
After say—						
8 years	210,000	135,000	175,000	7'714	10'750	3'036
14 "	280,000	160,000	200,000	6'857	9'214	2'357
19 "	350,000	185,000	225,000	6'343	8'268	1'925
23 "	420,000	210,000	250,000	6'000	7'679	1'679
26 "	490,000	235,000	275,000	5'753	7'240	1'487
29 "	560,000	260,000	300,000	5'572	6'811	1'339
31 "	630,000	285,000	325,000	5'429	6'653	1'224
33 "	700,000	310,000	350,000	5'314	6'450	1'136
At 35th year	770,000	335,000	375,000	5'221	6'283	1'062
Beginning—						In favour of Corporation
36th year with.	770,000	335,000	235,000	5'221	3'937	1'284
37th "	840,000	360,000	252,000	5'143	3'870	1'273
39th "	910,000	385,000	273,000	5'077	3'870	1'207
40th "	980,000	410,000	294,000	5'002	3'870	1'132

would be the best means of reducing the ratio of these charges, they set about seeing where such development was possible; and after inquiry, they adopted (1) free cookers, (2) special rate for industrial purposes, (3) hiring-out radiators, and (4) carcasing or refitting houses.

Free Cookers.—Whether from the desire to save cooker rental or from whatever cause, we had been burdened for several winters with an uncomfortable accumulation of cookers returned from hire. Previous to this, and chiefly on account of the difficulty of collecting cooker rentals from slot consumers, we had to abandon the separate charge to this class of consumer, and had included all in the gas-rate, so that our revenue from cooker hires amounted to only 0.5d. on the total gas sold to consumers other than those on the slot system; and it was decided to venture the loss of revenue from this source in anticipation that it would be recouped by an extra sale of gas through the use of these cookers lying in stock. This policy resulted in a demand in excess of the stock, so that I had all stocks cleared. I have since instituted a periodical survey so as to see that cookers and grillers are being used; and where they are not, I get them brought into use or removed to the works, and satisfy further inquiries from returned stock.

Special Rate for Industrial Purposes.—In these days of competition with other sources of power and cheap fuel, we require to consider to what limit we can go in order to secure sales that would otherwise go past us; and my Committee agreed to reduce the price of gas used for industrial purposes to a rate which works out to an average of 2s. 2½d. per 1000 cubic feet, against 2s. 10d. for ordinary lighting purposes—equal to a discount of 20 per cent. In our present circumstances, this is equivalent to meeting all costs in full with the exception of interest on loans and the sinking fund, half of which only is covered. Had we reached this stage about twelve months sooner, we should have prevented the introduction of at least one producer plant. We have since decided to give a further discount of 5 per cent. on all industrial accounts exceeding £100 per annum; and by this further concession we have secured a new consumer who hesitated between producer and town gas.

Hiring-Out Radiators.—Many years ago I tried the hiring-out of gas-fires, offering both simple hire and hire-purchase; but my experience then with stoves returned after one season's use was such that I have since always avoided the hire of heating-stoves.

The gas-fire cannot, after use for one or two seasons, be freshened up at a reasonable cost to admit of its going out again as equal to new. With radiators, however, we have a field which I think we should cultivate. True, the consumption is low. But I look to the upkeep being small; and a rental sufficient to meet capital charges and upkeep, irrespective of consumption, will still be low enough to induce business.

Fitting-Up New and Re-fitting Old Properties.—Fitting-up new properties with gas pipes and brackets seldom comes within the scope of our towns in Scotland, as these are invariably provided by the proprietors; so that our field in new properties is a small one. But, through making a comparison of the burgh valuation roll with our survey-book, we were able to make up a roll of all premises within our area of supply which did not use gas. This roll gave a total of 1345 premises not on our book, from which there fell to be deducted for premises unsuitable or already lighted by electricity 131, leaving a roll of 1214. A survey of the district brought out the following details:—

(a) Willing to have gas if slot-meter fixed, and already gas-fitted	Houses. 191
(b) Willing to have gas if slot-meter fixed. No gas fittings, or fittings in bad order	799
(c) Will not have gas	990
(d) Empty houses	142
	82

The houses where gas-fittings were in good condition were immediately taken in hand and supplied through slot-meters. The other 941 were chiefly premises where gas had once been fitted, but where, by long disuse, the fittings and pipes were in bad repair, and the proprietors would not go to the expense of gas-fitting. An estimate was made of the average cost of fitting such premises complete with brackets, and was reckoned at 20s. per house of two apartments. The capital charges for interest and repayment in five years for this internal work came to 4s. 6d. per meter per annum; and it was proposed to make an extra charge of 6d. per 1000 cubic feet above the usual rate for five years in order to repay this sum.

At first there was some difficulty with the Landlords' Association; but, having satisfied them that it would not be to our interest to remove the fittings again when once they were in, we had no further difficulty, excepting that of meeting the demand, and quite a number of those appearing on the list as "Will not have gas" were among the applicants. Instead of undertaking the work with our own staff, we invited tenders from local tradesmen, and issued a detailed schedule (see p. 92).

This obviated difficulty as to time taken by tradesmen to do the work, as they were responsible to their employers; and when men know that work is under contract, they usually act accordingly. The measuring-up was done fortnightly, and included inspection—representatives from the Gas Department and from the contractor going over the work together. Our own men afterwards delivered and fixed cookers or grillers, everything being in readiness for the final connection. The cost of the pipe to the griller or cooker was not estimated in the 4s. 6d. annual capital charge. Within six months we had fitted 620 houses in this manner, and 170 were fitted in houses already piped. To this scheme we mainly attribute our increase of 7,347,000 cubic feet, being 11.7 per cent., in the gas sales during the past nine months, and this in the face of very dull trade, which would undoubtedly have brought about a decrease under ordinary circumstances.

DANGEROUS GASALIERS.

While on the subject of distribution, I would just like to note that the London Gas Companies not only advise the removal or conversion of the water-lute gasalier, on account of the danger

city in September, 1882, to read therein an informal discussion on the use of oxide of iron. From I can only find five works where oxide was then in use—viz., Dundee, Greenock, Kilmarnock, Alexandria, and Old Kilpatrick—and in all these cases lime was also used. This number did not greatly increase, as, owing to the difficulties attendant on its manner of use at that time, oxide got a bad name as being dangerous, from firing and other causes; and as late as 1901 the numbers were still comparatively small. Since then, however, they have rapidly increased, and inquiries as to the best mode of working oxide, even from works making as little as 4 million cubic feet per annum, are being made, and the advantage to large midsummer resorts in keeping the boxes closed all summer, opening only in early spring and the late autumn, is one which keeps down to a very considerable extent the prejudice against gas-works. For works in Scotland making less than 10 millions per annum I would not recommend the exclusive use of oxide; but good results have been obtained by using two tiers of oxide and a top tier of lime. In works producing more than 10 millions, I would have no hesitation in using oxide alone, with revivification *in situ*. To get the best results, the air should be admitted in such manner that it can operate on the material which has already been sulphided; and this it will fail to do if there is sulphuretted hydrogen present in the gas along with the air. It is therefore necessary to absorb the greater portion at least of the sulphuretted hydrogen in a box of active oxide, and the air on passing on to the sulphided material in presence of the purer gas, will speedily revivify it. With the older system of working oxide, it did not pay, as a rule, to work material beyond 55 per cent. or so, as the labour in emptying and refilling greatly increased the cost. What the limit may be now, I am not yet able to say; but I am experimenting on this at present. One of our boxes filled in February for running on to October is loaded as follows: Bottom tier, with 51 per cent. sulphur; middle and top tiers, 57 per cent. All our testings are on the dry basis.

LIME PURIFICATION.

In small works with large purifying area, remarkable results may be obtained by the admission of a small percentage of air to the boxes. I know of one works with an annual make of less than 10 millions, and with four boxes, each 12 feet square, where a cover was not lifted for fully twelve months. The reaction I take to be as follows: $\text{CaH}_2\text{O}_3 + \text{H}_2\text{S} = \text{CaSH}_2\text{O} + \text{H}_2\text{O}$. The water formed absorbed the CaSH_2O , and kept the material in an open workable condition. This is only possible with very large boxes out of all proportion to the make of gas.

Discussion.

Mr. W. B. M'Lusky (Perth) thought all present would agree that the President's address had been a most interesting and practical one. Without attempting to institute comparisons, he believed it was an address which appealed to more of their number than any that had been delivered for many years past. He thought the President was to be complimented particularly on the survey he had made of non-consumers in Airdrie, especially as it had resulted in an increase of some 790 consumers of 9000 feet each per annum. This result was all the more gratifying when they considered that it had been realized without any capital expenditure. The only initial outlay was the installation; and this capitalized had cost but 4s. 6d. per annum to the consumer, who was called upon to pay it in addition to the ordinary fixed charges. Looking into their experiences of the large costs of making extensions, and how disappointing they were sometimes, they could understand what this meant. Here was a case where they induced some 790 consumers to come and burn gas off the existing plant. The President had mentioned power rates. In this respect he (Mr. M'Lusky) did not think, considering the part of the country in which the President was situated, that he had been very progressive, because compared with Alloa and other towns the 20 per cent. discount named was not enough. In his own remote part of the country, he found it necessary to give rates which were equivalent to 50 per cent. reduction on the ordinary rate. He had a sliding-scale beginning with 2s. 6d., and falling by 2d. per 1000 cubic feet of gas consumed to 1s. per 1000 cubic feet. They conformed with a clause which required that the rates should be the same to all persons in like circumstances. He did not understand how free cookers were allowed; and the objection which certain legal gentlemen in the country took to them was that their free distribution was not available to all classes of consumers. For instance, they were not wanted in offices. He himself believed in supplying cookers as cheaply as could be; and he had a nominal rate of 2s. per annum. With regard to fires, the President had had a peculiar experience, or otherwise he (the speaker) had, because out of 5700 gas appliances in Perth, only something like 3000 were cookers; the other half being divided between fires and small cooking-stoves. This was a large proportion of heating apparatus. The fires he did hire out were all of the very best class—majolica, in a great many instances—so that if a consumer wished to change, there was no damage when returned. He would like to ask the President what he meant by the statement, "the former conditions of gas-works labour."

The President: The explanation is this—that in one district trade might be very brisk, and you would have to advance the men perhaps 6d.; and when the boom was over the men would kick if you tried to take off the 6d.

Mr. M'Lusky thought the expression possibly referred to the

old days, when the men saw fit to take half-a-day, or a whole day or a week, and wanted full pay. A good many of them had had this experience. As to sick allowances, he had a sliding-scale, whereby a twenty years' servant received three months' full pay, three months' half pay, and then six months' quarter pay; a ten years' servant had three months' half pay and three months' quarter pay; and so on, down the scale. Automatic controllers for street lighting had been mentioned in the address. He thought they had a very fine example of their working in Glasgow that foggy day. Of what value were they? They had to send out the lamplighters to light the lamps, because the automatic lighters would not do it. There was a good deal to be said in favour of pressure-actuated controllers. It would be interesting to hear from those who had experience what was the cost of these systems. He had another question to ask: Why did the President deny the managers of works producing less than 10 million cubic feet of gas the benefits of oxide of iron? He (Mr. M'Lusky) had a note of works making 4 million cubic feet, with small superficial area of purifiers, in which oxide of iron had been in use for five years, and the sulphur at present was 40 per cent.

Mr. A. YUILL (Dundee) said they looked upon the President's address at the Informal Meetings as giving them some debateable matter, together with the President's experiences from his own working; and he thought they all came there that day prepared to listen very attentively to what the President would have to say, more especially on the question of purification. They all knew the results he had had in purification with oxide of iron—in carrying on the work without requiring to open the boxes for a considerable period. This was a question which would be of benefit to them all; and the information the President gave ought to be profitable in their individual works. In the beginning of the address, the President gave them the debateable subject of corporation *v.* company ownership. On this question he did not say they were Socialists, but most of them had socialistic tendencies—that was to say, when they wished to satisfy themselves as to what was best suited for the whole town, he thought that those who had had experience of gas-works management in the hands of a company and in the hands of a corporation would admit that ultimately—and he used that word advisedly—there was no doubt that a works in the hands of a corporation was in the best interests of the consumers. Some of them had reason to know that, in the case of a company, when they found it convenient to increase their capital, the benefit went to the shareholders, and not to the consumers; but in the case of a corporation, while they might be paying a little larger sum at the beginning, they were repaying their indebtedness, and when they increased their capital the benefit ultimately went to the consumers. They were all at one with the President in the wrinkles he had given them as to the extension of business. He himself had found the introduction of free cookers to be a considerable benefit. In looking at this question, he possibly faced it from a different standpoint from others. In the works he had charge of, under a Corporation, he looked upon the subject somewhat from a socialistic point of view—he asked himself what was best suited to the consumers. No doubt meter-rents, charging for this, and charging for that, caused annoyance and worry to consumers; and the line he wished to go on, and intended to go on, was to give all the facilities he possibly could to consumers, and make one charge upon them, which was their gas-rent. It was found that the rental for gas-cookers came, on the total gas sold, to one-fifth of a penny per 1000 cubic feet. Therefore they had for years given gas-cookers free. In doing so, they were making a concession of only one-fifth of a penny. His experience had been that formerly they were troubled with cookers being returned. Many people wanted to have a cooker during the summer months; but as the winter approached, they sent to have it removed. When the summer came again, they saw they had made a mistake, but they were ashamed to go and ask for the return of the stove; and thereby a consumer was lost. Now he had thousands of cookers in use, and not more than about half-a-dozen in stock. Another point they saved by was in not requiring to have returned cookers cleaned up. They also saved in not having their capital lying idle. They saved a great deal more than if they were charging cooker-rents. Mr. M'Lusky was not able to take advantage of this on account of the terms of his Acts of Parliament; but in Dundee they were in a different position. There they had one who had the gift of foresight, and in their Act they had power to make, buy, sell, or "give" gas-cookers. The one word "give" covered them.

Mr. M'Lusky remarked that they had these words in their Bill; but unfortunately they went back to get more words put in, and they took that particular word out.

Mr. YUILL (resuming) said there were one or two other points he would like to mention. Automatic street lighting was a question that affected them individually. In a flat town, where the pressure was practically uniform, and they were able to give an increase of pressure as the evening approached, they would have an ideal condition for pressure controllers; but, in his case, with altitudes varying in every street, he found that they would be inoperative. They had a greater pressure in some districts in the day time than they had at night. He did not condemn pressure controllers, but said they were applicable to certain positions only. In reference to clock arrangements, they required to study these from a different standpoint. In Dundee, there were 5000 public lamps. It would cost about 30s. each to provide and fix the controllers. This meant £7500 of capital expenditure. Upon this they would have 3½ per cent. interest, and 2½ per cent. for sinking

fund; and if they added 10 per cent. for maintenance—clock arrangements were somewhat delicate—this was 16 per cent., which, on £7500, would amount to an annual charge of £600 over their present charge. He did not think he would be able to save the £600; and at the present time, when there was so much cry about non-employment, he would be a strong man who would say he was going to try to save by dismissing all the lamplighters. As one who had had experience of retort-house governors, he did not know that he was more thankful for anything than that he had introduced them. He had four 12-inch governors fixed, and had no trouble with them. They controlled the pressure to a uniform line; the variation of fluctuation in the hydraulic main being not more than 1 $\frac{1}{2}$ inch during the twenty-four hours. There was no trouble with the exhaust. He had a little difficulty at the beginning from corrosion being set up by the hot gases. He introduced about 3 inches of oil, which floated on the top of the water; and in putting in water to maintain the level, it was run below the oil level. Then the overflow was taken off by the syphon, also below the oil level. The oil prevented corrosion; and it also helped them to maintain the liquid at its proper height. The governors were put in about eighteen months ago.

Mr. J. NAPIER MYERS (Saltcoats) remarked that though they had a large programme in the address, he did not think there was anything in it which stirred either his strong sympathy or active opposition. It occurred to him as somewhat singular that both in the President of the day and the President of a year ago they had two of their most advanced students in chemistry and in engineering; and yet both of them had been tempted into the field of politics. Last year they had the question of the miners' strike and the coal-tax; and that day they had the question of individualist or collectivist control of gas-works. It had never been his experience to serve a corporation, except in a subordinate position. In his first list of figures, the President pointed out a difference in favour of company management of 4d. per 1000 cubic feet. Under one of the items—viz., rates and taxes—he put about 1d. per 1000 cubic feet. In his experience at Saltcoats, taxes were over 2d. per 1000 cubic feet; and he believed that his neighbours in Troon were over 3d. So that the experience the President had revealed showed him to be in very favourable circumstances in regard to rates and taxes. He had made a note of the subject of purification. He well remembered that last year they were told that, as the result of thirty years' experience, it was good policy to convey the gas downwards, instead of taking it, as was usual, upwards. He should very much like the President to give a moment's attention to this, and tell them what he would recommend.

Mr. S. B. LANGLANDS (Glasgow) said Mr. M'Lusky had stated that clockwork controllers would be no use on a foggy day. He (the speaker) did not know whether Mr. M'Lusky had studied the subject, but he might mention that the clockwork controller was set in such a manner that it could be turned on from the street. The day of their meeting was an abnormal one in Glasgow, and they ought not to treat things normal as abnormal. They had about three such days in the year in Glasgow. They had not put away all their lamplighters. They had to keep on some for cleaning purposes, and they could be called in to light the lamps; but this would be only in the centre of the city. His idea was to make every man his own maintenance man, and make him responsible for his beat—for lamps, mantles, condition of burners, and condition of reflectors. Every lamp man in Glasgow had 118 lamps to keep right. There was a flying squad of inspectors, who went round every morning and reported to him. It was very much easier for a man to handle a clockwork controller than to have 118 lamps to light. He meant to make them tackle the cleaning of 240 lamps, because he found, in his wanderings, that double the number of lamps should be handled by a man, for cleaning, when he had not the lighting to do. This was a large question. It was easy to dismiss it by saying they did not like the system; but there was a good deal in it. They had 450 miles of streets in Glasgow, and the altitudes were very varying, giving great differences of pressure—from 15-10ths down to as low as 5-10ths. If they put on a pressure system, they would have an adjustment to make for every altitude, almost for every lamp. It might be thought that the adoption of the clockwork controller had been decided upon quickly; but, as a matter of fact, he had been testing clockwork controllers for two years. He had had them in the most trying positions, and, in the case of one of them, he had only once had to adjust a bye-pass. He thought this was a very good result. The President had spoken about hiring-out radiators. He (the speaker) wanted to give them a word of warning. There was a limit to the radiator. If they had perfect ventilation in a room, they might use radiators, but otherwise they should not do so. As to dangerous gasaliers, they would see that, if they had pressure control of the public lamps, water-sealed gasaliers might be very dangerous.

Mr. THOMAS WILSON (Coatbridge) remarked that the President had given the meeting much subject-matter for discussion. He compared corporation with company management, taking a company paying a dividend of 5 per cent.; but they never had one which paid this dividend. The President would have been nearer the mark if he had taken 10 per cent., and 3½ per cent. for corporation borrowed money. If he had done this, and had added the redemption fund, it would not have amounted to 10 per cent. He thought the reason why corporations could not sell gas so cheaply as companies was that all the companies that were in operation before they were taken over existed for the mere pur-

pose of earning dividends, irrespective of the cost of gas and of the maintenance of works. Corporations no sooner acquired such undertakings than they discovered that they had to remodel the works, or put down new ones, which meant doubling the capital. In purification, he had one box filled with lime, one with oxide, and another with lime and oxide. In his opinion, if they took into account the loss in illuminating power of the gas by cleaning with oxide, as compared with lime, they would find that the latter, as a whole, was as cheap a purifying agent as the former.

Provost MACFARLAN, speaking of transfers of works from companies to corporations, said the question was really reduced to one of individual instances. If a corporation were made to pay an exorbitant sum for rickety works, it was quite understandable that the very first thing they had to do was just what Mr. Wilson had mentioned. He had been connected with the transfer of quite a number of works, and in Dumbarton they were exceedingly lucky in being among the first, if not the very first, to take over the gas-works. They did so by a Private Act of Parliament; and in their instance he had no hesitation in saying it had been a great boon to the community, because, for one thing, they got the concern at what might be called a fair price for compulsory purchase. No sooner had they obtained possession of the works than the population of the town commenced to increase; and from having a production of some 14 million cubic feet a year, they were now making about 90 millions. The Corporation had done pretty well; but no thanks were due to the Company, for they got their "pound of flesh" at the time. No doubt corporations were very apt to wobble for a year or two after they took into their hands such a new thing as a gas-works; and sometimes, if they had an exceedingly advanced engineer, he was very apt to tell them a great deal regarding what was required—and occasionally a little more than was really needed. After all, a transfer depended very much on the bargain made, and upon whether there were growth and elasticity in the community. No doubt in most instances—perhaps he should say in the great majority—the effect of acquisition by a corporation had been the benefit of the community, though they had had to pass through a period of trial. He congratulated the President upon not going beyond his depth. He kept pretty closely to what his own experiences had been, and to what he might fairly infer from them. He (Provost Macfarlan) would close with a few observations on the question of the staffing of gas-works. They could hardly help contemplating that troubles with workmen, instead of diminishing, were likely to go on increasing; and therefore it behoved everyone of them to look to the selection of the men for work. It had been his experience to have had some little trouble. At one time there was a trace of discontent, and he found that the man who was the ringleader in the affair was practically a pensioner in the works. This might be an exception; but there could be no doubt that the selection of capable and trustworthy men was a matter of the highest importance.

Mr. J. W. NAPIER (Alloa) said he should like to draw attention to a remark made by Mr. M'Lusky with regard to the powers which corporations had, working under the Burghs Gas Supply (Scotland) Act, in the matter of charging differential rates. He thought it ought to be made perfectly clear that the conductors of gas-works under the Act had a right to institute differential rates, because, taking a new interpretation of the clause to which he had occasion to refer quite recently, the deduction was made that all consumers in similar circumstances must be treated alike. Similarly with regard to those using cookers—they also must be put on the same basis. Therefore there should be no particular trouble with regard to gas-works operating under the Act. But there were cases, somewhat unfortunate, in which it had been found necessary to go to Parliament to get Special Acts; and in these cases there might be difficulty. He was not quite in agreement with the President about company *v.* corporation management. He was inclined to think that, in a matter of principle, having regard to the financing of corporation gas-works, a town council would eventually be able to sell gas much cheaper than a company. They had a sinking fund, which had the effect of lessening the first charge. If he took the case of Alloa, which was fortunate in having acquired the gas-works at an early period, he found that in the course of a very few years they would have to face a lower charge of fully £600 per annum. This was much a matter of finance. A company had no such liquidating taking place; and therefore his contention was that in this matter of the liquidation of capital a corporation stood to great advantage. He was very much in sympathy with the supply of free cookers, because where they instituted a differential rate to power consumers it might be argued that consumers using cookers who were also day consumers were entitled to consideration, which could be given by letting them have cookers free. In regard to differential rates for power purposes, he thought gas companies had not gone sufficiently far, because unless they instituted an exceedingly cheap rate, it was not possible to keep out suction gas. So far as Alloa was concerned, the matter was taken up at an early stage, and, on the basis of a differential charge from 2s. to 1s. 6d., they had been fortunate in keeping out suction gas. Recently a firm who generated electricity had determined upon coal gas as against suction gas. In his mind, this was ample evidence that suction gas had not a strong position where coal gas was sold at a specially cheap rate. In the matter of gas for power purposes, he considered that a differential rate was much more satisfactory than a definite one, such as obtained in some places, because the large consumer was the man who was most likely to go in for suction

gas, and therefore he was the most valuable to them, and, being so, was entitled to the best consideration. With reference to the possibility of men leaving their work without notice, it ought to be mentioned that the mere placarding of the extract from the Conspiracy and Protection of Property Act was not sufficient to prevent a stoker throwing up his work. It should be clearly understood that a separate agreement must be made between the employer and employee. With regard to the advantage of the use of retort-house governors, it had been his experience that the illuminating power of the gas had been kept so regular that it could be depended upon at all times to such an extent that they were practically stopping enriching.

Mr. G. R. HISLOP (Paisley) said he was glad to find that the President was on the right lines with regard to free cookers and the charging of special rates for power and commercial purposes. He thought he himself was possibly the first in Scotland to adopt the free-cooker system; and he had had no reason to regret it. As he had mentioned before, for five-and-twenty years or more he worked very hard, with exhibitions and otherwise, to induce people to take cooking-stoves. At the end of that period, they only had about 700. He proposed to his Committee to introduce a new system, and now, at the end of five years, they had 5000 stoves and 3500 grillers; and still the progress being made was exceedingly good. He learned the other day that 150 were on order just now. A special rate was a subject which should receive the consideration of all gas managers, in order to induce people to use gas. In any case the fixed charges would be the same; and if they could increase their output, there was a direct saving. He never was favourable to the leasing out of fires, and he was a little doubtful of radiators, unless they were put in the proper place, where there was sufficient ventilation. He took very good care that he did not interfere with private enterprise. They sold nothing; and they did nothing which would interfere with tradesmen outside. They were sometimes confronted by some person who thought he had been aggrieved by a piece of work they had done—sometimes a trifling thing which their gas-fitters might have done; and with such warnings now and again, they did take care not to infringe upon other people's provinces. He started a number of years ago with the hiring-out of slot-meters; but, so far as Paisley was concerned, the movement had been a distinct failure. He had bought none for five years; and the number was steadily diminishing. He might state, as a substantial reason for non-success, that he only supplied these meters to single apartment houses. They managed to convince people occupying larger houses that it was a loss of money to pay more for gas, simply to have the privilege of putting a penny in the slot. The subject of dangerous gasaliers was one they could not entertain too seriously. In his own experience, he could mention many very narrow escapes of life owing to them. He had been in the habit of tying up gasaliers with copper wire; so that, if the weights did drop off, the gasalier was kept in position. If they could not be disconnected, this was the next best thing to do. But the day was not far distant when such gasaliers would be prohibited. His experience was that water gas was 2d. or 3d. per 1000 cubic feet dearer than coal gas. As they knew very well, he was a strong advocate of the use of both oxide of iron and lime for purification. He maintained that, in Scotland particularly, the amount of carbonic acid which they found in the gas was really too great to be utilized by enriching material; and down to the smallest works he invariably recommended both lime and oxide. They got most out of their product in this way—the oxide to take up the sulphuretted hydrogen, and the lime the carbonic acid. In England, where they seldom had more than 1½ per cent. of carbonic acid, it was not such a serious matter; but where they had 2½ per cent. or more of carbonic acid, it was, in his opinion, necessary that they should employ lime. The two materials should never be used together, but be placed in separate purifiers.

Mr. A. MACKAY (Montrose) observed that he required to push his business against their electric friends, and in this connection he was thankful to the President for mentioning the subject of the extension of business. He introduced free cookers about September last, because at that time of the year cookers were being thrown back upon him—people saying that they did not want them during the winter months. When he went to Montrose he started gas-fires; but after two years' experience he had to discard them. With regard to the fitting of houses, he quite sympathized with what Mr. Hislop had said. It certainly interfered with local plumbers; but when they found these people canvassing for an electric company, they had to take up the matter of canvassing for themselves. About two months ago he started a scheme of piping houses, charging 4s. for every light—supplying piping, brackets, incandescent burners, mantles, and ordinary chimneys complete. It paid him to do this. The course he took was that, instead of making a survey, he took two streets at a time. He had up to this time only managed to get about six streets done; and he fancied that he had got 10 or 15 new consumers in that area.

The PRESIDENT, in closing the discussion, explained that, with reference to capital charges for extensions, they sought to recoup themselves to the extent of 4s. 6d. in five years; but they did not include in this the cost of the service or the meter. The cost of these was a capital charge against every consumer, which was recovered in the ordinary way—by the price of gas. He happened to be one who made a number of experiments in the matter of automatic lighting from a pressure-operated controller point

of view; and when he told them that his patent expired a few months ago, and he did not renew it, they could understand his opinions about it. A pressure operator worked all very well in one room; but when they came to town distribution, it had not the ghost of a chance. The circumstances were too varying to admit of it being within the scope of practical politics. He denied the use of oxide to works of under 10 million cubic feet, for the reason that there was a slight falling off in illuminating power where oxide only was employed, and in a very small works the staff was not, usually, sufficient to cope with these variations in illuminating power. It required more attention than would pay; and therefore lime was more suitable in a small works. In the matter of free cookers, a point which swayed them was that the cost of changing from time to time practically swallowed up all the rental they got from the cookers; and they considered it was better to give them free, and let them stay out, rather than to collect money which they simply had to pay out as wages in the cost of removal and cleaning. He was very pleased to have had Mr. Yuill's opinion as to the use of retort-house governors; and many others who were considering the subject would also be glad to have this opinion. Mr. Myers was on the wrong tack in his references to rating. The rating he took was only the tax on their 1½ per cent. sinking fund—not their whole tax. If they were to take into account the whole rates, they would be as heavily handicapped as most people in the matter of rates. With reference to the hiring-out of radiators, he should like to mention that nearly all their radiators were put into halls or places where there was fairly good ventilation. In one or two cases people came and asked to have radiators put into bedrooms; but he told them he did not advise it, and that if they took them, it was at their own risk. The steam-heated radiator he could quite recommend for offices and halls; and it was for these purposes that he had been recommending them. As to his taking a company with a dividend of 5 per cent.—well, most companies who were paying 10 per cent. were looking about for some way of watering their capital and calling it 5 per cent. If they divided the capital by one-half and called it 10 per cent., they would find that the same figure dominated. He was surprised to hear anyone say that purification by lime was cheaper than by oxide. He did not advocate oxide alone if they had plenty of purifier capacity. If he had eight purifiers, he would not have oxide alone; but with four purifiers, he was quite prepared to face purification with oxide alone. With eight, he would use four with oxide, two with lime, and two afterwards, with oxide, as catch boxes. As to labour troubles, there was no doubt they would have to deal with the workman who knew all about every place except his own. It was not easy to "spot" who was the man; and when they did "spot" him, if the works were in the hands of a corporation, it was not easy to oust him. It was his view that corporations eventually had the benefit in the matter of the transfer of an undertaking. In seeking extension of business, he did not ignore the trade—he thought it well to keep it with him; and it was by a local tradesman competing and giving in prices for the work that he was able to undertake it so speedily and at such a low figure. He was a little surprised to hear that at Paisley slot meters were not a success, because his experience was that they could scarcely send out the meters fast enough. Perhaps one of the reasons was that they asked for deposits from all consumers of gas by ordinary meter; and people would not face this nowadays, when they could get a slot meter at very little more cost. What they gained most of all was in netting the paraffin oil consumers—people who were not likely to be consumers of gas unless they got it at a penny a time. He did not know that there was any other point upon which he could say anything. One subject he would like to have had fully discussed—one which was much before them at the present time—was that of distribution at high pressure. But there was not time; and he had only to thank the meeting for their patient hearing.

NEXT YEAR'S PRESIDENT.

Mr. M'LUSKY proposed Mr. J. Ballantyne, of Hamilton, as President of the Informal Meeting next year.

The PRESIDENT seconded the proposition; and it was unanimously agreed to.

Mr. YUILL proposed that Mr. M'Lusky be reappointed Convener of the meeting. This also was unanimously agreed to, and Mr. M'Lusky accepted office.

The managers and their friends, to the number of more than a hundred, subsequently dined together in the hotel—Mr. Vass in the chair. The toast of "The King" was the only one that was proposed; the after proceedings being devoted entirely to music and recitations.

Eastern Counties Gas Managers' Association.—The spring meeting of the Association is fixed for the 21st inst., at Stamford. The programme includes two papers—"Gas Practice at Great Yarmouth," by Mr. W. J. Carpenter; and "Tar for Roads, Drives, Yards, Garden Paths, &c.," by Mr. J. H. Troughton. For the following day a visit has been arranged to the fire-clay works of Messrs. Williamson Cliff, Limited; and should time permit, there will be a drive through the grounds of Burghley House, the seat of the Marquis of Exeter.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Round Oak Steel Works.

On the invitation of Mr. George Hatton, Managing-Director of the Earl of Dudley's Round Oak Iron and Steel Works, Limited, Brierley Hill, about fifty members of the Association paid a visit to the works last Tuesday evening.

The Round Oak works comprise blast-furnaces and accessory plant for the production of pig iron from iron ore; puddling furnaces and rolling mills for the conversion of pig iron into puddled bars and finished wrought-iron sections; and works for the manufacture of chain and cables; steel works of large capacity, and equipped throughout with the most improved and up-to-date plant for producing finished steel sections by the Siemens-Martin basic open-hearth process. In addition to these various works, the Earl of Dudley also owns a considerable number of coal, iron ore, and fire-clay mines in the immediate neighbourhood; but the time at the disposal of the visitors was short, and attention had therefore to be directed to the steel works alone. Mr. Howard, the Chief Chemist, and his assistant conducted the party round; the metal mixing plant being first inspected. This consists of a huge horizontally fixed barrel-shaped gas-fired furnace, capable of circumferential movement by hydraulic power. The pig iron received from the blast-furnace is melted on the hearth, and motion given to the furnace, with the result that the various classes of pig iron are thoroughly mixed, and also the amount of carbon silicon and sulphur in the metal is materially reduced.

The Siemens furnace was next visited; and there the operation of charging a furnace was watched with great interest. The pig iron, scrap, oxide of iron, and limestone forming the charge were contained in iron boxes on waggons; and these were brought up to the furnace-mouth by an electric charging machine. The ram of this machine engaged in the box holding the charge, lifted, and carried it into the furnace, and deposited the material on the hearth by turning partly to the right and then to the left, in a somewhat similar manner to the action of the scoop in a West's charging machine. While this was going on, a huge ladle of molten metal had been brought up from the mixer previously described; and by the aid of a powerful crane, the ladle was lifted and the metal emptied on to the furnace hearth.

Attention was then directed to the tapping of a furnace. The ladle for receiving the molten steel was carefully dried by fires, as it was explained that the slightest dampness in the ladle lining would produce an explosion, and cause the metal to fly in all directions. The steel, on being tapped, ran out in a stream, and in so doing gave a pyrotechnic display of extraordinary brilliance. The slag, by virtue of its specific gravity, rose to the top, and, as the ladle gradually filled, overflowed into an adjacent bosh. The ladle was then moved over the top of the ingot moulds, and each mould filled. The ingots were then stoppered by throwing sand on the surface of the metal, and an iron plate was wedged tightly on the top of the sand. When the metal was sufficiently set, the moulds were stripped; and the ingots would be taken as required to the soaking pits, where they are heated to the required temperature for rolling, and thence to the mills, where they finally emerge as finished sections.

During the interval between the charging of the one furnace and the tapping of the other, the chemists of the party were interested in the description given of the methods adopted in analyzing the steel. A fairly accurate analysis of the chemical composition of steel is required before each furnace is tapped; and as this is made in about 25 minutes, it was evident something was to be learned in the way of rapid methods of analysis. The chemical reactions taking place on the furnace-hearth, whereby the carbon, sulphur, silicon, phosphorous, and manganese in the charge are eliminated, were explained and discussed, as well as the method of re-carbonization by adding red hot ferromanganese to the molten metal as the ladle fills.

The producer gas plant was examined and the Siemens' regenerative system explained. In this system, two separate and distinct regenerators are used; and these are large chambers filled with open fire-brick chequerwork. The waste gases from the furnace-hearth on their way to the chimney are made to pass through one of these, with the result that some of the heat from the waste gases is absorbed by the fire-brick lining, and the temperature of the brickwork is raised. The travel of the gases is now reversed. The waste gases are taken through the other regenerator while the secondary air and producer gas travel in an opposite direction, over the heated brickwork of the first regenerator, which in turn gives up its heat to these gases.

Very little time was now left to examine the other portions of the plant, such as the boilers, electrical and hydraulic machinery, rolling-mills, testing apparatus, &c. A hasty glance at these on the way out only served to emphasize the regret that a thorough inspection could not be made.

Though the manufacture of steel is, of course, only of general interest to gas engineers, yet it was admitted on all hands that the visit had proved most profitable and instructive; and Mr. Hatton's kindness in affording the members the opportunity was suitably acknowledged.

Mr. John Nicholls, the Manager of the Crewkerne Gas-Works, died last Tuesday, after a brief illness. He was well known and highly esteemed in the town.

BUYING COAL ON ITS CALORIFIC VALUE.

Among the large purchasers of coal who make their contracts on the basis of the number of thermal units in the fuel delivered is the Municipal Traction Company of Cleveland. At a recent meeting of the Cleveland Section of the American Institute of Electrical Engineers, Mr. L. P. Crecilius, the Company's Superintendent of Power, described the methods followed in making these purchases. The following particulars in regard to the matter are reproduced from "Engineering Record."

There are now available in the Cleveland market in extensive quantities two principal grades of bituminous slack—one coming from the western section of Pennsylvania, and the other from the eastern part of Ohio—the better of which is known as Youghiogheny gas slack. For a period of about two months before the contract was put into effect, the Company made certain evaporative tests to determine the relative steam-making qualities of Ohio bituminous slack and Youghiogheny gas slack. These tests clearly indicated that with the furnaces as constructed, and the draught available, both slacks could be burned with equally good results. The average chemical properties of the two kinds, per pound of dry coal, are as follows:—

	Youghiogheny Gas Slack.	Ohio Bituminous Slack.
British thermal units	13,185	12,614
Ash p. ct.	11.60	13.80
Sulphur	2.03	3.53
Volatile combustible matter	31.95	36.62
Fixed carbon	53.52	45.55

The relative evaporation per pound of coal as fired was 7 per cent. in favour of the Youghiogheny gas slack. The inherent moisture contained in the coal in the first case is 1.52 per cent., and in the second case 2.7 per cent.

Each day's consignment of coal furnished to each power plant by the contractor during the continuation of the contract is sampled by the superintendent or his authorized agent, and analyzed to determine its heating value. The price paid by the Company per ton per car of coal is based on a table of heat value for excess or deficiency of the standard contained in the contract, but subject to further deductions for ash and sulphur.

A small quantity of coal is taken from at least five different places in each car received, by driving into the coal a 5-foot ram, before the car is unloaded. The quantities thus received from each car of coal of the day's consignment are thrown into a receptacle provided for the purpose and thoroughly mixed, and a properly selected sample of the mixture is taken for chemical analysis. Half the sample of the average mixture is labelled and held at the Company's laboratory for a period of two weeks after unloading the cars. The other half is analyzed as soon as possible after being taken. No other sample is recognized.

Tests of the sample taken from the average mixture are made by the Company's Chemist under the supervision of the Superintendent. Should the contractor question the results of the test (a copy of which is despatched to him), the Company will, if requested within three days after the copy has been sent to him, forward the other half of the sample to any laboratory in Cleveland which may be agreed upon, and have it analyzed there. The results obtained from the second test are considered to be final and conclusive. In case the disputed values as obtained in the Company's test are found by the second test to be 2 per cent. or less in error, the cost of the second test is borne by the contractor; but if the disputed value is found to be more than 2 per cent. the cost is borne by the Company. Should no question be raised within the three days specified, the second sample of coal is destroyed at the end of two weeks from the date of unloading the cars from which it was taken. Should a second test be made of the sample of the average mixture, any penalties to be made will be based on the results as obtained from the second test.

Coal which is shown by analysis to contain less than 15 per cent. of ash and 3.5 per cent. of sulphur is accepted without any deduction from the basic contract price, *plus* or *minus* an amount of excess or deficiency of B.Th.U. value. Where the analysis gives amounts in excess of these quantities, deductions are made from the basic contract price in accordance with the penalties provided in the contract, *plus* or *minus* the amount for excess or deficiency of the standard value.

The table of penalties is so proportioned as to focus the attention of the dealer to supplying Ohio bituminous slack of a value ranging from 12,500 B.Th.U., the standard in the contract, to 13,125 B.Th.U., 5 per cent. above the standard; which results to him in the best profit obtainable. To have protection against the supply of fuel which, though having a high calorific value, may, by reason of its chemical composition, not be entirely adapted to the stoker equipment, a limit has been placed in the table above which no further premiums are paid. Almost immediately after the contract came into force, there was a marked difference in the cost of efficiency of the entire plant, accompanied by an improvement of some 8 per cent. in the consumption of coal per kilowatt-hour.

The conclusions arrived at were: (1) That the installation of the scheme of purchasing fuel on the B.Th.U. value basis has been justified in this case. (2) That, due to the difference in price as existing between Youghiogheny gas slack and Ohio bituminous slack, the latter is the cheaper fuel to use—admitting, however, the superiority of the former over the latter.

COMMERCIALISM IN THE GAS BUSINESS.

By PHILMER EVES, of Indianapolis.

[Extracts from a Paper read before the Indiana Gas Association.]

"Commercialism" may be defined as the adoption of profitable and legitimate means to advance business interests. This precludes the escape of the technical gas man from participation in a general interest in the selling question—the commercial side of the gas business. In all business, whether competitive or unopposed, it is policy to produce the finest goods for the money, and to deliver the goods by as pleasant and acceptable a system as can possibly be devised. Too little is sometimes allowed for the beneficial effect of a satisfied and contented community. Here the gas manager or the gas superintendent and the distribution officials get in some of their best work, and pave the path, the "nearer way," to the goodwill and patronage of the public. It is an inspiration to associate commercially with an intelligent and up-to-date manager, who is wise to insist in all his departments on courtesy and the square deal.

A polite affability on the part of the street foreman and the meter inspector is one of the most valuable assets of a gas company; while a stubborn foreman or an uncivil meter reader could make business development difficult, if not impossible. And while the public are perhaps smarting under the effect of a dull year of trade, and feeling somewhat unapproachable, and especially where competition or probable competition propagates prejudice and unsettles the mind of the public, it is well for the sales manager and the officials of the contract departments to give all the assistance possible to the outdoor foreman, by seeing that the preliminary and necessary information, as well as the proper consent, has been previously secured.

The commercial or sales department has two distinct and inseparable duties to perform—first, to sell gas and gas appliances; second, to see that the fullest and most economical use is made of both the gas and the appliance. This selling of gas and appliances is being accomplished by many methods, and no two gas companies can adopt exactly the same system in every detail. But a general system, bringing perhaps the best results, is that afforded by the card census, which, though occasioning considerable expense and labour to instal, has proved to be productive of gains in appliance sales and gas output. This system is in operation in Indianapolis. The advantage of the card information, when once obtained, is in enabling the salesmen or canvassers to see the possibility for likely business when making their calls. The actual conditions are known, and much time is saved in ascertaining these conditions on each visit; while the classifications of the cards will simplify and specialize the advertising literature delivered at each call.

Residents and business men who are not using gas at all should receive the most persistent attention, and they occasion, through their inexperience, the most careful handling. Once get them to use gas, and to use it intelligently, and the other sales will naturally follow. The people most easily persuaded are those who use gas for lighting, but have not yet bought cooking and water-heating appliances. They know from public opinion the value of the gas-range and the water-heater; and it is only a question of constant persuasive effort to bring them up to the more advanced classification. After they have reached this higher class, it is surprising what may be done in the way of getting them to increase the aggregate gas sales. It is among this class of patrons that the largest number of orders are secured for the sundries, which all count, such as the iron-heater, the toaster, the domestic gas-iron, the cake-griddle, and many other appliances that are helpful to the consumer and a source of additional income to the gas company.

The question of the employment and payment of canvassers has always brought out a variety of opinions. What pays in one place may not be the best paying system in another. Payment of commission appears to risk having the largest number of worthless sales and losses; while the straight-salary plan is equally inadvisable in the opposite direction. The combination found to possess the smallest number of objections appears to be salary and prizes, with an increase of pay to the best men—the prize winners. This method stimulates the personal interest, creates, by fair competition, a desire to win, and affords the best means of displaying the comparative worth of each man for the weekly inspection of all.

The question of the commercial department's policy of selling gas appliances on a profit-bearing basis, as against selling at cost or at a loss, has been so often discussed, and the opinions on this question are so diverse, that it may not be productive of much profit if attention is invited to the point again. It may, however, be said advisedly that the opinion seems to be growing in favour of considering that the time has gone by when gas companies can afford to put out appliances at or below cost. The general expenses of operating the appliance department and the warehouse or storeroom, the reasonable and unreasonable demands of gas consumers, the necessity of subsequent inspections of appliances sold, the cost advisedly incurred in giving instruction to patrons, the expense of appliance repairs, and the attention which must be given to troubles arising from the misuse of appliances, to say nothing of the cost of connecting the appliances and of advertising literature and soliciting, are all too well known to warrant

the putting out of goods without some margin of profit to partly defray this large maintenance cost.

The argument, which I admit is a strong one, that an increased sale of gas results from minimizing the selling cost of appliances, is somewhat weakened or counteracted by the comparatively new method of adopting selling prices that will encourage outside dealers and local agents to handle gas-ranges and other gas-consuming goods. This practice has proved satisfactory, not only on account of the additional co-operation secured in the efforts to put out the appliances, but in bringing in some business which probably might not be reached by the gas company's efforts alone. The danger or objection to this plan, if there be any at all, arises from the competition giving rise to exaggerated statements by the dealers and their assistants, who, of course, are not gas men, and who are not greatly interested in the customer after the goods have been sold and delivered. And, allowing for the dealer's strenuous efforts to sell his own goods, it is difficult to check the tendency to injure the reputation of the ranges sold by the gas company. The cost of connecting, free of charge, the ranges sold by these outside dealers, also counts against the plan, because the dealers, and not the gas company, get the profits. But, on the whole, it is considered that the dealers assist the aggregate output of ranges and some other gas appliances.

The policy of selling on the "easy payment" plan is almost universally favoured. By securing a controlling interest in the appliance, by means of the contract card, on "lease," as it is sometimes called, there is very little chance of loss of the appliance or loss through bad debts. Going back over a long period for data on this point, it has been found in Indianapolis that upwards of 200 gas-ranges were brought back and resold, and that the average amount received in instalments on these forfeited ranges was almost equal to the difference between the selling value of the second-hand ranges and new ones; so that the actual loss by the credit or monthly payment system is surprisingly small, especially where close watchfulness is exercised in the collection department.

Of the gas-ranges sold in Indianapolis during the past year, 73 per cent. were sold on the monthly payment plan, and only 27 per cent. of the purchasers paid cash. Industrial appliances and gas-engines, which, of course, represent larger sums of money, are put out on the contract or leasing plan; and this plan has rarely been found either a losing system or to have failed to secure acceptable industrial business. The water front in the kitchen heater is also in line with the gas company's efforts to give gas consumers a winter supply of hot water, so that the necessity of a coal-range for this purpose may no longer be raised or offered as an objection to the use of the gas-range all the year round.

The business outlook is now more encouraging. The demand of property owners for gas extensions shows that the value of gas and of having buildings piped for gas is becoming more understood and appreciated; and it is a fact that few people nowadays will rent a house that is not equipped for gas. The landlords also recognize the additional advantage in the use of gas-ranges throughout the year in the saving of cellar space and in the prevention of dust and damage to property arising from the use of hard fuel. The development of lighting appliances in the way of artistic adaptation, design, efficiency, and economy has received more universal and successful attention during the past year than ever before. Even this helpful advance may not be wholly the effect of commercial competition, but may be partly attributable to the greater effort put forth in the quieter times of business depression.

Gas appliances for cooking have been advocated for so long a time that the gas companies' territories have now been fairly well supplied. The chances for the sale of gas-ranges and other cooking devices are becoming comparatively smaller every year, and while the extension of gas-mains and the acquisition of new consumers along older mains may continue uninterruptedly to some extent, and while older ranges will be replaced by others of newer styles, the bulk of the harvest in this direction has been gathered.

At this opportune epoch there comes along the kitchen heater or coke attachment, whose welcome appearance has given rise to the almost universal remark: "Why was this necessary and extremely useful friend of the gas company and the gas-using public not introduced before?" Gas consumers can now be induced to use the gas-range throughout the winter, when without the kitchen heater the use of gas for cooking would be discontinued until warmer weather made the gas-range again an absolute necessity. It is, of course, well known that numbers of gas consumers have always cooked with gas throughout the year; but a large percentage in most towns have gone back to the coal-stove during the colder weather.

The steps hitherto taken in Indianapolis and other places to keep the gas-range in use all the year have resulted in a considerable increase in winter gas consumption. The visits and advice of the instructor or demonstrator have been valuable in this respect; and the diminution in the number of customers who request the temporary disconnection of the gas-range shows that the public are now becoming educated in this respect. But the kitchen heater is the more wholesale preventative of winter loss of gas sales; and it is acceptable alike to gas companies and the gas-using public.

Attention must be paid to the cooking classes at the public schools and the hospitals. The school classes are, as a rule,

presided over by competent graduates of domestic science universities and colleges; but it behoves the representatives of gas companies to visit the classes occasionally, in order to help the teachers to keep pace with improved gas appliances. It is found that suggestions along these lines are generally acceptable.

The Indianapolis Gas Company's cooking classes at the hospitals are welcomed by the authorities and the trained nurses. The nurses are instructed in the art of cooking a number of dishes suitable for the sick. Gas-ranges are used in this work—thus qualifying the pupils to use them intelligently when engaged as trained nurses in the city. The Gas Company's demonstrator is available to conduct these hospital classes. It has been found that the classes are frequently visited by medical men and friends of the hospital, which secures added goodwill for the Company and a valuable sentiment in favour of gas for cooking.

Undoubtedly the best-paying expenditure of time and money along domestic lines is that which provides the woman demonstrator—the "Gas Company's Cook"—all the year round for instruction work. Cooking demonstrations in the office, which she conducts, on busy days, are a means of advertising the advantages of the gas-range, and of assisting and instructing customers who experience trouble in getting the best results. Her visit to the home of every purchaser of a gas-range puts the novice on the right track, secures the fullest use of the range, and thus increases the aggregate gas sales. The printed list of all the dishes that may be broiled and baked in the two ovens of the gas-range, by utilizing the heat generated, and the quantity of gas that may be economized or saved to the consumer in this way, may apparently cut down the gas sales in the individual case; but the good effect gains the goodwill of the consumer, adds to the popularity of the gas-range, and will account for an increase eventually.

The cooking lectures which have been given in Indianapolis during the past few years, in connection with the churches, have been very popular and well attended. They have reached the largest number of interested women at the smallest cost. The cost of the hire of halls and other expenses have been saved. The advertising cost has been minimized, and considerable advantage has come to the Gas Company by the announcement of the meetings from the pulpit and in the schools. At nineteen of these church lectures, held in one month alone, the total attendance was 2796, or an average of 141.

The co-operation of plumbers and gas-fitters is an important asset. House piping must not be overlooked in the effort to gain additional consumption of gas. An amiable arrangement has been made in Indianapolis whereby the gas-fitters are brought into harmony with the Gas Company's objects. A uniform price of 20 c. per foot has been established for house piping. Orders obtained by the Gas Company are forwarded for execution to the various gas-fitters of the city, who in turn report to the Company all house-piping work secured by its own efforts. This mutual co-operation brings with it the friendliness of the plumbers and the additional gas appliance business which their influence secures. It keeps the card census up to date, and enables the canvassers to follow up the prospect for further sales.

The instantaneous automatic water-heater is becoming better known and appreciated, and furnishes hot water in homes and business houses that would not be adequately supplied from an ordinary small tank heater; while the tank heater itself is being more universally adopted in homes and business places.

Heating by gas has made some short steps in the right direction. Hitherto it has not been claimed by any experienced gas man that gas is practical and economical for the exclusive heating of residences or other buildings; but with the advent of the gas-steam radiator some business may be secured, to the mutual advantage of the user and the seller of gas. This radiator has been installed to heat one of the largest schools of Indianapolis; and as the sessions extend over only five hours of each day, gas-steam heat is found more economical than to pay for an engineer and hard fuel to run the boiler. Other buildings, such as lodge-rooms, churches, and similar places, where only occasional meetings are held, or where supplementary heat is needed, can be economically heated by gas.

Gas companies are now giving more serious attention to the industrial field, and it is in gas appliances using gas for industrial heat or power that the gas industry must turn for most of its future business development. Gas-engines are being perfected and brought up to guaranteed economy. Manufacturers of gas appliances and gas men themselves are inventing burners and contrivances to meet practically every industrial requirement.

One of the best methods of keeping up with the development of industrial appliances, and of influencing this branch of a gas company's business, is to procure the latest catalogues and descriptive literature, and to watch the advertisements in various newspapers and gas publications. The latter are now devoting more editorial and descriptive space than ever before to this fast-growing and all-important problem, and publishing reports of experience and experiments. The industrial gas business is yet in its infancy; and where the extension of sales is a question of education and demonstration, it is advisable as well as necessary to find out what gas appliances can supplant the more primitive devices, and offer to instal the modern apparatus on trial. This method of granting a reasonable trial removes the obstacles of ignorance and incredulity, and, in most cases, nets a profitable patron. Difficulties arise from the workman's prejudice, careless manipulation, or want of proper pipe connections or air supply in appliances procured without the intervention of

the gas company. To overcome these drawbacks, the gas company's expert mechanic must visit the appliances regularly during the period of experiment, and give the necessary information and advice to the owner of the industry, as well as personal assistance to the machine men or the engineer.

In conclusion, we may say advisedly that, with good gas, the best lighting, cooking, heating, and power appliances, and the determination of the appliance makers to keep ahead of the times, commercialism in the gas business will mean more and more as time goes on.

BOGHEAD CANNEL EXHIBITED AND DESCRIBED.

At the Meeting of the London Section of the Society of Chemical Industry held at Burlington House on Monday of last week, Mr. Watson-Smith exhibited a specimen of the "now extinct Boghead cannell coal" or "Torbanehill Mineral."

At the request of the Chairman (Mr. E. Grant Hooper), Mr. Watson-Smith gave a brief historic and chemical description of the mineral, of which the fine specimen exhibited had been presented to him by the late Dr. Percy. He referred first to the litigation in the Edinburgh Courts, in the year 1853, between the lessors and lessee of the property on which the mineral was found, as to whether or no it was a coal. The right of the lessee to work it depended on whether it was comprised under the term "coal;" and though it was undoubtedly on sale as a gas coal, it was nevertheless contended that it was not a coal but a bituminous schist. Many scientific witnesses were called and asked to define what they understood by coal; but the Judge, in summing up, recommended the Jury to disregard the confusing and conflicting definitions thus tendered by the scientists, and to consider whether the mineral was coal in the ordinary language of those who usually trafficked in it, and in the acceptance of business transaction. The Jury decided that the mineral was coal—thus confirming the opinion held by A. W. Hoffmann, Thomas Graham, J. Stenhouse, Edward Frankland, and a number of other eminent chemists of the day.

A contrary decision, however, was given by the German Customs Official Court in Berlin, when the question was raised as to whether Boghead cannell could be imported into Germany free of the duty which was levied on importations of bituminous gas coal. The Boghead cannell was being imported by one of the two competing Gas Companies at Frankfort-on-the-Maine—the one Company making coal gas and the other gas from resin, fat, &c. The Customs Court decided that the mineral was not a coal, but merely a bituminous substance. The arguments adduced by the scientific witnesses turned very much on the question whether, on distillation, the mineral yielded benzene, the formation of which was then believed to be characteristic of coal. On the other hand, the large percentage of ash in the Boghead mineral was quoted in support of the bituminous schist classification. Even the classical definition of coal given by Dr. Percy, under which Boghead or similar schist would be excluded from the category of coal because of its large content of incombustible matter, would, however, Mr. Watson-Smith pointed out, fail if applied to more recent discoveries, such as Japanese Muke coal, which is now always regarded in commerce as a coal.

Boghead cannell was found in position not different from that of coal; and was won in rhomboidal blocks. It afforded on gas-works 3000 cubic feet more gas per ton than other cannells, and the gas was of higher quality. A somewhat similar cannell had since been worked at Breckenridge, in Virginia; and a specimen of this was also shown by Mr. Watson-Smith. The various cannells, &c., were distinguished by the proportion of their contents which was dissolved by benzene. This rose from 0.6 per cent. for Boghead to 1.06 per cent. for Breckenridge and Wigan, and 9.5 per cent. for Japanese Muke coal. The Boghead mineral ignited readily, burnt with a white smoky flame; split and cracked in burning, without intumescing; and yielded on the average 21 per cent. of ash. Its specific gravity was 1.15 to 1.21. It yielded 31.7 per cent. of coke, which consisted of 33.4 parts per cent. of carbon and hydrogen and 66.6 parts of ash.

At the close of Mr. Watson-Smith's remarks, Mr. Oscar Guttman observed that, in the Siege of Paris, the French used the ashes of Boghead cannell as a substitute for kieselguhr in the preparation of dynamite.

Analysis of the Accounts of Water Undertakings.—It will be seen, from an announcement which appears elsewhere, that the annual analysis of the accounts of the Metropolitan Water Board and of some of the principal water undertakings of the United Kingdom, which is compiled by Messrs. Wood, Drew, and Co., of Queen Street, E.C., is now ready. The accounts of the Water Board dealt with are those for the year ending March 31, 1908, and, for purposes of comparison, an analysis is given of those of the Metropolitan Water Companies (including the Staines Reservoirs Joint Committee) for 1903-4, the final year of their existence. In the other cases, the accounts taken are for 1907-8, and the analysis is presented in practically the same form as for the preceding year, but with a few alterations in the setting-out of the tables. This is the twenty-eighth year of publication of the book, and its characteristics are too well known to call for special notice. It is published at the office of the "JOURNAL," and the price is 15s.

CALORIMETRIC CONTROL OF FUEL CONSUMPTION

In the notice of the Smoke Abatement Exhibition at Sheffield which appeared in the "JOURNAL" for the 9th ult., it was mentioned that conferences of manufacturers and local authorities were to be held to discuss questions bearing upon the production and prevention of smoke. A conference of local authorities took place the previous day, when Dr. R. Lessing, F.C.S., read a paper on "The Calorimetric Control of the Supply and Consumption of Fuel."

The author began by recognizing the success which has of late years attended the various smoke abatement organizations in fighting the great evil of smoke production, though they had, he said, been strenuously opposed by prejudice and ignorance. Unfortunately, the manufacturer, and generally the coal consumer, looked upon the production of smoke as a welcome sign of industrial prosperity; and far from acknowledging the existence of a "nuisance" arising from it, he regarded rather in this light the societies and their executives who worked to abate it, on account of the prosecutions he had to fear from them, and which added to his already numerous worries. He (Dr. Lessing) thought there would be a possibility of bridging over the gulf separating the negligent coal consumer and the exponent of the right to a pure atmosphere, as soon as it was brought home to the manufacturer that it would be to his own financial interest to prevent black smoke issuing from his chimney-stack. The fact that a good deal of valuable carbon lost as smoke could be saved, was correct as far as it went; but in attempting to effect a saving, there was great danger of encountering an economic loss in the opposite direction. In order to make this point quite clear to his audience, the author proceeded to explain the scientific principles of combustion.

Dr. Lessing then, at some length, dwelt upon the advantages of proper methods of controlling the combustion of coal, and pointed out that the laws of chemical combination permit us to conclude, from the composition and temperature of flue gases, how efficiently the process of combustion is being conducted. He went on to show that the analysis of flue gases is a very simple operation which can be carried out by any man or boy possessed of some manipulative skill, after due instruction and under the control of the trained chemist or engineer, using the ordinary apparatus for gas analysis. But even this little trouble could, he said, be dispensed with; for there are now on the market a number of very reliable and fairly accurate instruments which automatically analyze the gases—thus eliminating the human element altogether. Most of them are fitted with recording devices noting on a chart the percentages of carbon dioxide (and some also those of oxygen) contained in the gas. By this means the superintending engineer could easily find out, by the oscillations of the curve produced, whether or not his stokers were exercising due care in tending the fires. Dr. Lessing stated that in all cases which had come under his notice, the installation of such appliances had been followed almost immediately by a more regular fire practice, more especially during night shifts, which seemed to produce almost invariably a less continuous curve during the first period of the working of the apparatus, until the men became wide awake to the fatal accuracy of the method. In every instance, careful supervision in this direction was accompanied by considerable economies in the consumption of coal; and control on these lines with a device of any description, provided it worked with a certain degree of accuracy, commended itself highly to any steam user.

The author next turned his attention to the question of fuel supply, and emphasized the necessity for some steps being taken in the direction of its control. He said the great majority of coal consumers, though possibly recognizing the existence of "good coal" and "bad coal," were, to say the least, indifferent to a valuation of their source of thermal energy on a scientifically sound basis. They purchased their coal on the statement of quality by their coal merchant or factor, or on the reputation of the mine or district whence it was obtained; and in most cases no specification whatever was asked for or furnished. Since fuel was used for its thermal value only, it was most important to obtain information on the point.

Dr. Lessing went on to say that methods of determining the calorific value of combustibles had been worked out in great variety. The best and most accurate calorimeter was undoubtedly the bomb calorimeter, originally proposed by Berthelot, the great French chemist, and improved by various workers—such as Mahler, Donkin, and Cook. The modification known as the Mahler-Kroeker type was considered the most accurate (though expensive) instrument of to-day. He gave the following particulars in regard to it: It consists of a closed bomb or cylinder, in which the combustion takes place in a constant volume. The bomb is made of mild steel, and is platinum lined or inside enamelled with an acid-resisting composition; for, under the pressure employed—viz., 25 atmospheres of oxygen—the nitrogen contained in the fuel is converted into nitric acid, which would corrode the unprotected steel. The cover of the bomb screws down on leaden joints; while two tubes in the cover serve for the admission of oxygen from a steel cylinder. A gauge allows the pressure to be read when filling. One gramme of the coal sample is placed in a porcelain or platinum cup, into which dips an iron

wire connected to the circuit of an electric battery. The bomb is placed in the calorimeter vessel (which contains about 2·25 litres of water), the walls of which are suitably insulated against radiation. The calorimeter water can be agitated by a stirring arrangement. On closing the current, the iron wire is raised to incandescence and ignites the fuel, which burns completely in the atmosphere of compressed oxygen. The heat is imparted to the water; and knowing the thermal capacity of the bomb and the actual weight of water employed, the maximum rise in temperature observed by means of a very delicate thermometer graduated in one-hundredth degrees, gives a value from which the calorific value of the fuel under test can be calculated, by a standard formula, and after due consideration of certain corrections to be made. The method has been brought to a degree of perfection which allows the error in two or more experiments on the same sample to be restricted to as little as 10 B.Th.U. A method which gives results of such accuracy—it corresponds to an error of only about 0·1 per cent. or less—deserves to be made use of to the largest possible extent. It not only is accurate, but it gives us a correct picture of exactly that factor for which we employ coal or other fuels—namely, the heat value.

The author pointed out that other countries are fully alive to the importance of this question of rational fuel analysis. In the United States, fuel experts have gone so far as to propound a scheme according to which coal is not to be sold by weight, but simply by its calorific value; making the number of B.Th.U. it contains the basis on which price and payment are regulated. This is perhaps an extreme case, as a lot depends on all the other factors making for the distinctive character of a coal.

The method now adopted by the United States Government, proceeded Dr. Lessing, although not quite so extreme in its principle, certainly deserves mention. As the result of a letter from President Roosevelt to the National Advisory Board on Fuels and Structural Materials, calling attention to the need of a uniform and efficient basis for the purchase of the Government fuel supply, a specification was drafted and approved by the Board for the fuel supply of all Government offices and buildings. The principal point of this specification is the requirement of a certain standard of coal as regards all its constituents and heating value. These have to keep within certain specified limits, beyond which the cargo is rejected. Within these fairly wide limits, a sliding-scale regulates the price according to the heating value and ash contents of the dry coal. For example, for every 2 per cent. more or less B.Th.U. the coal contains, a bonus or penalty of 2 per cent. is incurred. For ash contents above the specified limit, a penalty is charged ranging from 2 c. per ton with low ash contents up to 18 c. for all coals rich in ash. A Chicago company who are said to purchase and inspect nearly a million tons of coals for clients, make the number of B.Th.U. the basis of their contract, and adjust the price according to the percentage of moisture and ash. The Interborough Rapid Transit Company, of New York, in purchasing nearly 400,000 tons per annum, base premiums or penalties on the price at a rate of 1 c. per ton for a variation of 50 B.Th.U.

In Germany, consumers have not yet gone as far as our American friends; and though there are occasional contracts effected on the basis of calorific value, this has not become general, but there are a large number of manufacturers, ship-owners, public authorities, and dealers who demand a guarantee of a minimum calorific value in their coal contracts. This course seems to be a very reasonable one, and works, as I am informed by one of the largest dealers, to everybody's satisfaction.

I do not think that mineowners or dealers in this country will agree in the near future to have anything like the American system thrust upon them; but I cannot see any reason why they should resist the introduction of more rational methods than those at present in vogue. The consumer who buys coal for its heating value should see that he gets the value for his money that he is expecting. He should insist on having certain properties of his coal supply guaranteed to be up to specification, and should control the uniformity of the deliveries. I have heard it objected against any system of specified coal contracts that the man who is satisfied with a certain coal will continue to use it, and the man who is dependent on a convenient local source has no choice but to continue his supply. The latter is certainly in the minority; and even he is, by proper testing methods, enabled to remonstrate with his contractors should they choose to supply him in irregular fashion. The man who purchases constantly from the same mine must bear in mind that not every part of a certain seam would contain coal of exactly the same value, though the type might be the same throughout.

But how should the buyer who has to choose between a variety select the one best suited his requirements? For him it is most important to know which of a score of different coals would be most advantageous for him to use, and would be cheapest for his given requirements of thermal energy, having due regard to special circumstances, probability of smoke production, ash contents, &c. He would soon find out that a proper control on these lines would amply repay his trouble; and not only would he restrict this control to the supply, but, once he recognized the possibilities at his command, he would extend his attention to the careful supervision of his fuel consumption.

On the other hand, the seller of coal will, if he has a good material to dispose of, not hesitate to guarantee what he is certain of on reasonable terms, and only that class of traders who so far are able to take advantage of the buying public will resist the

introduction of methods which would show their ware in an unfavourable light. Another and most important advantage would result from the general adoption of such a scheme. By the labours of the Royal Commission on Coal Supply, it has been brought to light that the wanton waste which is known to take place with the coal treasure of this country could be considerably decreased, if better and more up-to-date methods of raising and preparing coal were to be adopted. No other means would be more practicable than the universal testing of coal to bring home to the mine-owner the need for improvements in this direction—showing him the advantages to be gained by applying an improvement factor to his coal by the installation of washing, screening, and classifying plant.

In conclusion, I should like to appeal to you to give this matter your serious considerations. Many of your public bodies are themselves manufacturers, and all of them coal consumers on the large scale. It should be the pride of any municipal authority to lead the way in advances of this kind. It should be made impossible for local authorities to be entirely in the hands of their coal contractors; and this will be the case as soon as scientifically drawn up specifications are made the basis of these contracts, and their stipulations are carried out and adhered to in a scientific spirit.

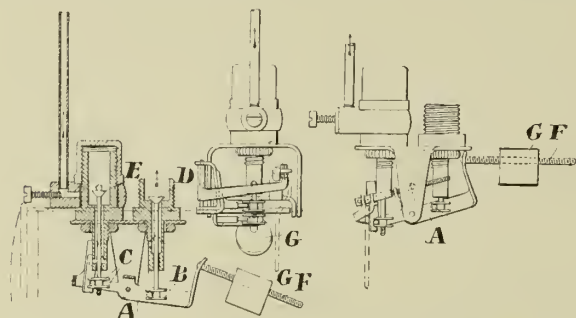
REGISTER OF PATENTS.

Gas Lighting and Extinguishing Apparatus.

ELTON, E. H., and STEPHENS, R., of Clevedon.

No. 2816; Feb. 7, 1908.

This invention relates to gas apparatus operating from a distance, of the type described in patent No. 15,067 of 1906, with the particular object of improving and simplifying the construction and rendering it more effective in operation.



Elton and Stephens's Lighting and Extinguishing Apparatus.

The illustrations represent in sectional elevation the mechanism for operating the valves according to one construction; an end elevation; and a corresponding front view.

The first part of the present invention consists in means for operating the valves of the pilot burner and main burner (as illustrated in the prior specification) directly from a lever by projections or pins provided or mounted upon the lever, which work in grooves in the valve spindles or against the sleeves or flanges provided on it, or by the provision of slots in the lever with which engage the grooved ends of the valve spindles or the like.

As shown, the lever A is provided with pins which engage between flanges B C on collars that are mounted on the respective valve spindles D E; the former being the spindle of the main valve and the latter the spindle of the pilot valve. The collars carrying the flanges are screw-threaded upon the valve spindles to provide for the necessary adjustment.

The second part of the invention—relating to means for regulating the lighting and extinguishing of the burners under varying conditions—provides for the threaded portion of the lever A, or threaded stem F secured to the lever, being of the form shown, and disposed at such an angle as will enable the weight G to be moved from one end to the other of the stem by rotation without altering the difference between the lighting and extinguishing pressures, "due to the increased leverage of the gas pressure upon the diaphragm consequent upon the swinging of the lever."

The required angle of the stem (found by experiment) is such that a vertical line drawn through the weight, at any one of its positions on the stem, will move approximately the same distance along a horizontal line through the lever fulcrum for any given movement of the lever. The angle shown in the first view may be taken as approximately the true angle. Upon increasing the leverage of the diaphragm connection, it is only necessary to bend the stem F downwards to secure the conditions required.

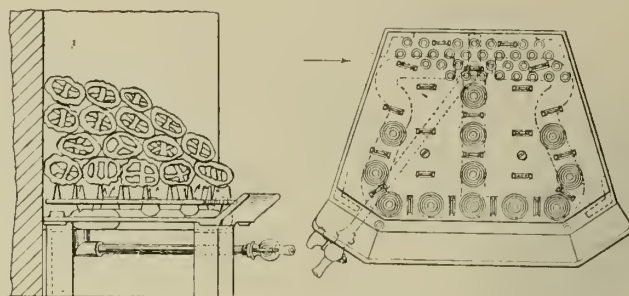
Gas-Fires.

BRATT, L. G. J., of West Norwood, S.E.

No. 5747; March 14, 1908.

This gas-fire is similar to the "barless coal-fires" now much in vogue. It consists of a fire-brick back and sides, with a horizontally extended gas-burner, and a more or less barless means for supporting the asbestos lumps over the nipples of the burner, "so as to obtain a more or less horizontal or heaped mass of incandescent fuel in contradistinction to the usual more or less vertical wall of fuel supported between the fire-brick back and front bars."

In one way of carrying out the invention (as shown), instead of pro-



Bratt's Gas-Fire.

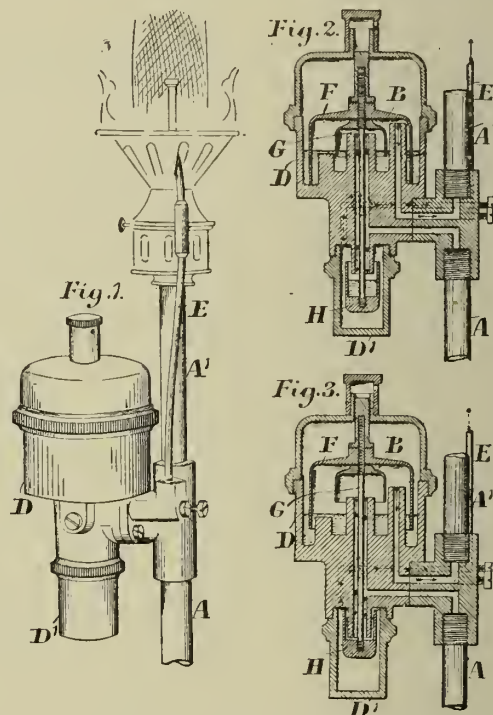
viding the burner heating the fuel with the usual single row of gas-nipples, it is extended both backwards and forwards and arranged to fit between the fire-brick sides and back and extend forward of the sides. The gas-nipples are distributed over this more or less horizontal surface, and suitable projections are arranged between the nipples to support the fuel.

Automatically Lighting and Extinguishing Gas-Lights.

ROSIE, J., and M'KELVIE, J., of Edinburgh.

No. 5793; March 16, 1908.

This invention relates to means for automatically lighting and extinguishing public gas-lamps at a distance, by varying the pressure in the mains, and in connection with the supply of gas to churches, halls, &c., by means of a bye-pass on the supply pipe, and the turning on or off of the gas from the area in question—the bye-pass lights alone being left in.



Rosie and M'Kelvie's Automatic Gas-Lighter and Extinguisher.

Fig. 1 is a perspective view of the appliance; fig. 2, a section of the appliance, inoperative as regards the supply of gas to the burner; and fig. 3, a similar view, but operative.

To effect the lighting, the gas enters the stand pipe A, passes to the bell-valve B, lifting it clear of its seal and allowing the gas to flow to the burner-pipe A¹—the gas supply to the pilot light being extinguished during the time the gas is lighted at the burner. The outer casing D has a well for holding mercury or other sealing liquid, and ports communicating with the interior of the bell-valve B and supply pipe A. There are also ports communicating with the burner pipe A¹; the body of the casing having the port I (shown dotted) for supply of gas to the pilot-tube light E.

Depending from the centre of the casing, and slidably fitted to it, is the dome F, closed at the top and open at the bottom. It is provided with a guide-spindle riding up and down into a guide portion closed with a cap; the mouth of the dome dipping into the liquid seal so as to prevent the gas escaping and having access to the inside of the casing between it and the outside of the dome. Depending from within the dome is the bell-valve B, which moves up and down simultaneously with the dome, and controlling the passage of gas from port to port.

Threaded through the bell-valve B and dome F is a depending rod G, which passes down to the chamber D¹ of the casing, and having secured to its end a cup H sealing (or unsealing) with the liquid the opening of the bottom end of the port as the case may require; the cup being moved up and down simultaneously with the bell-valve and dome.

When the dome and bell-valve are down, as shown in fig. 2, the passage of the gas to the burner-pipe is cut off and the light extinguished. The cup H is also down and its port unsealed at its bottom end, so that the gas is free to pass into the chamber D¹; and thence through the port for the pilot light—communicating with the chamber D¹ and pilot-light

tube. The jet of light is kept burning until the cup H assumes the position shown in fig. 3, when it is extinguished; the gas at the burner being "on" and being lighted by the pilot light before the latter is extinguished.

The dome is weighted to suit varying pressures; and the arrangement of the bell-valve B is such that upon the gas emerging from the port the pressure is only distributed over the lesser internal area of the bell-valve, so that, in the meantime, this pressure only becomes the lifting agent for the dome until the bell-valve is clear of the seal, when the gas from it passes simultaneously to the dome and to the port of the burner-pipe.

It will thus be seen that an increased pressure of gas is required to primarily lift the dome, due to the gas only having access to the confined internal area of the bell-valve; but when the gas has access to the interior of the dome as well, a lower pressure (owing to the increased area of the inside of the dome) effects the keeping up of the dome if the gas in the main varies somewhat—this being effected, as stated, by the pressure of the gas on the differential areas.

When the dome is down (in its normal position), it so remains during such time as the gas is at its ordinary pressure; but with increase of pressure, the dome rises and remains up until the pressure is reduced below what the dome is weighted for.

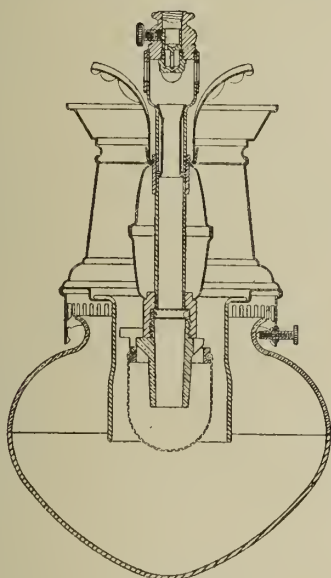
For interior lighting, the appliance may be actuated by varying the pressure by a main stop cock and bye-pass.

Inverted Incandescent Gas-Burners.

SHAW, E. J., of Walsall.

No. 10,284; May 12, 1908.

This invention is particularly applicable to burners of the Graetzin type, designed to afford "greater efficiency in lighting effect" while "remedying defects hitherto existing in inverted incandescent gas-burners."



Shaw's Inverted Gas-Burner Lamp.

The casing is secured to a ring forming a gallery to which the globe is attached. The top (preferably secured by spinning) has a cross-piece attached at its ends to inwardly turned ears on opposite sides of the funnel top. The central gas-tube is protected from the hot products of combustion by an enclosing jacket or sheath held against the cross-piece by the nozzle carrier screwed upon the lower end of the gas-tube. The nozzle screws into a carrier within which is fixed wire gauze immediately above; and, being at the termination of the enclosing jacket, it is found to prevent back-firing with greater certainty than when the jacket does not extend so far downwards. The regulator placed at the top of the burner tube consists of a coned pin adapted to enter a hole; its lift being determined by a sliding cylinder to which the pin is attached. The cylinder is perforated; and its movement is obtained by an eccentric pin attached to a revolvable screw passing through the wall of the regulator. A tubular liner is fitted in the position shown, so as to receive the mixture of gas and air and lead it down the gas-tube to a point within the jacketed portion. Direct contact of the gas with parts which might be heated by conduction from the shields and cross-pieces is thus avoided.

Gasholders.

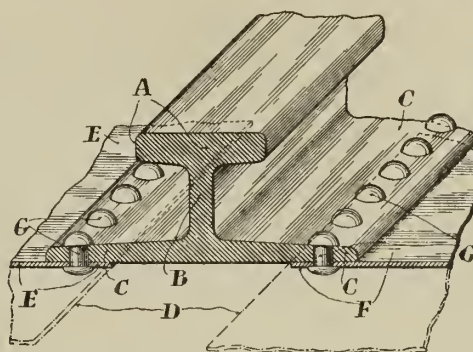
CLAYTON, SON, AND CO., LIMITED, and CLAYTON, J., of Hunslet, Leeds.

No. 12,387; June 9, 1908.

This invention relates to spirally-guided gasholders, in which the spiral-guide rails on the face of the holder are employed in conjunction with runners provided on the holder tank and on the various dips of the holder for supporting and guiding the holder when working.

The spiral guide-rails employed are of I-section, each rail being formed with an extended fixing base made internal therewith and of sufficient width to span the gap left between the ordinary plates of the holder and overlap the adjacent and ordinary plates—the rail being fixed directly to the adjacent and ordinary plates of the holder by closely pitched rivets. By extending the base of the rail outwardly from the web on its opposite sides, so as to span the gap formed in the holder plates, the operation of riveting the rail to the holder plates is facilitated, as the head of the rail does not interfere with the process.

The illustration represents, in isometric perspective, portions of the



Clayton's Spiral Guides for Gasholders.

ordinary plates of a gasholder spaced apart to form the usual diagonal or spiral gap, and being fitted with a guide-rail according to this invention.

The guide-rail of I-section comprises a head A and a web B formed with an extended fixing base C, which latter is made of such a width as to span the gap D left between the ordinary plates E F of the holder and overlap the adjacent and ordinary plates. The guide-rail is fixed directly to the plates by rivets G passed through the plates E F and the base C of the rail.

Metallic Incandescent Mantle.

REESER, H., of Devereux Court, Strand, W.C., and BRAY, H. E., of Woolwich.

No. 13,828; June 30, 1908.

This invention relates to "metallic mantles" "made of materials admitting of them being easily handled without risk of damage."

In one type of such a mantle, threads or filaments are employed which are produced from the oxides of the rare earths, or of the metals of the alkaline earths, or of the elements zirconium, thorium, molybdenum, tungsten, uranium, titanium, vanadium, niobium, and tantalum; while, in another type, threads or filaments are adopted composed of a wire of some precious metal constituting a core which is coated with an oxide of a rare earth. Thus, in the former case, the threads or filaments are of a simple structure and constitute the incandescing member wholly, whereas in the other instance the threads or filaments are of a compound structure with the coating only forming the incandescing member.

Now while such mantles prove an advance over the earlier types, the patentees maintain, yet they possess certain disadvantages in the way of stability, luminosity, and cost of manufacture; and it is with the object of obviating these disadvantages that they have directed their attention to the subject.

In conducting various experiments, they claim to have discovered that an incandescing member composed of an alloy of tungsten and molybdenum overcame the disadvantages before mentioned, and, accordingly, the manufacture of mantles with simple threads or filaments composed of such an alloy, or with compound threads or filaments wherein the coating is formed of such alloy and the core of silver thread, constitutes the principle feature of their invention, though in this connection they point out that they are aware it has been proposed already to make the filaments of incandescent electric lamps of the same alloy, and, in consequence, they wish it understood that their invention is directed to incandescent mantles only.

A subordinate feature of the invention resides in the provision of a ring or bar of some suitable material for not only strengthening the edges of the mantle composed of threads or filaments, but also for supporting the mantle in use with the aid of other adjuncts. The proposed ring or bar is made of U-shape in section, to embrace the edge of the mantle in the resulting cavity, wherein it is secured in suitable fashion.

The alloy is obtained in any of the ways well known to metallurgists; the proportions of the two components being determined by the intended service of the mantle and the shade or intensity of the light desired, though in every case the amount of the tungsten will predominate. It is, however, found that for average purposes the best proportions are 80 per cent. of tungsten and 20 per cent. of molybdenum.

The thread or filament, when composed wholly of this alloy, is produced by any of the ordinary manufacturing processes; and the same remark applies when the thread or filament is composed of a core of silver thread coated with the alloy, though in this instance it is preferable to adopt electrolysis for obtaining the coating.

Safety Gas-Cocks.

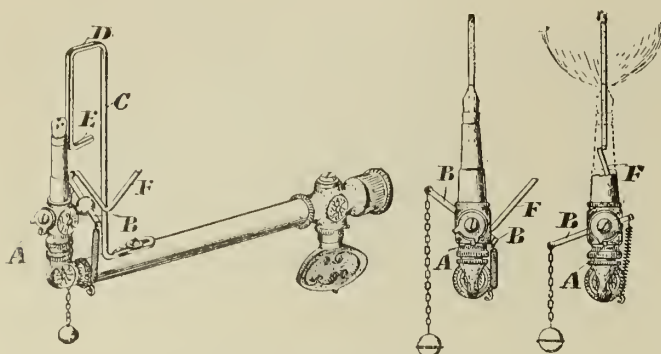
BROCKMAN, H. E., of Sioux City, Iowa, U.S.A.

No. 15,637; July 23, 1908. Date claimed under International Convention, March 13, 1908.

This invention has for its main object a device which will at once automatically shut off the gas as soon as the flame has been extinguished.

A perspective view is given of the burner; also front views of the burner in a position to cut off the gas supply and to permit the gas to flow.

The cut-off cock carries at one end a disc formed with lugs adapted to alternately abut against a lug A projecting out from the casing of the cock so as to limit the movement of the plug. The cock is provided at its opposite end with a head formed with a transverse bore extending through it, in which a rod-like lever B is mounted. One arm of the lever is returned upon itself, and is thence extended upwardly to form a detent so disposed as to oscillate in a vertical plane at right angles to the axis of the cut-off cock when the latter is turned. A compression spring is secured at one end to the opposite arm of the lever B, the



Brockman's Safety Gas-Cock.

other end being secured to the burner at the base. A pull-chain, secured to the first-named arm of the lever, is designed to rock the plug of the cut-off cock against the tension of the spring, so as to turn the cock to the open position.

In order to hold the cock in the open position so long as the gas is not extinguished, the thermostatic rod C, held in a preferably erect position upon the gas-supply pipe, is formed with an off-set looped end secured directly to the supply pipe. The rod projects upwardly parallel to the burner, and is provided at its upper end with a cross bar or arch D, and thence extends downwardly in close proximity to the burner—the free extremity E of the rod projecting in a plane at right angles to the plane of movement of the detent F, and normally just out of the path of movement of its extremity.

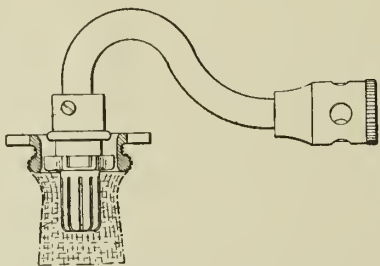
In use, the chain is pulled downwardly by hand and the gas lighted. The cut-off cock is held open for a moment until the heat of the flame expands the thermostatic rod C (or, rather, the depending portion of it) sufficient to cause the laterally disposed extremity E to engage with the extremity of the detent F, and thus maintain the cock open so long as the gas is burning. Should it, however, be extinguished from any cause, it is manifest that the thermostatic rod will at once cool off and contract so as to carry the keeper constituted by the portion E out of engagement with the extremity of the detent, and permit the spring to act and at once automatically move the cock to the closed position and shut off the supply of gas.

Incandescent Burners and Mantles.

MARILLIER, F. W., of Swindon, and STILL, E. H., and ADAMSON, A. G., of Charles Street, Hatton Garden, E.C.

No. 19,731; Sept. 19, 1908.

This invention has for its object "to distribute the flame evenly throughout the length of an annular or open-ended mantle surrounding the burner."



Marillier, Still, and Adamson's Inverted Gas-Burner and Open Mantle.

The burner (as shown) is in the form of a tubular nipple attached to the mixing-tube in any convenient manner. The lower end of the burner is closed, and a number of slits are formed through its wall, extending from its lower end upwards to nearly the top of the mantle, so that the gas-flames issuing from the slits impinge upon the mantle throughout its length. The mantle, rigidly supported at its upper end, is open at the bottom—"thus admitting a full supply of air to the flame, and permitting the mesh of the knitted fabric to be woven much closer than in the ordinary inverted mantle having a closed lower end, and giving increased incandescence over a given area."

The slits in the example illustrated extend radially through the wall of the burner, and are arranged vertically and parallel; but they may, of course, be otherwise arranged, so long as they extend from the bottom upwardly towards the top of the burner.

Coin-Controlled Gas-Meters.

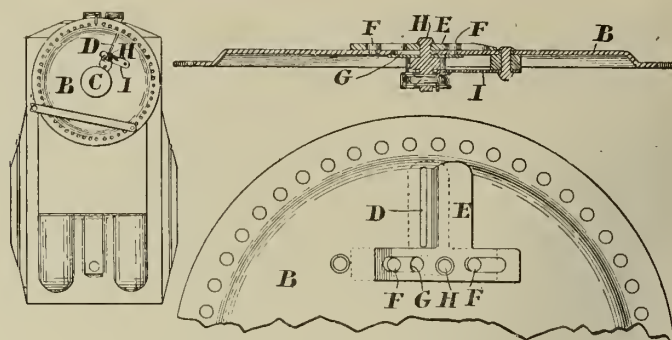
SLOPER, H. T., of New Britain, Connecticut, U.S.A.

No. 20,190; Sept. 25, 1908.

This invention relates to improvements in coin-controlled gas-meters, so as to prevent the introduction of a coin for starting the gas by any unauthorized person.

The illustration shows the side of the meter to which the coin slot-plate and operating knob are applied; also an enlarged section of the coin slot-plate and attached parts, and a rear elevation of same.

The meter has a coin-slot-plate B and an operating knob C to be rotated for transferring a coin from the coin-slot to the coin-drawer. The coin-slot D is formed in B, and on the rear or inner side of the plate there is a slide E, for opening and closing the slot. As shown, the plate is T-shaped, and is provided with slots in its horizontal member, and pins F within the slots for guiding the plate thereon. The upright or vertical member of the T-shaped slide leaves the slot



Sloper's Coin-Controlled Gas-Meter.

D open when in the position shown by full lines, while the member comes in the rear of the slot and closes it when the slide is moved into the position shown by broken lines. The coin slot-plate B is provided with a slot G, below the lower end of the coin-slot and extending transversely to the coin-slot. A finger-piece H is placed on the outer side of the coin slot-plate with its shank or inner end extended through the slot G into the slide E, to which slide it is so secured that the slide may be operated to open and close the coin-slot by manipulating the finger-piece.

In order to prevent the introduction of a coin by any unauthorized person, an eye is formed in the finger-piece; and on the outer side of the plate (on the side of the finger-piece towards which it is moved to close the coin-slot) a keeper I is secured, having an outwardly projecting eye adjacent to the finger-piece and in alignment with the eyes or openings therein. When the slide is in position to close the coin-slot, the finger-piece will be near enough to the keeper for the insertion, through the keeper and finger-piece, of the hasp of a padlock, so that when locked the slide cannot be moved to open the coin-slot.

The meter is said to be particularly adapted for use in boarding houses and the like where various persons might put in the proper coin for starting the gas through an ordinary meter without the knowledge of the owner of the house.

Making Coal Gas Economical for Welding Purposes by Increasing its Calorific Value.

KNAPPICH, J., of Augsburg, Germany.

No. 23,992; Nov. 9, 1908. Date claimed under International Convention, Nov. 9, 1907.

The specification of this invention points out that, as is generally known, autogenous welding is at present almost exclusively effected by means of gas of high calorific value—such as acetylene, hydrogen, blue gas, and others in combination with oxygen, or after having passed through a volatile hydrocarbon. It has also been proposed to use air, oxygen, oil gas, acetylene, and poor gas which has been carburetted. According to the present invention, however, coal gas is carburetted (as opposed to the gases enumerated) and used for welding.

The process described (but not illustrated) has for its object to impart a higher percentage of carbon to coal gas, and therefore a higher calorific value to its flame, by carburation with volatile hydrocarbons such as benzene, benzol, gasoline, petroleum ether, and the like. The carburation is effected by a cold method, by interposing a carburettor of suitable construction in the gas-conduit which leads to the welding room. The carburettor is filled with a volatile hydrocarbon as named, and arranged in such a way that the gas flows through it, rises up in bubbles, and is saturated with the vapours of the liquid in the carburettor. The hydrocarbon may, however, be evaporated by dropping into the carburettor, or the carburettor may be filled with a porous mass saturated with the hydrocarbon liquid. The "essential point" is that the passing gas be mixed with the hydrocarbon vapours which are formed in the carburettor.

The patentee concludes: "The coal gas thus carburated gains apparently in heating power, and becomes therefore serviceable—indeed, equal to other gases—in its application to autogenous welding. The latter becomes thereby actually cheaper than by the use of the other gases of high calorific value. It is evident that coal gas thus carburated in combination with oxygen is quite as suitable for the cutting of metal and the like as for welding."

Consolidated Water-Works Company of Rosario, Limited.—Mr. W. T. Western, presiding on Tuesday last at the fourteenth ordinary general meeting of this Company, said the gross revenue increased from £70,200 to £78,700, while the cost of working and management had gone up from £28,700 to £32,300. The balance was £46,300, being £4800 in excess of the corresponding item in the previous year. After providing for fixed charges and making the usual contribution to the staff provident fund, the Board were able to carry £2500 to the account for depreciation of machinery, to place £7500 to the general reserve, and to declare a dividend of 4 per cent. on the ordinary capital—making, with the interim dividend, 7 per cent. free of income-tax; and the balance to be carried forward was £2800. During the year the Company had laid 38 kilometres (23½ miles) of pipes, and connected 1368 additional services. On capital account they had expended £36,000 during the past year, of which £9400 was for land, some of which was not immediately required, but would be very useful when the need came to increase the area of their filters. During the current year it was proposed to proceed with the construction of large reservoirs, both for river water and filtered water, and to make preparation for an additional pumping-engine. The Chairman concluded by moving the adoption of the report, and it was carried. A resolution was also passed authorizing the increase of the capital to £440,000 by the creation of 10,000 additional ordinary shares of £10 each.

PARLIAMENTARY INTELLIGENCE.

LLANELLY WATER BILL.

This Bill, which proposes to empower the Llanelly Urban District Council to construct and maintain additional water-works, to define and extend the limits of supply, and for other purposes, came recently before the Select Committee of the House of Commons presided over by Mr. Rose.

In opening the case on behalf of the promoters, Mr. Hutchinson said the first Act obtained was in 1865, under which they expended £40,000; and they borrowed £12,700. There were other Acts. Three reservoirs were constructed, from which the water supply was now obtained. The total amount of money expended was £150,000. At present, the outstanding debts were £94,505. Half the water supply was used for trade purposes at a cheap rate. In 1908, the Llanelly Rural District Council and the Burry Port Urban District Council asked Parliament to pass an extravagant Bill; but it was thrown out. The Urban District Council then promised to come to Parliament this session for a Bill which would remove the objections of the Local Government Board with regard to the necessity of filtration and purification. From one of the reservoirs which was at a higher elevation and capable of affording greater pressure than the others, they would take water which would be passed through newly constructed filter-beds and mains for domestic purposes; while water would be supplied through the existing mains for trade uses. For the purpose of purifying the gathering ground, they were asking for powers to remove a farm which was likely to contaminate the supply. Dealing with the petition of the Llanelly Council, Mr. Hutchinson said they objected to the promoters having any portion of their district of supply handed over to them.

Evidence was given by Mr. Henry W. Spowart, the Clerk to the Council, who said that the total storage capacity was 430 million gallons. Tin-plate manufacture was carried on to a very large extent; and it was essential to the prosperity of the trade that there should be a cheap supply of water. The Council sold a great quantity at 1½d. per 1000 gallons. This was the minimum charge for trade purposes; the maximum being 6d. The works in the town consumed 1½ million gallons per day; the draw from the reservoir being 3 million gallons per diem. For domestic purposes the daily supply was 60 gallons per head. There had been agreements between the Urban Council and the Rural Council in respect to the water supply; but he was not aware of any objection with regard to the quality of the water.

In answer to the Hon. J. D. Fitzgerald, K.C., who appeared for the Rural District Council, witness agreed that the proposal in the Bill with regard to the area of supply was to take the area that was easiest and the most profitable to supply and leave to the Rural Council the area which was not so profitable. They were asking for a right to a portion of the Rural Council's district in perpetuity, and that the Rural Council should have provision that, should the Rural Council want to supply water, they might resume the supply by paying the Urban Council for the mains and pipes they had laid. Part of the lands proposed to be taken included an estate under which were seams of valuable coal—the finest anthracite in the United Kingdom; but it would not be well to sacrifice the wellbeing of the inhabitants or the tin-plate trade for the purpose of extending the working of the coal.

Mr. R. Hawksley, in giving evidence, said the three reservoirs of the Urban Council had a storage capacity of 3½ million gallons, and the consumption would be 2,700,000 gallons a day; leaving a margin of 30 per cent. The water for trade purposes they did not propose to filter, because it was unnecessary and would cost £30,000. Under the present scheme, the expenditure would only amount to £13,000.

Addressing the Committee on behalf of the petition of the Rural District Council, the Hon. J. D. Fitzgerald said the Bill was in contravention of well-settled parliamentary principles. Under the Public Health Act of 1875, the Rural Council were constituted the water authority within their own district; and it was a perfectly well-settled parliamentary principle that these powers should not be taken away by a Private Bill unless some negligence or serious default was proved against them. The promoters were now seeking to annex the low-lying part of the rural area.

The Chairman announced that the Committee were prepared to approve the preamble upon two conditions: (a) That the promoters should agree to the insertion of a clause, to be approved by the Speaker's Counsel, similar to the Model Clause 9, with the exception that seven years should be the limit of time for the introduction of a Bill by the Rural District Council of Llanelly, and the purchase of the plant, &c., within the area of the Rural District Council by the Urban District Council should comprise only the distribution plant; (b) that the promoters introduce a clause to the satisfaction of the Committee which would give protection to dormant interests of mineral owners.

On the suggestion of Counsel for the promoters, the consideration of these and other clauses was deferred till after the Easter recess.

WEST GLOUCESTERSHIRE WATER BILL.

The Bill promoted by the West Gloucestershire Water Company, for extending the limits of supply and conferring further powers upon them, and for other purposes, was recently considered by a House of Commons Committee presided over by Mr. J. J. MOONEY.

Mr. HONORATUS LLOYD, K.C., Mr. G. J. TALBOT, K.C., and Mr. ALGAR HOWARD appeared for the promoters (Messrs. Sherwood and Co., Parliamentary Agents); and Mr. BALFOUR BROWNE, K.C., Mr. LEWIS COWARD, K.C., and Mr. HOLMAN GREGORY (Mr. J. Kennedy, W.S., Agent) represented the Bristol Water-Works Company, who petitioned against certain parts of the Bill.

Mr. TALBOT, in opening, said the West Gloucestershire Water Company was incorporated in 1884. He believed the Bill, as it came before the Committee, was unopposed except upon the point of the extension

of limits. The existing area of supply of the Company was a very extensive one. It was almost entirely a rural district; the population was very scattered over the greater part of it; and, except at the edge of the City of Bristol, it was very sparsely populated. There were a number of places in it which wanted water. On the edge of Bristol, and immediately outside a part of the area of supply of the Bristol Water Company, there was a certain fringe of population, although they had very much the best district from a commercial point of view. The policy of his Company had been to extend as widely as possible, and without relying too strictly upon their rights under the Water-Works Clauses Act to require in every instance a guarantee before providing a supply. It was impossible for a company with an area such as this, if they were to do their duty at all, not to run a certain amount of risk; and the result was to make the commercial return to the Company comparatively small compared with a more thickly populated district. The extent to which the Company had succeeded was shown by the fact that on their 10 per cent. capital they had never divided more than 4 per cent.—and this was what they were paying now; and upon their 7 per cent. capital the limit had been 2½ per cent. So that they were a long way from their maximum dividends upon all their capital. They supplied some 53,000 people; and the maximum supply was about 1,340,000 gallons. It was impossible to supply the whole district—it was a thing that could never be done, and could not be done approximately for a long time after the Company had commenced operations; but with the exception of the extreme north and south of the area, they did supply most of the principal places. In the north, there was a considerable area which was at present without a supply from them. It was an exceedingly scattered district; and they had felt that as they had not been able to provide for it in all cases, it had been their duty and their policy not to resist applications from others who asked their consent to supply them. Berkeley and Wootton-under-Edge were supplied with their consent—Berkeley by Lord Fitzhardinge (a large landowner in the neighbourhood), and Wootton-under-Edge by the Rural District Council. In the south, where the area unsupplied was much smaller, they were at the present time practically providing for everything that needed provision there. There were works in course of construction from Keynsham to Chew-Magna which would afford all the water that was wanted there. The additions they asked the Committee to include in their area were all small places. Counsel proceeded to mention the particular places which the Company hoped to take in, and which asked for water. They were supplying Northwick and Redwick. The population there was 500; and the Rural District Council of Thornbury, where they were situated, urgently asked for a supply. The need arose mainly in this way. The Severn tunnel of the Great Western Railway Company ran through these parishes and under the river. In the course of constructing the tunnel, a very large body of underground water was tapped; and in order to keep the tunnel clear, pumping had to be kept up there incessantly, especially on the Gloucestershire side of the river. The result had been very much to deplete the water supply of the areas immediately adjoining the Severn. They had taken the risk, at the instance of the District Council, of laying mains there, and were supplying at the present time; and they asked that this should be added to their area. Immediately to the north was the parish of Aust, which they asked to be included. There was also the parish of Sopworth, which they were supplying under an agreement entered into in 1903 with the Duke of Beaufort; and Nettleton, in Wiltshire. From all these places there was no opposition; and the promoters asked the Committee to allow them to take them into their area. Compton Greenfield also, inasmuch as nobody had the right to supply there at the moment and the Company were willing to give any supply that was needed there, they considered ought to be put into their district. Charlton was the only place where there was a controversy between them and their opponents. But the Bristol Water Company had done nothing for the place, although it was in urgent need of water. The real fact, of course, was that the position of the Bristol Company was totally different from the West Gloucestershire Company. There they had a district which, from a water company's point of view, was an exceedingly valuable one. They had the City of Bristol; and the natural tendency of all such companies was to put the town first and to neglect the fringe on the outskirts. It was often, of course, that the town called more for water, but also that it was a far more paying thing. Therefore it was the tendency of all urban water companies to insist somewhat rigidly upon their rights under the Water-Works Clauses Act, to require a guarantee of 10 per cent. for the cost of laying the necessary mains before they would give a supply to any of these places. Early last year events took place which had already formed a matter of contention between them and the Bristol Water Company in regard to a house called Hollywood Tower, owned by Sir George White. Their main was laid; and they believed, and were advised, that if Sir George White laid the pipe from his house and took a supply from them in their own district, they were entitled to supply him. The Bristol Water Company were advised that this was not so; and the question was where were they to supply him. They were entitled under their existing Acts to supply him within their own district; and the question was whether the supply was given at a certain point or at the point where the owner took it. The Bristol Company put the Attorney-General in motion; and they applied to the High Court for an injunction to restrain them, and Mr. Justice Neville decided against the West Gloucestershire Company. He held that the supply was given at the house and the point where the main stopped. The case had got further; but his learned friends were quite entitled to assume that Mr. Justice Neville was right. They had been restrained from supplying the house; and this was one of the matters on which they asked that the Committee, on the question of policy—they having been held to be wrong in law—should be entitled to supply in this and other places in a like situation. The Bristol Company had since developed surprising activity with regard to Charlton, which they had neglected since 1872. The promoters asked the Committee to allow them to supply in the district both the Charlton and the Compton Greenfield areas, which would cover this house; but, of course, they would not come to Parliament or expect the Committee to give them power to supply one house. He believed they would satisfy the Committee that they could and should supply—if they thought fit to throw Charlton

into their district of supply—the inhabitants with water. Counsel next drew attention to the clauses upon which the opponents under the decision of the Court of Referees were entitled to be heard, particularly with reference to clause 40 (power to remove meters and fittings). With one exception, this was a Model Clause form:

The Company may enter into, and carry into effect, agreements with any local authority, company, or persons, for the supply of water beyond the limits of supply to any such company or persons respectively in bulk for any purpose and for such remuneration and on such terms and conditions and for such period as may be agreed upon. Provided that such supply shall not be given except with the consent of the local authority of the district to be supplied, nor if and so long as such supply would interfere with the supply of water for domestic purposes within the limits of supply.

This clause had been in every Water Bill for a considerable time, with the exception that, in an ordinary Bill, as well as the consent of the local authority the consent of any company or persons supplying water under parliamentary authority within the district to be supplied was required. Counsel then went into the history of the matter, and proceeded to comment upon the petition of the Bristol Company.

Evidence was given in support of the Bill by Mr. S. F. Andrews, the Secretary and General Manager to the West Gloucestershire Water Company; Mr. S. H. C. Coles, F.S.I., the Chief Agent for the Duke of Beaufort, Lord Glenusk, and others; the Rev. C. S. Jones, Rector of Nettleton; Mr. H. Thurston, Clerk to the Thornbury Rural District Council; Mr. F. J. Williams, Building Surveyor and Sanitary Inspector to the Thornbury Rural Sanitary Authority and Rural District Council; Mr. J. A. Waller, of Westbury-on-Trym; Mr. J. B. Hillier, of Charlton; Mr. J. W. Pallan, of Compton Greenfield; Mr. T. Spencer, of Luckington; and Mr. W. Fox, civil and mechanical engineer.

Mr. COWARD then addressed the Committee on behalf of the Bristol Water Company against the Bill.

The Committee having consulted in private,

The CHAIRMAN announced that they found the preamble of the Bill proved, with the exception of the portion dealing with Charlton. They would require alterations to be made in clauses 7 (construction of mains, &c., sanctioned) and 40; and they would require a map defining the Charlton area to be drawn up and signed. Unless the necessary alterations were made in clause 40, they expressed the opinion that an undertaking ought to be given that the consent necessary under that clause should not be unreasonably withheld from the Company supplying Sir George White with water in the event of his not being able to get it from any other source.

Mr. TALBOT: Do I understand that you do not give us Charlton, and you do not give us so much of Compton Greenfield as is within Charlton?

The CHAIRMAN: Yes; that is it.

The Local Government Board report having been considered, Dr. J. C. Thresh was examined concerning his visits, to and inspection of, sources and works.

The CHAIRMAN said that clause 40 would have to be remodelled.

Mr. TALBOT said that, in the case of Hollywood Tower, he understood they would be entitled to supply if the consent of the Bristol Water Company was unreasonably withheld.

The CHAIRMAN said the Committee also thought the Bristol Water Company must not unreasonably withhold consent.

Mr. TALBOT: I understand you wish to empower us to supply Sir George White unless they can show cause for withholding their consent—unless they say they are going to give him a supply at once.

The CHAIRMAN: Yes.

At a subsequent stage, the clauses were brought up and considered.

The CHAIRMAN remarked that what he had intended to convey by the decision of the Committee was that they required clause 40 to be framed in accordance with the Model Clause; and if this did not give Sir George White sufficient protection, they, as a Committee, without putting a specific clause in, expressed the opinion that he should get water, and that consent should not be unreasonably withheld.

The clauses were agreed to, with the necessary amendments; the preamble was passed; and it was directed that the Bill, as amended, should be reported to the House.

Mantle Contracts at Nottingham.

The following questions were put by a member at last week's meeting of the Nottingham City Council with regard to the letting of some recent contracts, about which it is said a good deal of comment has been raised. The answers were given by Alderman C. Lovett, the Chairman of the Lighting Committee. In the Committee's application for tenders for incandescent mantles, &c., were full particulars given as to quantities or qualities of the same?—No. Were private trade marks of a particular firm mentioned; and, if so, why?—No. Was only a small quantity of goods ordered for which tenders had been invited?—No. Was the bulk of the mantle contract placed with a member of the Nottingham Ironmongers' Association?—The Committee made no inquiry as to this. Was it known to the Lighting Committee that one of their number is connected with this Association?—No; but if so it is immaterial, as the Association carry on no business. Is it in accordance with the usual practice of the Council to allow interested members to take part in the placing of contracts?—No. Is it a fact that the contract was given to a firm charging 3s. 9d. per gross more than the usual wholesale price of the mantle they were prepared to order, thus adding to the expenditure about £30 on the contract?—Not that the Committee are aware. Have not the Committee had the opportunity of having demonstrated to them that the mantles of lesser price are identical in quality and make, and refused to investigate the matter?—No.

In an attractive little booklet, entitled "Simplicity and Satisfaction in Gas Cooking," Messrs. R. & A. Main, Limited, draw attention to the advantages possessed by the goods which they supply for culinary purposes. Illustrations and prices of various sized cookers are given; and the grills and boiling stoves are similarly treated. Space is also devoted to the "Main" gas-iron heater, as well as to the firm's hot-water circulator.

LEGAL INTELLIGENCE.

Committal of an Alien for Meter Robbery.

At the County of London Sessions, last Thursday, before Mr. Robert Wallace, K.C., Gregory Koslow, 46, a gas-fitter of Russian nationality, was indicted for stealing 7s. 8d., the property of the Commercial Gas Company. Mr. Huntly Jenkins appeared for the prosecution. The Jury returned a verdict of "Guilty," and the prisoner was sentenced to four months' in the second division, and to be recommended for deportation.

Extraordinary Gas-Meter Robbery with Violence.

At the Thames Police Court last Tuesday, William Musson, 20, a painter, was charged on remand, before Mr. Chester Jones, with stealing 6s. 5d. from two prepayment gas-meters, belonging to the Commercial Gas Company; further, with assaulting Susan Sarah Rogers, a girl of 13, who lived with her parents at 115, Upper North Street, Poplar; and also with the attempted murder of his aunt, Alice Robshaw, at 84, St. Mary Street, Woolwich. Mr. Young prosecuted on behalf of the Company; Detective-Inspector Ball watched the case for the Criminal Investigation Department. The prisoner had lodged at 115, Upper North Street, and on the 15th ult. he, it was alleged, called the girl, seized her, bound a towel round her mouth, tied her hands behind her back, and secured her to the bedstead. He then demanded money, went downstairs, broke open the boxes of the gas-meters, and stole the contents; after which he released the girl, and left the house. Mrs. Robshaw, who had previously been unable to appear in consequence of her injuries, and was still in a very weak condition, deposed that the accused was her nephew. Shortly before ten o'clock on the morning of the 16th ult., he called at her house, and said he intended to join the Army. He then inquired if she was alone, and she replied that she was. She went into the garden, and on her return the prisoner sprang from behind the kitchen door, seized her throat with both hands, threw her on to the floor, and threatened to kill her. Witness described the nature of the violent attacks made upon her; the effect being that she was still under medical treatment. A detective-inspector stated that when he told the prisoner the charge he said he did not intend to hurt his aunt so much, but he wanted the money. He was committed for trial on the three charges.

Compensation Claim at Huddersfield.

At the Huddersfield County Court recently, Alberta Marsden sued the Huddersfield Corporation for compensation for the death of her husband, which, it was alleged, was accelerated by a fall down some cellar steps while engaged in his employment as a gas-meter inspector on May 22 last. In her evidence the applicant said her husband was in the employ of the Corporation for twenty years; and before the accident he had very good health. His wages were 27s. 6d. a week. After the death of Marsden, Mr. E. A. Harman, the Gas Engineer, came to see her, and asked her to sign something, but she refused. She did not receive £5. In cross-examination, she said her husband was "run down" a bit before the accident, and had had some medicine; but she did not know what was the matter with him. The accident happened on a Friday; but he was not seen by a doctor until the following Tuesday. He worked the day after the accident. Then he was in bed for a fortnight; and he afterwards worked from June to October without a break. In November he died. He kept on saying that the accident "finished him off." Dr. Orr, who examined deceased on May 26, found that he had two ribs broken. He had Bright's disease; but witness could not say when this commenced. The accident would, however, certainly aggravate it. Death was in some way accelerated by the accident. For the defence, fellow employees said that deceased had been losing weight for over two years. Mr. Harman stated that the man had previously been in a very delicate state of health; and he had had to reprimand him on more than one occasion when he had shown the effects of drink. Witness was sent by the Corporation to give £5 to the widow as a gratuity. Dr. Collinson gave it as his opinion that an accident of this kind would have extremely little, or no, influence in producing death after the interval stated; and Dr. Irving said the fact that the accident was not mentioned in the death certificate suggested that the bearing of the accident was not in the mind of Dr. Orr when he signed it. His Honour Judge Gent, in giving his decision, said the question was "Would the death have happened as and when it did if there had been no accident?" It seemed to him that this was the true test as established by the cases. There was evidence that Bright's disease might suddenly take a worse turn; but they must take this in connection with the fact that his work did not involve excessive physical exertion. Dr. Collinson's testimony did not materially shake Dr. Orr's evidence; and the latter was the only person who saw and knew the deceased. His Honour found that the accident caused death to take place at the time it did, and that it would not have taken place but for the accident. He made an award in favour of the applicant and the other dependants for £214 10s., representing three years' wages of the deceased.

Alleged Damage to Horticultural Lands by Pumping.

Seven actions brought against the Municipality of New York, in which damages were claimed on the ground that the pumping of water for the Brooklyn supply had injured farm and horticultural lands on Long Island, by drawing off the water or lowering its surface beneath the property, were recently decided in favour of the City. The plaintiffs also asked for an injunction to restrain the City from operating their pumps. According to "Engineering Record," the defendants offered in evidence the results of investigations, extending over a number of years, which showed that the ground-water level was not lowered beyond the property owned by the City, reaching 800 feet north of the wells. The particular cases cited were the driven well

stations at Matowa and Wantagh, which are of about the same capacity. The Wantagh station pumps about 3 million gallons per day from 50 driven wells, varying in diameter from $4\frac{1}{2}$ to 6 inches, and spaced along an east and west line 1500 feet long. Two-inch test wells were driven north of the supply wells on the City's property, and then at intervals extending three or four miles beyond; the maximum well spacing in the farther sections being about 1000 feet. Readings were taken in these wells at regular intervals. During a period of six months, the supply is sufficient to dispense with the driven wells, so that the readings taken in this period are a record of the ground-water level undisturbed by pumping. When the wells have been placed in service, no lowering of the level has been caused by the pumps beyond the 800-feet property limit. The seasonal fluctuations have been carefully determined by normal wells located at such distances from the supply wells and at such points that it is certain that the ground-water level at them is unaffected by the pumping. These readings enable comparison to be made with the other data, so that the seasonal fluctuations will not be interpreted as due to the pumping. Similar investigations have been carried on in connection with the other driven well stations on Long Island.

Claim for Rebate on Water-Rate.

At the Westminster County Court, on Monday last week, his Honour Judge Woodfall gave judgment in a case raising the question of a rebate on water-rate. Mr. Boyce, the defendant, the owner of premises in George Street, Hanover Square, let them to two business tenants. There was one communication-pipe from the water-main, and one person (Mr. Boyce) was assessed by the Metropolitan Water Board, but there were two assessments—£150 and £217. These amounting together to more than £300, Mr. Boyce deducted about £3 as rebate from his payment for water, and the Board sued him for this amount. Mr. Boyce contended that this was one house, with two common staircases giving access to the whole premises, that there was no structural division, and that one person was assessed. The Board submitted that the local authorities assessed each of Mr. Boyce's tenants separately, and that the Board were acting within their powers in making separate assessments. In order to get the rebate, there must be one assessment of upwards of £300. His Honour expressed the opinion that the defendant's contention that the two assessments could be lumped together to claim the rebate was unsound, but he acknowledged that there might be another opinion; and, therefore, in giving judgment for the Board, with costs on the higher scale, he granted leave to appeal. The defendant at first said he would appeal; but later, on a question of costs, he stated that he would not take the matter further. Judgment was then entered for the Board, with ordinary costs.

British Cerofirm Company, Limited, in Liquidation.

A meeting of creditors of the above-named Company was held at the offices of the Official Receiver in Bankruptcy last Tuesday. The receiving order was made on the 23rd of February upon a creditor's petition. The statement of affairs submitted by the Directors showed 47 unsecured creditors for £6487 18s. 9d., and two creditors partly secured for £2922. The assets were estimated to be worth about £1070. The Company was registered on May 24, 1907, to acquire and work a patent for the manufacture of incandescent mantles in Great Britain and the Colonies, with the exception of Canada. The nominal capital was £120,000, in £1 shares; and 100,100 of them were issued and allotted. The vendors of the patent (the Cerofirm Gesellschaft of Berlin) received in respect of the sale £82,500, of which £17,500 was in cash and £65,000 in fully-paid shares. Of these shares, 35,000 were transferred to the promoter, who in addition received £5000 of the cash consideration; and the fully-paid shares were in turn partly transferred by him to the Directors. The Directors stated that they discovered that part of the method of manufacture in question infringed prior patents, and they were consequently unable to do business. One of the Directors went to Berlin, and, after meeting with considerable difficulty owing to the action of a person against whom both he and the vendors made charges, was able ultimately to bring back another process. By this time, however, the season's trade had been lost; and though the Directors themselves had subscribed largely towards the expenses of carrying on the business, they were not successful. After a good deal of discussion, the appointment of a Liquidator was left to the Registrar, and a Committee of Inspection was appointed.

Coal in North Lincolnshire.—After carrying on boring operations for coal in North Lincolnshire for 2½ years, success has, it is stated, at last rewarded the efforts of the Calyx Boring Company, who were the contractors. The seam struck is said to be both extensive and excellent in quality, and is believed to be one of the best in the country.

Fermoy Gas Company's Provisional Order.—The Hon. T. H. W. Pelham, the Chief of the Harbour Department of the Board of Trade, has given his decision on the subject of the Provisional Order applied for by the Fermoy Gas Company, in regard to which he conducted an inquiry on the 5th and 6th ult. (see "JOURNAL" for March 16, p. 800). The Order will be granted conditionally upon the acceptance by the Company of the following alterations: The illuminating power of the gas to be 14 instead of 12 candles, the standard price to be 5s. instead of 5s. 9d., the original shares to carry 8 instead of 10 per cent. dividend, and the additional capital to be reduced from £15,000 to £5000.

Illegal Gas Connections.—At the Bradford City Court, William Nicholls, a metal worker, was fined £2 and costs for making a connection with the Corporation mains without their consent. A gas-bracket had been connected with the inlet-pipe of defendant's meter in such a manner that the gas used was not measured. The explanation offered was that he had "inadvertently" connected the bracket on the wrong side of the meter, and that there was no effort at concealment. The Stipendiary Magistrate remarked that people seemed to think very often that they could play tricks with a public body that they would never think of playing with a private individual. A similar fine was inflicted on Mark Scott, a plumber, for a like offence. His defence was that he was drunk at the time he made the connection.

MISCELLANEOUS NEWS.

GAS-WORKS SIDINGS AND RAILWAY RATES.

In the last two issues of the "JOURNAL," there has appeared a brief report of an interesting case in which the Corporation of Birmingham raised the question of the charges made by certain Railway Companies in connection with the traffic to and from their gas-works; and in view of the importance of the matter, not only to Birmingham, but also to other gas undertakings which possess private sidings, we have thought that it would be of value to readers to be put in possession of a fuller account of the proceedings, which occupied seven days, and at the end of which judgment was reserved. The remainder of the report will be published in the next and subsequent issues.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Monday, March 22.

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Railway Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges.

All possible efforts were made by the Corporation to arrive at a settlement; but as these were unavailing, the case had to go into Court. The Corporation first applied to the Court in December, 1906; and the Companies replied the following March. Towards the end of 1908, the North-Western and Great Western Companies amended their replies. They then—two years after the Corporation's first move—gave way on the question of coke rates upwards, and admitted that they were overcharging to the extent of from 1d. to 8d. per ton; and they also made concessions with regard to brick and retort material inwards. These concessions, however, did not meet the views of the Gas Committee; and so the action was proceeded with. After the case went into Court, they also admitted that they had been making improper charges against the Corporation on merchandise delivered to the gas-works in Classes B and C, and Nos. 1, 2, and 3.

The following were the Counsel engaged: For the Corporation: Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASPINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

Mr. Balfour Browne's Opening.

Mr. BALFOUR BROWNE, in opening the case for the Corporation, explained that what they wanted was, first, relief in respect of charges to and from their gas-works in Birmingham. They said that certain rates were in excess of the maximum, and were therefore illegal; that certain rebates should be allowed to them, because they provided accommodation for coal at their works, and also rendered services; and there was, further, a claim against the London and North-Western Railway that they charged for the hire of waggons more than they were entitled to do. The Corporation supplied with gas an area of 114 square miles, with a population of 850,000 people. The capital invested in the undertaking was £3,000,000. There were in all five works; but the application referred to only four of them—Saltley, Nechells, Windsor Street, and Swan Village. The inward traffic was equal to 650,000 tons a year to the gas-works; and of this, 540,000 tons was coal. The outward traffic amounted to 120,000 tons, of which 100,000 tons was represented by coke. Upon this enormous traffic, even 1d. overcharge meant about £3000 a year to the Corporation; so that, though they were dealing with small amounts to begin with, the aggregate value of the concessions they demanded was very great. The correspondence was full of ingenuity on the part of the Railway Companies in withholding information; and the Corporation had had to grope very much in the dark in trying to ascertain what charges were levied, and how they were made up. With regard to the inward traffic, of course, by far the most important were the coal rates; but there were also bricks and retort material from the Corngreave sidings.

THE SALTLEY WORKS.

Dealing first with the Saltley works, these were in the centre of Birmingham, and were served, he thought, by the Midland Railway only—being upon the main line. They were a mile short of Lawley Street Station. The works covered 18 acres of ground, and carbonized 200,000 tons a year. Sidings were laid down by the Corporation to connect the works with the railway system; and an agreement was entered into in 1883 which provided that the Corporation should maintain

sidings on their own land, that all waggons were to be marshalled by them in accordance with the directions of the Midland Railway General Manager, and that the use of the connecting line between the Corporation siding and the Railway Company's siding was to be under the direction of the Company's officials. In most cases the Corporation paid to the colliery proprietors a price which included the sum charged by the railways for carriage; but in others they paid the charge for carriage direct to the Railway Companies. The cost of carriage added on an average about 50 per cent. to the pit-mouth price of the coal. The coal was obtained mainly from collieries in Derbyshire, Nottinghamshire, and Yorkshire; and to a smaller extent from those in the county of Stafford. The delivery of the whole of this coal traffic was regular throughout the year. It was conveyed over practically the same routes, and was dispatched in large quantities by daily consignments, and in trucks containing an average weight of 8 tons. These conditions were unusually favourable to the Railway Companies, and tended to greatly reduce the expense to them of conveying and dealing with the traffic. No allowance was made in the rates charged by reason of the quantity, character, and regularity of the traffic. On the contrary, the rates charged in respect of merchandize delivered to the Corporation sidings were the same as those charged by the Companies to small and casual traders for the conveyance of similar goods under ordinary conditions to Lawley Street Station, notwithstanding that the distance to Lawley Street was a mile greater than to the Corporation sidings at Saltley. With regard to all the traffic, both inward and outward, at the four works, the Corporation did not require the Companies to provide for them—nor, in fact, did they provide—any station accommodation or terminal services at their private sidings. There were no services at all needed at the sidings beyond those incident to the conveyance of the merchandize. The Corporation contended that the Companies (except in so far as the London and North-Western Company had allowed a reduction of 3d. per ton on the coal traffic delivered at the Windsor Street sidings) had included in their rates during the past six years a charge for station accommodation which was not provided, and for terminal or special services which were not rendered at their private sidings; and they claimed that they were entitled to a reasonable rebate in respect of all traffic collected or delivered at each of the sidings. In the year 1896, the Corporation made an application to the Court against the Midland Company, in respect of overcharges, and asking for a rebate; but there was a complete difference in the condition of affairs existing then and now, inasmuch as a large scheme of sidings had since been put down, which were called the Washwood Heath sidings. The Midland Company used these sidings for marshalling their traffic—separating the Birmingham traffic from that of other towns. The Birmingham traffic, of course, included that from the gas-works and the general traffic. From the colliery to Lawley Street, passing through the Washwood Heath sidings, the journey took practically the same time as to the gas-works. These sidings had some thirty sets of rails, and could accommodate about 3000 trucks. They existed for the Company's purposes only. All the traffic at this point was in transit. In fact, it did not finish its journey until it came to the sidings which connected the Corporation siding at the Saltley works with the Midland Company's system. However, it was sought to charge the Corporation with respect to the Washwood Heath sidings, where, for the Railway Company's convenience, two sidings out of the thirty were devoted to the gas-works traffic. The capacity of these two sidings, he believed, was 150 trucks. Of course, the coal came in large quantities, and was dispatched from the collieries in full trainloads. The Corporation had ample room in their own sidings at the works. There were, in fact, some 2 miles of sidings there; and they employed four engines in connection with the in and out traffic. As many as 203 full and empty waggons had been moved to and from the works in a day; while the daily average over a period of seven weeks was 113. The Company did not necessarily deliver the traffic in the order in which it was received from the colliery, because for their own convenience trucks or trains might be left at dead-ends for a considerable time. The Company, however, said that the Corporation, in consequence of the limited accommodation which they possessed, were not prepared to accept delivery of the coal as and when it arrived; and therefore it was hauled into special sidings provided by the Company at Washwood Heath, and reserved for it, and there stored to await marshalling and delivery as and when the Corporation required it. The Company said this was done at the request of the Corporation; but that was a mistake, for no request was made. They also said the Corporation required the waggons in a different order from that in which they were received, and from that in which they had been placed and stored for the Corporation's convenience. This, again, was a mistake. It was no convenience to the Corporation to have the trucks placed in any order at Washwood. They did not want them there, but at Saltley. What they wished was that the coal, as it left the colliery, should come on to them. Then the Company said the traffic for Saltley, after storing and marshalling at Washwood Heath, was worked by the Company from the sidings to a special siding near the Saltley works, which was provided by the Company and reserved for this traffic. Well, so far as he could see, this was the only part of the case where the Company could say anything really was set apart specially for the Corporation traffic. This siding must be some relief to the works, because the traffic was left there, and then taken into the works; but even if the siding were not there, he fancied the Corporation could get their empties out, though it would be somewhat inconvenient. In connection with none of the other works was there any such separate siding accommodation provided by the Railway Company. The Company went on to say that several times during the day and night they worked the traffic with their engines from this siding into the gas-works siding; and the labour and expense were greatly increased by the fact that, owing to the Corporation's limited siding accommodation, the coal could only be delivered to them in far less than full train-loads, and frequently only in a few wagon-loads at a time. The Company added that, after the waggons had been unloaded, they worked them away from time to time, which they had to do in less than full train-loads; and that there was nothing special in the quantity, character, or regularity of the traffic which would justify any such allowance as was being claimed. Dealing with the reduction which the Corporation maintained that they were entitled

to, he referred first to what they should have as station terminals. When, he said, they found the charge to a station was the same as the charge to the works that were claiming a rebate, the presumption was that in the latter figure there was included a charge for station terminal. If so, a station terminal was being charged at Lawley Street. The Company said that there was only 1d. in the charge for station terminal at all; but it was a fact that on coke the terminal amounted to 3d. Class A traffic at Lawley Street was liable to a 3d. terminal charge. As he had already stated, the London and North-Western Railway allowed 3d. a ton off the rates to Windsor Street, because the Corporation provided station terminal in the works. If this was the right allowance there, it was (barring the special siding accommodation to which he had referred) a right charge to be taken off the Lawley Street rate. The Great Western Railway allowed 3d. to the Wolverhampton Gas Company off the Wolverhampton Station rate for station terminal; and the Corporation said they ought to have at least as much as that, though, of course, if the station terminal was to be taken on the Piddock principle there might have to be some reduction in the rebate. The Midland Company said that the terminal charge on coal was only 1d., but this could not be so, when they had a terminal charge of 3d. on coke. He was reminded that 3d. was for the terminal at the station to which the coke was sent. That was so. Coke might be sent from the gas-works to Lawley Street; and then for the station accommodation would be charged 3d. If coal was sent from the colliery to Lawley Street, the charge ought to be the same for coal as for coke, for station accommodation; and therefore if the Corporation saved the Company station accommodation, they ought to have the terminal 3d. The Corporation took delivery and returned trucks far more rapidly than the ordinary trader at Lawley Street; and the Company gained in this way. The waggons conveyed to the Corporation made four journeys a month between the colliery and the gas-works; while those conveying traders' coal only made 2½ journeys a month, which was to the advantage of the Railway Company. Yet, though they were conveyed a mile less, and though on the previous occasion the Company said "That mile costs us 0.6d.," they refused to give the Corporation a rebate as compared with the ordinary trader at Lawley Street Station.

THE REDUCTION MADE IN CHARGES ON COKE.

As to coke despatched from the Windsor Street and Nechells Gas-Works siding, the London and North-Western Railway Company first submitted figures of terminal charges at the forwarding end, varying from 1½d. up to, in the case of Lichfield, 8½d. This was their first disintegration of the figures; and apparently they found it would not do, so they had submitted amended figures reducing all these amounts. They now said the charge for terminal services at sending end was 1d. in each case; and the charge for terminal services at receiving end was 3d. in each instance. They added that the balance of the rates in every case was attributed to conveyance. But if they attributed it to conveyance, it brought the conveyance rate over the maximum they were entitled to charge in a large number of instances; and they had reduced the coke rates in consequence. Take Lichfield as an example, the rate was 2s. 2d.; and it had now been reduced to 1s. 6d. This was not on the question of rebate. The Corporation said that if the 1d. with regard to Lichfield was right, and 1s. 6d. was all the Company could charge for conveyance, the Corporation, having been charged 2s. 2d., claimed to have the difference refunded to them.

Sir JAMES WOODHOUSE: It was 2s. 2d.; but it is now 1s. 6d. Do you say that this is the maximum of their charging power?

Mr. BALFOUR BROWNE: That is what I understand; but they could justify it if they had been entitled to charge 8½d. for a terminal, and that is the way they did justify it in their first disintegration. Now that they cannot justify it, of course, they have to reduce the rates. Therefore we say it is juggling, because that is not the terminal they were charging. It is now, because I want a rebate, that they put down 1d.

Sir JAMES WOODHOUSE: What you say is that the distribution they made first was a purely artificial disintegration?

Mr. BALFOUR BROWNE: Absolutely artificial, as you can see, because in every case it varied; and it was only made in order to justify the total they were charging.

Sir JAMES WOODHOUSE: We have heard of that in other cases.

Mr. BALFOUR BROWNE: We have. It is not the first time that a railway company have been driven to that ingenuity.

Justice LAWRENCE: Am I right in supposing you say you have got a reduction out of them by reason of your stirring the matter up?

Mr. BALFOUR BROWNE: Yes, a great reduction on the coke rates; but even now, when they say "We are charging this 1d.," we say that it is too much. They have no right to charge 1d. at all.

THE NECHELLS WORKS.

As to the Nechells works, these were served by two Companies—the London and North-Western and the Midland. They were completed in the year 1900, and were capable of carbonizing 100,000 tons of coal a year. They had sidings on both lines. The traffic for Nechells was treated in exactly the same way as that for Saltley, so far as the Washwood Heath sidings were concerned. It was then separated, and hauled to Duddleston Mill sidings, and afterwards put into a connecting line between the works and the Railway Companies' sidings. This line held from twelve to fifteen trucks. A Corporation locomotive went and picked the trucks up and hauled them into the works; and the Corporation said the traffic was still in transit until it was deposited there for them to take away. That was to say, it was delivered to them there; and they took it away by their locomotive, and carried it into the works. They maintained that there was no accommodation provided or service rendered by the Midland Railway Company at this place. In the report of the case of the *Chatterley Iron Company v. The North Staffordshire Railway Company*, before this Court, the following appeared: "The fifth question distinguishes between the main lines of a railway and the subsidiary lines used as sidings for shunting, handling of goods, and other like services; and it is proposed that it should be asked whether in using or giving the use of sidings for such purposes the North Staffordshire Company do not perform a terminal service within the meaning of the 86th section of the Company's Act of 1847, or of the 19th section of

their Act of 1864, and may not make an extra charge in consequence." In his judgment, Sir Frederick Peel said: "A railway company could not carry on the business of a carrier if they had no place to shunt, or to stand or deposit their trucks in; and they cannot therefore be said to perform a special service, which are the words of the 86th section, by having and using or granting the use of such places." As to the Washwood Heath siding, he (the learned Counsel) said the Railway Company could not carry on their business without it; and according to the case he had quoted, they were not entitled to charge for it.

Justice LAWRENCE asked whether this was quite consistent with what happened in regard to the application in 1896, which was apparently defeated by reason of services rendered at certain sidings.

Mr. BALFOUR BROWNE replied that they were sidings in exactly the same position, he took it, as the special one he had referred to at Saltley. They were sidings dedicated to the use of the Corporation's particular traffic, which could not be worked without them. The Washwood Heath sidings, however, were away from the gas-works, and not connected with the delivery to these works. They were used for the purpose of separating Birmingham traffic from that of other towns, and also for sorting out the station traffic from the siding traffic. What he thought was the decision in the Chatterley case was that anything which was essential to the railway company's own duty, which was the conveyance of goods, could not be charged for except as part of the conveyance rate; but if a company provided a special siding for a particular works, they were entitled to charge for it. As to the North-Western Railway, they refused until last February at Nechells the rebate of 3d. on coal which they allowed at Windsor Street. They were now giving it; but the Corporation asked for an order.

THE WINDSOR STREET WORKS.

At Windsor Street there was a siding made under an agreement. The coal traffic to the works was 170,000 tons a year; and it came from Yorkshire and Derbyshire. It was brought to the works by the London and North-Western Railway, who, as he had stated, allowed the 3d. terminal rebate on coal. There was therefore nothing more to say about this. The sidings at Windsor Street were very extensive.

THE SWAN VILLAGE WORKS.

The siding accommodation at the Swan Village works was amply sufficient. The Great Western Railway charged the same rate to the gas-works as to the Swan Village goods station, which was close to the gas-works siding. They did precisely the same with the Corporation traffic as with their own traffic to the station; and yet they denied that the Corporation were entitled to a rebate. The Company said that, in consequence of the position of the siding at Swan Village, and owing to the fact that the siding junction was only with the up-line, all outward traffic had to be worked in the first place into West Bromwich Station, after which it had to be worked back, if it was destined for places north of the Corporation's siding. For the same reasons, all inward traffic coming from the south had to be worked past the siding in the first place into Swan Village Basin Station, and subsequently taken back to the siding. That they so hauled the Corporation goods was quite true; but they did the same for their other traffic, and so it was not for the convenience of the Corporation, who did not want it done.

THE QUESTION OF WAGGON-HIRE.

Another claim the Corporation made was with regard to waggon-hire. Section 9 of the London and North-Western Railway Company's Act of 1891 entitled the Company to charge for the use of trucks provided by them for the conveyance of merchandize, when the provision of trucks was not provided in the maximum rates for conveyance, any sum not exceeding 4½d. per ton for distances of not over 20 miles. As a matter of fact, the Company had charged 6d.; their argument being that they were entitled, when the journey was partly over their system and partly over that of other companies, to charge 4½d. per ton for the distance between the Corporation sidings and the point of junction, together with such additional sum as the other companies were empowered to charge. The 6d. was a commutation of these two sums.

MISCELLANEOUS TRAFFIC—WHAT THE CORPORATION CLAIM.

The Corporation also made claims with regard to miscellaneous traffic, which the learned Counsel set forth at some length. Various reductions, he said, had been made by the Companies while the application to the Court was pending; but these were not such as the Corporation contended ought to be granted. He asked the Court to fix what was a fair rebate to be allowed to them off the station rates in the cases complained of—leaving out the North-Western so far as they had already granted a rebate at Windsor Street and Nechells. He suggested that the rebate on coal should be 3d. per ton. They also asked for a similar rebate on coke outwards, because they provided in that case, too, the station, which was not furnished by the Railway Company. As to the general traffic, a like argument applied. Then the Corporation claimed damages in connection with the reduced coke rates. The Companies had been charging them, under their own showing, as a pretended terminal (to take one case), 8½d. per ton, when they now said they were only entitled to charge 1d., and the Corporation said they were entitled to charge nothing. The Great Western Company admitted that since the application was filed they had revised certain of the rates for coke from the Swan Village siding; and they had stated their willingness that the accounts should be adjusted as from the date of the application. He also wanted damages in connection with other reductions that had been made, where the Company had admitted they were wrong.

Mr. SIMON said the North-Western Company were prepared to do the same as the Great Western in this respect—that was, to make the reduction retrospective.

Mr. BALFOUR BROWNE remarked that he must be fortified by the order of the Court. Of course, he further claimed damages in respect to the overcharges for waggon-hire. It was a very complicated and a very difficult case.

The Court then adjourned.

For the past year, the Directors of the Colonial Gas Association have declared an interim dividend of 2s. per share on the ordinary shares, and of 4s. per share on the founders' shares.

THE RETIREMENT OF MR. LAYCOCK.

As was stated in last week's "JOURNAL" would be the case, the Keighley Town Council, at their meeting last Tuesday, were asked by the Gas Committee to accept the resignation of Mr. John Laycock of his position of Gas Engineer and Manager, and to appoint him Consulting Engineer for five years.

In submitting these recommendations, Mr. John Harrison, the Chairman of the Gas Committee, paid a high tribute to the energy and capability of Mr. Laycock, and expressed the opinion that the retention of his services as Consulting Engineer would be highly advantageous to the town. Mr. B. S. Brigg, as one of the old members of the Council, and one who had been in touch with Mr. Laycock and his work for nearly forty years, also spoke very highly of the services of that gentleman, and referred to the development of the works under Mr. Laycock's direction. Few corporations, he said, had had the services of so able, successful, and conscientious an official. The history of the gas-works under the management of Mr. Laycock was a record of continuous progress. If evidence were needed of his successful management, it would be found in the fact that the total amount of profit paid by the undertaking, after allowing for interest on capital, under his management, was no less than £326,000. If these figures could be given to some of the people who objected to municipal trading, they would not, he thought, be quite so certain that municipal trading was always a mistake. In Keighley, so far from being a mistake, it had been a great success. The Mayor (Mr. James Wharton) said he was glad the Committee had agreed to retain Mr. Laycock's services in a consulting capacity; but he did not like a five years' agreement. The proposals were adopted without a dissentient.

On the recommendation of the Gas Committee, Mr. William Baillie, the present Assistant at the gas-works, was appointed Engineer and Manager on probation.

SATISFACTORY WORKING AT LANCASTER.

Reviewing the position of the gas undertaking at the quarterly meeting of the Lancaster Town Council, Alderman Helme, M.P., said they had every reason to be satisfied with the balance-sheet. On the income side they had estimated that from the sale of gas they would derive £18,930; and by the end of the month the receipts would be within 11s. 5d. of this sum. The price of coke and residuals was always a matter of uncertainty, being regulated by the state of the markets; and from this source, against an estimate of £6290, they had received £5818. But in regard to coke they had suffered a money loss of £200 in the effort to share the policy of the Corporation in providing for the distress in the town. For products from tar and liquor they had received £3279, against an estimate of £3500. The total estimated income was £29,432, and they had actually received £28,771—a shortage of £662, including the £200 spent on coke. In regard to the expenditure, the policy of the Committee respecting the purchase of coal had been eminently successful. They refused to contract at the prices put before them a year ago; and the result had been that they had saved some £700 in the price paid. Allusion had been made to the salaries paid in some departments; but in the Gas Department they had worked very carefully, and under the head of salaries and wages for carbonizing the expenditure was below the estimate—£1282, as against £1300. The total expenditure was estimated at £26,580; and it actually worked out at £25,986. They had been able to spend £233 in maintenance of works, £63 in maintenance of mains, and £466 in extension of mains; the latter being really a development on capital account charged to revenue. They came out at the end of the year, therefore, with a profit in round figures of £5000. This was made up of £2000 contributed to the relief of the rates, £784 put to the reserve fund, £1700 the value of gas supplied for the lighting of the town, £200 earned but spent in coke for the relief of distress, and £466 spent on new mains—a total of £5150 as the result of the year's working. The £784 carried to the reserve fund would make the total of the fund £11,797; but against this the Council had sanctioned the expenditure of £250 for new testing plant, and £500 for a scrubber-washer. In considering the question of the distribution of gas to the town, especially with regard to unemployment, he had conferred with the Manager (Mr. Charles Armitage); and in view of the generous support of the Finance Committee in the building-up policy which had made the department so strong, it was possible that, after providing for the contribution to the rates, they might spend £700 in laying a 12-inch main in certain streets. This would provide a considerable amount of employment, especially if, as they hoped, they were able to procure the pipes locally. In the estimate for next year they anticipated a fall of £329 in income from gas, owing to power being supplied to users of gas-engines at a lower price; the total being £18,600. From coke they estimated to receive £5637, and from other products £3300; the total estimated income being £28,234, as against £28,771 last year. They put down the cost of coal at £12,000, and the total expenditure at £25,846, against £25,986 last year. This they hoped would provide not only £1700 for the supply of public lighting but the £2000 for the rates, which might be regarded as a regular contribution, and £386 for the reserve fund. In conclusion, he paid a tribute to the care and ability with which Mr. Armitage conducted the work of the department.

Several members congratulated both the Gas Committee and Mr. Armitage on the excellent results attained.

Idle Gas-Works at Bradford.—When the minutes of the Gas Committee were submitted to the last meeting of the Bradford City Council, Mr. Hustler suggested that the gas-works at Idle and Eccleshill, which were standing useless, should be sold. Mr. Geldard, who moved the adoption of the minutes, observed that the Council, when they bought the out-district gas-works, ought to have been more careful as to what they were doing. The only use which was made of the Eccleshill works was that in winter the holder was brought into requisition. He had no objection to selling the rest of the works.

THE PROPOSED LIGHTING EXPERIMENT AT PLYMOUTH.

The refusal of the Electricity and Street Lighting Committee to permit the Plymouth Gas Company to demonstrate the advantages of gas for street lighting, was the subject of some discussion at the meeting of the Plymouth Town Council yesterday week.

Mr. Munday asked why the Committee shirked the proposed test, and said he found it difficult to understand why they should refuse the offer of the Gas Company. Mr. Jacobs thought the refusal to allow the Gas Company to show what they could do was a plea of "Guilty" on the part of the Electricity Committee. Mr. Anthony, the Chairman of the Committee, replied that he thought the use of the word "shirk" hardly fair. The proposal was made that experiments should be carried out at the expense of the ratepayers to show which was the more effective system of street lighting; and the Committee felt that the present was not the right time to adopt the suggestion. As experiments of a similar character were being conducted in other parts of the country, the Committee were of opinion that the chestnuts might just as well be pulled out of the fire by other people as by themselves. Another difficulty was as to who should be the judge. If it rested with him, he should declare in favour of electricity, and say it was the best. The "JOURNAL OF GAS LIGHTING" had commented on this matter; and it had also said that the Committee "shirked" this trial. The Committee had not shirked their responsibilities in the least. Mr. Munday remarked that he had not seen the "JOURNAL OF GAS LIGHTING," and had no interest in the Gas Company. Mr. Anthony said he did not mean that his remark should be taken in any personal sense. The Committee considered that it would be useless expense to contemplate the possibility of having to "scrap" all their electric lighting standards. At the same time, if the Gas Company had any suggestions to make for the improvement of the gas lighting where it was used, they would be glad to consider them.

At the same meeting, Mr. Pengelly called attention to a minute instructing the Electrical Engineer to submit an estimate for installing the electric light at North Road School, which is to undergo extensive alteration, and asked whether the Education Committee had considered the cost of improved gas lighting. Alderman Woolcombe, Chairman of the Committee, thought there would be no objection to considering the cost of gas as compared with electricity; and an amendment directing that an estimate should also be obtained for improved gas lighting was carried.

THE ELECTRIC LIGHTING DEFICIENCY AT HASTINGS.

Gas Company Successfully Object to the District Rate.

At the Meeting of the Hastings Town Council on the 2nd inst., the Finance Committee reported that on the 18th ult. the Town Clerk received from the Hastings and St. Leonards Gas Company a notice of appeal to Quarter Sessions against the general district rate made on the 5th of March on the following grounds:

(1) That the rate is bad in law, inasmuch as it includes retrospective charges. (2) That it includes charges and expenses which had been incurred and became due more than six months before it was made, contrary to the provisions of section 210 of the Public Health Act, 1875. (3) That included in the estimate of the rate, and levied by it is the sum of £1615 19s. 4d., or thereabouts, being a deficit on the electric light undertaking and works for the year ending March 31, 1908. (4) That included in the estimate of the rate, and levied by it, are sums, being deficits on the electric light undertaking and works for a period prior to Sept. 30, 1908. (5) That the Mayor, Aldermen, and Burgesses so acting through the Council did not, before proceeding to make the rate, cause an estimate to be prepared of the money required for the purposes in respect of which it was to be made, showing the several sums required for each of such purposes, and in particular did not cause an estimate to be prepared of the money required for the electric light undertaking and works for the year in respect of which the rate was made, contrary to the provisions of section 218 of the Public Health Act, 1875. (6) That by reason of the inclusion of such sums, or some one or more of them, and of the omission, the rate is rendered invalid and should be quashed.

The Committee were advised by Counsel that the inclusion of the amount of the deficit in respect of the electricity undertaking at March 31, 1908, in the expenses to be defrayed out of the rate was a good ground of appeal, it being a debt incurred more than six months before the making of the rate. The same objection would apply to the items in respect of part cost of altering the Front Line lamps and installing electric arc lamps in Queen's Road and Cambridge Road. The Committee were further advised, however, that it was open to the Council to amend the estimate already approved, by eliminating therefrom items that were improperly included, and by inserting other items that might have been included. They therefore recommended that the estimate for a general district rate for the year ending March 31, 1910, which was approved on Feb. 19 last, be amended by excluding the sum of £1625 2s in respect of the electric light undertaking deficiency at March 31, 1908, and by substituting for the sum of £5723 2s., inserted in the summary opposite the item "electric lighting," the sum of £4098, representing the anticipated deficiency for the year ending March 31, 1909, and by inserting the estimate showing how the deficiency is arrived at, by striking out the following items: One-third estimated cost of altering Front Line lamps, £711; one-third cost of installing electric arc lamps in Queen's Road and Cambridge Road, £72, and inserting the following items in the summary: Amount expended during the half year ending March 31, 1909, on special work for unemployed at Buckshole reservoir clarification works, Bopeep Sanatorium, &c., £1127; amount overspent during half year ending March 31, 1909, in clearing snow, £500—total, £1627.

The Committee also reported that a communication had been received from the Local Government Board stating that they had had under consideration the report made by their Inspector, Mr. Fawcett,

after the inquiry held by him with reference to the application of the Council for sanction to borrow £1683 for the purpose of fitting certain public gas-lamps in the borough for electric lighting; and that, on the information at present before them, the Board were not satisfied that the proposal was one for which a loan should be sanctioned, and were, therefore, not prepared to comply with the application. Under the circumstances, the Committee recommended that the following item should be inserted in the estimate, with a view to the carrying out of a portion of the work during the year ending March 31, 1910: Fitting certain existing gas-lamps for electric lighting, £500; and that the estimate should be further amended by making all necessary consequential alterations, including the substitution in the summary for £62,987 2s., estimated amount required to be raised by rate, the sum of £62,706. The amount of the rate (3s. 2d. in the pound) estimated to realize £62,456 16s. would not, therefore, be affected.

The Committee further recommended that no part of the general district rate made on the 5th of March for the year ending March 31, 1910, be applied towards defraying any of the items to be now excluded from the estimate; that this and the amendment of the estimate be forthwith notified to the Gas Company; and that in the event of the Company proceeding, the Town Clerk be authorized to take all necessary steps to oppose the appeal.

Mr. A. W. Chesterfield, in moving the adoption of the report, said the Committee greatly regretted the necessity for it; but they felt they had no other alternative. There was no item in the estimates for which they need be sorry to be responsible. Alderman Parker seconded the motion; and it was carried.

ANTWERP WATER-WORKS COMPANY, LIMITED.

At the Annual Meeting of the Company on March 29—Mr. EASTON DEVONSHIRE presiding—the Directors reported that the income, from all sources, amounted to £78,712, as compared with £73,908 in 1907; and after deducting working expenses, the cost of laying on services, and London expenses, there was a balance left of £53,258. To this was added the undivided profit of £7877 brought forward from the last account, and interest on investments £214—making a total credit of £61,350. Against this there had been charged debenture interest and income-tax for 1908, the contribution to the reserve account of 5 per cent. on net profits, the interim dividend of £13,500 (at the rate of 9 per cent. per annum), the transfer to the sinking fund for redemption of debentures of £1900, and for that of the share capital £6250, and the Directors' extra remuneration (as provided for by the Articles) of £2243. The sum of £29,781 was left, out of which the Directors recommended that a balance dividend for the six months to Dec. 31 be paid at the rate of 12 per cent. per annum, free of income-tax, absorbing £18,000, and making a total dividend of 10½ per cent. for the year—the balance to be carried forward being £11,781.

The CHAIRMAN, in moving the adoption of the report and accounts, congratulated the shareholders on the exceedingly satisfactory results of the year. The income received from the water-rentals, he said, created a record. It was £6868 higher than in 1907, or about 10½ per cent. on the rental for that year. It would be wise, however, to consider part of this increase as somewhat exceptional. The State Railways used rather over £4000 worth of water during the year; but the Railway Department was now preparing a scheme on a somewhat gigantic scale, including a reservoir of 5 million cubic metres capacity, for the supply of filtered river water for railway purposes. When the scheme was completed, the railway would no longer have need of the Company's supply. It would take about three years to carry out the scheme; but the Directors had every reason to expect that, during this period, a very large supplementary supply of water would be required from their mains at Antwerp. At the same time, it would have been noticed from Mr. Kemna's report that there had been a falling off, owing to bad trade, in the general meter supply for private trade consumers, and also in the shipping supply. He (the Chairman) thought, however, they might anticipate that, in the course of a few years, the return to normal conditions would compensate any loss there might be through the cessation of the railway supply. Taking this into consideration, and also the fact that they were able to carry forward a large balance of undivided profit (over £11,000), the Directors were, in his opinion, quite justified in giving full dividends this year in accordance with the Articles of Association. One of the items showing serious falling off was shipping supplies; and this indicated the state of trade. The diminution was no less than £500. One of the most satisfactory items was that of the increase of domestic supplies. It was no less than £3200 for the year. The Manager's report showed that the increases had been in geometrical progression since 1900. Whereas in 1900 the increase over the previous year was 20,278 frs., in 1908 it was 78,411 frs., or nearly four times as large. During the past year they had completed a series of what were known as Puech filters, or gravel strainers. The plant had not been constructed solely for the chemical improvement of the water, but because, by its use, they were able to avoid an increase in the storage reservoirs. The Directors only adopted the strainers after long experiments, and finally with certain modifications and improvements (as he thought) on the original system. The expenditure on them seemed to be fully justified. The improvement in the quality of the water was remarkable, both in its appearance and in its chemical quality. They had also made a large expenditure during the past year, £4163 (which had been charged to the reserve account), in improving and altering the machinery. This expenditure was sure to pay for itself in a few years time by economy of fuel and by efficiency in pumping. A triple-expansion engine had also been moved from the Waelhem works to the Luthagen station. It had been supplied with larger pumps; so that practically they would be able to pump, with the same quantity of fuel, 50 per cent. more water with one engine. As to the general expenditure, the increase in pumping and engine charges and in maintenance and repairs, was, generally speaking, completely justified by the increase in the quantity of water pumped and

sold—the addition being 618,577 cubic metres or tons, and equal to about 15 per cent. increase over 1907. A very interesting fact was brought to light by a diagram sent over by Mr. Kemna. It was that the death-rate of Antwerp had fallen since 1898 from 17·7 to 12·7. He (the Chairman) thought the Company could claim some little credit for this, because during the same period they had added 10,000 to the number of houses supplied with water. At the present moment, they supplied 20,000 houses out of 39,000. When the demolition of the fortifications occurred (this would commence in the year 1910) he had great hope that the Company would have a further increase of customers in a very short time, by building proceeding within the at present prohibited area of 1000 metres from the fortifications. In regard to what would occur to the Company in 1911, they were much in the same position as when the shareholders last met. The matter was being carefully studied and considered by the authorities, and in a reasonable way. The Directors thought the management of the water supply of Antwerp could not be in better hands than now. However, there was no need for anxiety one way or the other.

Mr. GEORGE EVANS seconded the motion; and it was carried.

Other resolutions were passed, declaring the dividend, re-electing Directors and Auditors, and thanking the Chairman and Directors for their services.

SALE OF THE PONTYPRIDD WATER-WORKS.

Provisional Agreement Signed.

It was mentioned in the "JOURNAL" last week (p. 51), that terms had been practically arranged by which the Glamorgan Water Board, for the constitution of which a Bill is now before Parliament, will acquire the undertaking of the Pontypridd Water Company. We now learn that an agreement has been signed for carrying out the transfer, subject to the formation of the Board being sanctioned by Parliament—the purchase price being £333,000 in the gross. The actual price for the existing concerns, which include the two reservoirs at Mardy, having a storage capacity of 220 million gallons and 20 million gallons respectively, together with the whole of the mains, &c., is £310,000. The remaining sum (or £23,000) is mainly made up of the proportionate cost of £15,000 incurred by the Water Company in promoting their Bill last session, which conferred powers for carrying out the Llia scheme, and the expense which will be entailed in connection with the Bill now before Parliament for extension of works, together with £8000 compensation to officials, &c., and contingent payments. Though a "sterilization" clause was inserted in the Act obtained by the Company last year, the Board agreed to a payment of a fair proportion of the cost commensurate with the benefits they will obtain under the powers conferred by the measure. The capital outlay on the existing undertakings of the Company is practically a quarter-of-a-million, and the dividends paid last February were 7½ per cent. on the 10 per cent. maximum shares, and 5½ per cent. on the 7½ per cent. maximum shares.

PROTECTION OF MUNICIPAL RESERVOIRS.

The Corporations of Lancashire and Yorkshire, who have reservoirs in their keeping, are protesting against an attempt to interfere, needlessly as they think, with their control. At present these reservoirs are treated as private property; but an endeavour is being made to bring some, if not all, of them under the jurisdiction of the Lune Fisheries Board. In many of the reservoirs it has been the practice to allow fishing, subject only to the authority owning the water; but Manchester occupies an exceptional position. The Water Committee regard the presence of the angler as tending to jeopardize the purity of the water. Where the water is filtered before passing into the mains, which it is not in Manchester, this objection does not apply; but as regards the importance of maintaining unrestricted control over the reservoirs, the Corporation are understood to be in full accord with the other water authorities of the two counties.

With the object of organizing opposition to the proposals above referred to, an influential meeting, convened by the Town Clerks of Bradford and Lancaster (Mr. F. Stevens and Mr. T. Cann Hughes), was recently held in the Victoria Hotel, Manchester. The gathering was a representative one, and was presided over by Alderman Land, of Bradford. The proceedings were conducted in private; but at the close the result was communicated to the Press. It was to the effect that, on the motion of Mr. Bennett, a member of the Sheffield Corporation, seconded by the Town Clerk of Rotherham (Mr. W. J. Board), the following resolution was carried unanimously: "That this meeting urges and recommends all the water authorities in the districts affected by the proposed Provisional Orders for the constitution of Fishery Boards in certain districts of Lancashire and Yorkshire at once independently to lodge objection to the proposed Orders, so as to secure a definite exemption of all reservoirs belonging to water authorities from the operation of the Orders; and that a Committee, consisting of representatives of Leeds, Bradford, Rotherham, Sheffield, Huddersfield, Bolton, Halifax, Harrogate, Doncaster, Burnley, Manchester, Liverpool, Barrow-in-Furness, Rochdale, and Lancaster, be appointed to consider the action to be taken to give effect to the above resolution, and to protect other authorities from similar Orders, and as to a division of the expenses of such opposition between the authorities affected." The Town Clerks of Bradford and Lancaster were appointed the Hon. Secretaries of the Committee.

Notice of objection to the increased assessment of the Leeds Corporation Gas-Works in the township of Armley and Bramley has been served upon the Assessment Committee of the Bramley Union; and the Town Clerk is to be authorized to take such steps as he may deem necessary in the matter.

LAND FOR BIRKENHEAD WATER-WORKS.

Arbitration Proceedings.

At the Surveyors' Institution, on Monday, March 29, an arbitration was opened to determine the price to be paid by the Birkenhead Corporation for the compulsory acquisition of land on the Hafod Elwy and Taincha Estates, Denbighshire, owned by Mr. A. O. Evans, required for carrying out the extensive scheme of additional water supply sanctioned by the Corporation's Act of 1907. The price asked by the claimant for 2039 acres was about £100,000.

Mr. TOBIN, K.C., was Arbitrator for Mr. Evans; Mr. MONTAGUE SHEARMAN, K.C., acted in a similar capacity for the Corporation; and Sir EDWARD CLARKE, K.C., was the Umpire. Mr. T. G. HORRIDGE, K.C., Mr. F. E. SMITH, K.C., and Mr. C. C. HUTCHINSON appeared for the claimant; Mr. BALFOUR BROWNE, K.C., Mr. ELLIS J. GRIFFITHS, and Mr. LESLIE SCOTT represented the Corporation.

Mr. HORRIDGE, in opening the case, explained that, owing to the heavy demand upon the existing supply of water to Birkenhead, which came from wells in the Wirral Peninsula, the sea began to percolate into the wells, and was making the water saline. As a result, the Corporation obtained an Act in 1907 giving them power to construct a dam on the Alwen, in the Alwen and Brenig Valley, Denbighshire; and it was proposed to construct a reservoir capable of supplying 10,807,000 gallons of water per day, of which 3,600,000 gallons would be used for compensation. The Brenig reservoir would have a total available daily capacity of 5,205,000 gallons. It was proposed to take 11,313 acres for the watershed and reservoirs; and of this total the claimant owned 3343 acres. The water area of the Alwen reservoir was to be 340 acres, and it would be 2½ miles long, with a storage capacity of 2140 million gallons. The claimant's estate possessed special adaptability for the purposes of a water undertaking. It had an ideal formation; there was stone on it with which to construct reservoirs; and the foundations could be reached within a short distance of the surface. It was moorland, and therefore free from sources of contamination. Owing to the position of the estate, the Corporation would have an exceptionally short distance to take the water. Another advantage was that the estate was surrounded by other water-bearing areas, which added to its value, because these could be utilized. From an engineering point of view, the site possessed enormous advantages, since the water would be conveyed by gravitation along the shortest route to Birkenhead. The only tunnelling required was 381 yards, and only the River Dee had to be crossed. The large towns which were over-taking their water resources were looking to such estates as the one in question for increasing their supplies. With regard to the principles of his valuation, he had added 50 per cent. to the worth of the reservoir site for the surrounding filtration beds. The claimant was also entitled to compensation for the taking of his sporting rights. With regard to minerals, he was entitled to be paid for the additional value of the stone on the estate. For 1672 lineal yards of easements he could claim at the rate of 7s. 6d. per yard. He was entitled to £10 per acre above the agricultural value of the land in respect of the water-bearing character of the soil, and to 10 per cent. on the value of the estate in respect of compulsory purchase. The estate was in such a position that there must be competitors for it; and he (Counsel) asked the Umpire to take this circumstance into account in determining the sum to be paid by the Corporation.

Evidence was then given in support of the claim.

Mr. E. W. DIXON, of Leeds, said there was no such place as the claimant's for obtaining a water supply and making reservoirs on the east side of Snowdon. He expressed the opinion that the whole Wirral Peninsula would be obliged at some time to have to go to the same source for its supply; and there was ample room for extension. The Alwen reservoir, when completed, would be the largest at that height in the kingdom. As an item of enhanced value, he pointed out that the tunnelling would only be a few hundred yards, while Birmingham had to tunnel 13 miles, Manchester 14, and Liverpool 4. This site possessed all the elements of special adaptability. The large towns in South Lancashire had at present practically exhausted their supplies. Stalybridge, Ashton-under-Lyne, Dukinfield, and others, were all constructing their last reservoirs, and had no hope—inside the Mersey watershed—of getting any further surface water supply. If the present growth went on as it had done, he was confident that these districts would have to go to Wales for their supply in the future; and the Wirral Peninsula was also a competitor for the Welsh supplies.

In cross-examination by Mr. LESLIE SCOTT, witness said that, assuming he was the owner of a site in Wales suitable for reservoir purposes, and had received no inquiry for it for a reservoir—no intimation that the water authority had been requested to make arrangements for the sale of the site—and, on the other hand, he received an offer for it for a grouse moor and pastoral purposes, and could sell it at top market value, if he thought that some years hence an authority would come and ask him to sell, he would hold on to his land in the event of such a probability, if it were a matter of twenty years, unless compelled to sell through poverty.

Re-examined: Outside the site in question, there was not one that a purchaser would look at for water-works purposes. He could not conceive any better scheme for Wirral than that with which the Birkenhead Corporation were concerned. From the point of view of quality, quantity, and ultimate cost, there was nothing cheaper; and nowhere in North Wales was there an equivalent site to the Alwen.

Mr. T. T. WAINWRIGHT said he valued the reservoir site, together with surroundings, at £1 an acre per million gallons of water stored in the reservoir. This, taken on the 4 per cent. table, 25 years' purchase, represented capitalized £25 per acre per million gallons. Then he found that the site was equal to 6·29 million gallons of water per acre, which represented a sum equivalent to a value of £157 per acre. The land to be taken was 2039 acres. He did not think he had ever seen land better adapted than this for the storage of water. Estimating the land for the reservoir and surroundings at £157 per acre, he valued this portion of the estate at £59,817. The watershed was an admirable one, and fully worth £10 an acre for this purpose, in addition to its

value as agricultural land. The watershed lands he valued at £21,795; making a total of £81,612. Then there were 927 acres of good shooting to be taken, which he put at 2s. an acre, £334 per annum, capitalized at £5412 10s. This sum included depreciation to the value of the 1300 acres remaining. Including wayleave for pipes, his total was £90,869, and adding 10 per cent. for compulsory purchase, brought it up to £99,758, which he thought was the compensation that should be paid to the claimant. He was unable to point to another water area which could so cheaply and adequately supply the needs of Wirral as the one in question.

Witness was cross-examined at some length by Mr. BALFOUR BROWNE in regard to his valuation of the sporting rights connected with the site; but he defended his figure of 25 years' purchase, and 35 years for the agricultural land. He said he considered the site an extraordinary one for the purposes of water supply.

Mr. G. N. Youndi said there were no geological difficulties in connection with the site, and he did not anticipate any with the bottom of the foundations of the reservoir. Of an average of eight North Country reservoirs, he found the cost to be £147,000 for the storage of a million gallons of water. Estimating the total cost of the Alwen reservoir at £175,000, the cost per million gallons was only £82,000. As a collecting-ground, the site in question was absolutely pure. He placed the 381 acres required for the reservoir and surroundings at £157 an acre, and he added to the value of the remaining agricultural land £10 for water-bearing capacity. The stone on the site he valued at 60,000 cubic yards at 1s. per yard; and his total valuation was £99,758.

Mr. T. Jones said, in his opinion, the land in question possessed special adaptability for water-works purposes. The water area of the reservoir was 254 acres, and the surroundings he put down at 50 per cent. extra—reckoning them at £157 an acre. The remaining agricultural land he valued at £16,580; but in this was included a sum of £10 per acre for adaptability as a watershed. The shooting he valued at 2s. an acre over 2039 acres which would be taken, and depreciation to the 1304 acres remaining of the claimant's property he put at 5d. per acre; his valuation for shooting and depreciation being £4925. The wayleave for pipes he priced at 7s. 6d. per lineal yard, £628; and his total for the whole, including 10 per cent. for compulsory purchase, was £99,641. Asked whether it was not becoming increasingly difficult to obtain sites for purposes of water supply, and were not the large towns going more and more to Wales, witness replied that people there feared that all their water would be taken; and therefore there was a natural feeling about it. He should say the site in question was one which would at an early period he sought after for the supply of water for domestic use.

Mr. J. Clarke, Mr. J. Farrer, and Mr. F. W. Thompson gave similar evidence; the last-named witness stating that his valuation of the site, which was an ideal one, was £96,255, exclusive of stone.

Mr. F. E. Priest, the Engineer to the Wirral Rural District Council, said that at present, with the exception of Wallasey, the Wirral Peninsula was supplied with water from deep wells. The whole of it was covered with boulder clay and impervious to water, so that the surface water could not be obtained; and the supply to the wells came from the sea in the estuary—the depth of the wells being below sea level. The least distance from the sea at which they could put a well was three miles; and the effect of the increasing demand on the wells was to make the supply saline. He was perfectly certain the present water supply in the Peninsula could not continue very much longer. He knew that Birkenhead made serious efforts to avoid having the present scheme on their hands; but they utterly failed.

Mr. BALFOUR BROWNE then opened the case for the Corporation. He said the owner of the land required was claiming about £100,000, chiefly on the ground of its special adaptability for water-works purposes. The claim raised what was most inappropriately termed "special adaptability;" but he ventured to say this was not only fallacy, but downright absurdity. Special adaptability depended entirely on the point when the want of water would arise. If it was a present want, the land might be worth £150 an acre; but suppose the want did not arise for 33 years, the consideration of special adaptability had gone. It might have been possible, before Birkenhead obtained statutory powers, to make a bargain with Mr. Evans, the other gentleman in the locality, to purchase land. What would they have given then? First of all, he suggested this would be a blackmail value. If Birkenhead was in deadly need of water, it might have given a heavy price for the land; but such a bargain could not have been made except under the authority of an Act of Parliament. They must consider whether the interests of Birkenhead were such that the Corporation must necessarily go to this site. If there were a dozen other sites available, what became of the special adaptability of this one? If Mr. Evans had asked a large sum, Birkenhead would have gone to half-a-dozen other sites equally suitable. How would he prove special adaptability then? There was no competition among corporations or individuals for these sites. He was prepared to show that in this particular locality there were sites which would have suited any one of the districts that had been mentioned. If one wanted to show a market, one must show a demand, and not only a demand but the imminence of demand. If no imminence arose within a period of 33 years, special adaptability went. The claimant's case was founded upon market and competition, and he had failed to make it out. An enormous sum was being asked from the Corporation; and the Court should have regard to the value of this property at the time notice to treat was served.

Evidence was then given on behalf of the Corporation.

Mr. G. F. Deacon was the first witness. He said in connection with the water schemes with which he had been engaged he had examined various sources in North Wales, and had known two or three sites for forty years. They largely exceeded the present demand for them, as well as any future demand, so far as one could foresee. He had examined the whole of the cases of the authorities within sixty miles of the site in question, and there is not one within that distance in the least likely to go to Alwen, or anywhere near it, for thirty or forty years; and he was inclined to say for a good deal longer. He made a preliminary report to the Birkenhead Corporation; and in it he said there were about ten schemes which might prove suitable to them. He pointed out in a later detailed report that three of the sites were equal to that at Alwen. A further report was given of nine additional schemes, three of the sites being in Welsh areas. There was another Welsh

scheme reported on later. Of the schemes he dealt with, three in Wales were equal to a supply of 18 million gallons per day, and several of the sites were capable of supplying from 10 to 12 million gallons per day. Some of the other sites available were better than the Alwen; they were wider, and the water was of better colour. There was no population within 60 miles of Alwen likely to go there for water. If they wanted sites within this distance, there were some nearer and much more economical.

In cross-examination, witness stated that, in the estimate they had taken, the rate of increase in population would in 1951 give a population for Birkenhead of 207,000 and the Wirral Peninsula of 464,000. When applying to Parliament, 18 million gallons per day was the supply Birkenhead thought it necessary to apply for. Questioned on the evidence he gave before the Parliamentary Committee, he said he told them that, besides Birkenhead, Wirral would require a further supply of water, especially as the population was increasing. The Glen Alwen reservoir in this scheme was intended to supply compensation water entirely. It was correct to say, as he had stated to the Parliamentary Committee, that in course of time—perhaps in fifty years—Wirral would have to go elsewhere than to Wales for water. There were no rivers, no canals, and no suitable wells for the supply of water for trade purposes in Wirral. The sites of the proposed reservoirs were excellently adapted to the supply of water to Birkenhead. They could get good foundations from a water-works point of view. In answer to further questions, witness said he knew Chester demanded compensation water, and got a clause inserted in the Corporation Act. If Wirral had a Water Board and asked for a similar arrangement to be made, there would be no difficulty about it.

In re-examination by Mr. BALFOUR BROWNE, witness said the Corporation scheme was a very good one, and one which would not injure the River Dee or the fisheries, as the Conservators got compensation water. In making his survey for the Corporation, he found a large number of sites suitable for municipal water undertakings.

Sir Alexander Binnie stated that he was consulted in 1905 by the Birkenhead Corporation about their water supply, and investigated the Alwen and the Brenig. He did not believe that if any town within fifty miles required water in the next twenty years, seeing that the Alwen could only yield 7 million gallons per day after supplying compensation water, they would go there. A bar would be put on it by the expense of the aqueduct. Other sites in the district were very numerous. He went over many of them, and consulted with Mr. Deacon as to four or five; and recently he had been over them again. He was of opinion that there were other sites in the neighbourhood, not only for reservoirs but for watersheds, amply sufficient for a probable population of 3 million people. When he was first consulted, he considered the scheme of the Corporation one of the best he had ever seen; but then he did not know they would have to give compensation water. It had also been mutilated by the refusal of the Glen Alwen portion of it.

Mr. Lovell Clare, a surveyor, said his valuation for land taken was: Agricultural value, £5570; sporting and fishing, £2500; plus 10 per cent. for compulsory purchase—making a total, with wayleaves, of £9060, against £99,960 on the other side.

Mr. Henry Hartley said he valued the site and compensation at £9171. He did not consider anything should be added, beyond its agricultural and sporting value, on account of special adaptability. With regard to possible competition for the site from Wirral, witness said there was no place in the peninsula which was growing very much except Port Sunlight and part of Lower Bebington.

Mr. J. T. Wallis, Surveyor to the Manchester Ship Canal, said he had considered the question as to whether the owner of the site would get more money for his land than its agricultural value because at some future time a reservoir might be put upon it, and he was of opinion that he would not. He valued the land, on an agricultural and sporting basis, at £9030, and said it did not possess any additional worth for special adaptability.

Mr. E. Holmes said there was no evidence of any reasonable demand for the site in question, there being others in the district; and there was no other than sporting and agriculture value in it. His valuation was the same as that of Mr. Clare.

Mr. J. T. Wood said he had visited 21 prospective reservoir sites at the instance of Mr. Deacon, and did not think this one had anything more than agricultural and sporting value. The total of his valuation was £8705. He had added 10 per cent. in respect of compulsory purchase; but it was not his practice to add a like percentage in respect of easements for the pipe-line, because neither landlord nor tenant could be injured by a pipe which ran underground.

This concluded the case for the Corporation.

Mr. BALFOUR BROWNE then addressed the Umpire on behalf of the Corporation. He denied that there was any reservoir value in the site, on two grounds. First of all, there was no real indication that there was any demand for water for any place that could possibly come there; and the claimant's witnesses had not shown that there was any other town in want of water. He therefore suggested, in the second place, that no market had been shown for this commodity. As to vague suggestions that there were populations who were wanting water and that populations generally were increasing, he ventured to say that for this particular site there would never be any demand, even if the suggestion were true. His learned friend (Mr. Horridge) had mentioned several places as possible competitors for the site, and especially Wirral; but Wirral was to be supplied by Birkenhead, and they had also entered into an agreement with Wallasey, and also with the Wirral and West Cheshire Company. Was there really any want of water in the Wirral Peninsula? According to Mr. Deacon, there were 7 million gallons per day available for the population. But, apart from this, there was no evidence to show that Wirral would ever go to this site at all, for there were dozens of others available. If there was no market, there could be no reservoir value. The other side had failed to show any demand, or that there was any special value in the site; and he therefore asked the Court to say that there was nothing in it except its value for agricultural and sporting purposes.

Mr. HORRIDGE, for the claimant, said the questions which stood out were: First, adaptability; secondly, competition; and, lastly, the basis of valuation. With regard to the first, he said that, even if there

were competing sites and sellers, this did not in the least touch the question of adaptability; and if it existed, it only related to the question of a possible reduction of value of their site. The real question in the arbitration was that Birkenhead had taken the best site it could get in Wales, close to populous Lancashire towns, and that this gave special adaptability to the site. He thought it would be treating the Corporation generously if it were assumed that in four or five years there would competitors for this land. Wirral and Chester had protested that the site was the natural one for their supplies; and Mr. Deacon had admitted the same thing, and had shown that there were possible purchasers within a reasonable time. The Corporation had chosen deliberately to throw the whole die of their case on agricultural value. The first reason was that if they did this their valuation would be a low one; and, secondly, if they adopted any other method, their valuation would be as high as, or higher than, that of the claimant's own witnesses.

The UMPIRE announced that, in view of the magnitude of the interests concerned, the award would be made at an early date.

At the meeting of the Birkenhead Town Council last Wednesday, the Chairman of the Water Committee (Alderman Bloor) announced Sir Edward Clarke's award in the arbitration proceedings reported above. He said it was £26,168 for land, and £350 for easements; making a total of £26,518. He was satisfied with the award, because he felt that it was as much as the owner ought to get; and, in view of the large claim of about £100,000, supported as it was by most valuable expert evidence, the Council had every reason to be pleased that this figure had been reduced to the amount mentioned. The award had come within the Committee's estimate of the cost.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Informal Meeting in Glasgow on Wednesday—which, by the way, was one of the largest yet held—was opened with the pathetic incident of the inauguration of the M'Gilchrist Memorial. So rapidly does time wing its flight, that it was almost startling to be reminded that it is nearly three years since Mr. M'Gilchrist died. The principal figure in the ceremony was Provost Macfarlan, of Dumbarton, who was a lifelong friend of Mr. M'Gilchrist's, and who acquitted himself admirably. The memento is a beautiful piece of workmanship. The medallion was reproduced in the "JOURNAL" a year ago; but it may be described here again. It consists of an oval plate, of gold, with a portrait of Mr. M'Gilchrist engraved in the centre. The border surrounding it is an open design in thistles, with the monogram "G.M." (gas managers) at the upper and lower shoulders, a gasholder at the top, crossed flaming torches at the bottom, and Roman lamps at each side. The arrangement by which the medallion is attached to the chain is in the form of a flat gas-flame. Round the medallion, and separating it from the ornamental border, there is a raised band, upon which is the inscription—"Informal Meeting of Scottish Gas Managers, Inaugurated by James M'Gilchrist, Dumbarton, 1884." The portrait on the medallion is a much more expressive likeness of Mr. M'Gilchrist than was the original sketch submitted last year by the maker—ex-Lord Provost David Macgregor, of Perth. Mr. Macgregor was a specially distinguished artist in gold engraving. Alas for the mutation of human affairs, while kind things were being said of him at the Informal Meeting in Glasgow, he was lying dead at Bridge of Earn, having died that morning, and no one in the meeting being aware of the event. On its business side, the meeting was a great success. Mr. Vass, in his Presidential Address, covered numerous subjects of interest to managers; and he did it so successfully that a very prolonged discussion ensued. It is always evidence of an auditory having been appealed to when those who are expected to discuss the observations rise spontaneously to make their remarks. Such was the case on this occasion; and Mr. Vass is entitled to take to himself the compliment that, as President of the Informal Meeting, he laid before his brethren subject-matter which touched them, on account of its applicability to their individual conditions and needs.

Mr. W. M. Burke, the Gas Treasurer of Dundee, has prepared a statement regarding the relative prices of gas as supplied through prepayment and ordinary meters. He states that prepayment meters were instituted in Dundee in 1897, and the price then charged for gas supplied through them was 3s. 9½d. per 1000 cubic feet, which was 7½d. above the rate charged for ordinary meters. The prepayment meters in use are still set at 3s. 9½d. Discount at the rate of 5 per cent. is allowed on gas consumed through ordinary meters; but there is no equivalent in the case of prepayment meters. The number of prepayment meters in use at March 31 was 15,488. The price of gas this year is, through ordinary meters, 2s. 4d. per 1000 cubic feet, and 2s. 8d. through prepayment meters—a difference of 4d. Mr. Burke explains to the Council that the increased charge is required in consequence of (1) the increased cost of collection—prepayment meters being inspected six times a year, as against three times with ordinary meters; (2) ordinary meters are fitted up by outside plumbers, but the Gas Commissioners fit up all prepayment meters and stopcocks free; and (3) prepayment meters are dearer than ordinary ones, the prices being, 2-light, ordinary, 19s. 1d., prepayment, 32s. 5d., and 3-light 23s. 4d. and 34s. 1d. respectively. The difference between the present charge of 2s. 8d. and 3s. 9½d., at which the meters are set, is returned to the consumers in the form of a rebate; this system having been inaugurated in 1903-04, previous to which time no rebate was allowed. For the year ending April 30, 1908, the consumption of gas through prepayment meters was 114,243,000 cubic feet, which, at 2s. 10d. per 1000 cubic feet, realized £16,184. At the ordinary rate the revenue would have been £14,280—a difference of £1904. It is added that the excess charged in the case of prepayment meters is 7½d. in Aberdeen, 7d. in Glasgow, 1s. 2d. in Edinburgh, 5d. in Perth, and 1s. 1d. in Paisley.

In the Peterhead Town Council on Monday, the Gas Committee

reported that they had received a deputation from the Council of the Peterhead and District Friendly Societies with reference to the charge made for gas used by consumers who have prepayment meters, as compared with that to consumers who have ordinary meters, and that the Convener replied to the points raised by the deputation, basing his reply on information contained in a report by the Gas Manager, in which it was stated that he had gone into the matter very carefully, and that his investigations had shown that at present the prepayment-meter consumer has a distinct advantage over the ordinary consumer.

The employees in the Aberdeen Corporation Gas Department held their annual reunion in the Richmond Café, Aberdeen, on Saturday last. Mr. S. Milne, the Engineer, presided, and expressed his pleasure at meeting with the workers in a social capacity. An enjoyable evening was spent in dancing, songs being interspersed, and supper served during an interval in the proceedings.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 8.

Quietness has prevailed throughout the week; there being but few direct orders from abroad, and buyers who may have contracts to cover for April delivery being in no hurry to effect their purchases. The large makes, having for the most part been sold in advance, have not been on the market; but the smaller makes have been available, and have only been disposed of at declining prices. So that the closing quotations are £11 8s. 9d. per ton f.o.b. Hull, £11 11s. 3d. per ton f.o.b. Liverpool, and £11 13s. 9d. per ton f.o.b. Leith. In the forward position, the situation is unchanged, and no important first-hand business has transpired.

Nitrate of Soda.

Holders continue to maintain a firm attitude; the spot quotation for 95 per cent. being 10s. 4½d. per cwt., and that for refined quality 10s. 7½d.

Tar Products.

LONDON, April 8.

Markets have been firm all round throughout the past week. Pitch has been very steady, and some good figures have been paid for both prompt and forward delivery; but the Continent are not replying to the full extent of the rise which has taken place here. Creosote is quiet; but makers are in most cases well sold, and it is known that there is still a large quantity to be purchased for delivery over the summer. Benzols and toluol are dull, and sales very difficult to negotiate. Solvent naphtha is steady. For heavy naphtha, there is little inquiry. Carbolic acid is rather firmer, several dealers being short of 60's on the east coast. Crystals are unchanged. Naphthalene is dull; and salts are in fair demand at good prices. Little alteration is to be looked for during the next week or ten days owing to the holidays.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d. ex works. Pitch, London, 23s. 6d. to 24s.; east coast, 23s. to 23s. 6d.; west coast, 22s. 6d. to 23s. 6d. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 61.; North, 5½d.; 50-90 per cent., casks included, London, 6½d.; North, 6d. Toluol, casks included, London, 8½d. to 9d.; North, 7½d. to 8d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3d. to 3¾d.; solvent naphtha, casks included, North, 9d. to 9½d.; London, 10½d. to 11d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d. to 1s. 0¾d.; west coast, 1s. to 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market is quiet, and there has been very little business during the last few days. To-day upon Beckton terms the price is £11 10s., and for Beckton prompt £11 17s. 6d.; while the ordinary London makes are sold at £11 8s. 9d. In Hull, the price is £11 10s., and in Liverpool £11 10s. to £11 12s. 6d. In Leith, £11 15s. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is in some measure interrupted by the holidays; and though there has been a heavy production in the last few days, it will now be light until the effect of these holidays is past. In the steam coal trade, best Northumbrians are from about 11s. 6d. to 12s. per ton f.o.b.; but there is little coal free for prompt sale. Second-class steams are from 9s. 6d. to 10s. 6d., and steam smalls from about 5s. to 6s. per ton—the latter being firm with a growing request. In the gas coal trade, the demand is fairly steady; but the consumption shows a falling off, both locally and generally. Prices of Durham gas coals are from about 9s. to 10s. 3d. per ton f.o.b., according to quality, for the usual classes, and up to 10s. 6d. for "Wear specials." There have been some sales of gas coals for shipment over the season, and the prices that have been generally paid seem to be such as to leave from 9s. to 9s. 9d. per ton f.o.b. There are other similar contracts now in the market that seem likely to be settled on terms that are very close to those named. The output of gas coal appears to be well taken up for this season of the year; and the prices are steady. Coke is little changed; and gas coke is maintained in price, the output being less. Good gas coke is from 13s. to 13s. 3d. per ton f.o.b.

Scotch Coal Trade.

Trade has improved a little, in response to a better foreign demand, and prospects are brighter than they have been for some time. Prices have not moved much; but it is probable that the inquiries for gas coal have had the effect of keeping them higher of late than the state

of the market warranted. The quotations are: Ell 8s. 9d. to 10s. 3d., splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 276,725 tons—a decrease of 10,436 tons upon the previous week, but an increase of 18,720 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,185,445 tons—an increase of 238,984 tons upon the corresponding period.

Gas v. Electricity for Public Lighting at Lewisham.

The Works and Highways Committee of the Lewisham Borough Council reported last Wednesday that they had considered suggestions submitted by the Engineer of the South Metropolitan Electric Light and Power Company, with general details of alternative schemes for street lighting, together with approximate estimates for the different systems proposed. The Chairman and Borough Surveyor investigated the matter, and wrote as follows: "The Engineer of the Company suggests three alternative schemes of lighting—(1) by arc lamps which should be alight all night; (2) by arc lamps as in system (a), but to be extinguished at midnight, after which two incandescent lamps of 22-candle power would be provided at each standard; (3) by incandescent lamps fitted with two 32-candle power lamps of the metallic filament type. The first and second schemes are quite out of the question, as the first costs £15 1s. per lamp per annum and the second £8 7s. 6d. per lamp. The third system would cost £2 17s. 6d. per lamp per annum against the present charge of £2 9s. 2d. for No. 2 incandescent Kern gas-burners. The Electric Light Company's estimate is for 3650 hours per annum. The South Metropolitan Gas Company light the lamps for 4200 hours, and the South Suburban Gas Company for 3800 hours. The Gas Companies' price includes all costs of maintenance, lighting, extinguishing, &c. The Electric Light Company's estimate does not include trimming lamps, painting posts, switching on and off, the renewals of incandescent lamps, &c. This would further increase the cost very materially. The advantage claimed by the Electric Light Company is that there would be an increase of 20 per cent. over the present amount of light; but this is problematical, and is not calculated when the mantles on the gas-burners are new. There are upwards of 3000 No. 2 Kern burners in the gas-lamps in the borough, and the increase in the cost of lighting would be more than £2000, without any definite advantage. The cost of the installation, even of the third system, would be approximately £15,000." In view of the foregoing communication, the Committee have decided not to take any further action in the matter.

"Richmond's Gas-Heated Furnaces and Laboratory Appliances" is the title of a 12-page catalogue just issued by the Richmond Gas Stove and Meter Company, Limited. The pamphlet shows several classes of crucible and muffle furnaces suitable for workshop, studio, and laboratory purposes. Besides furnaces for melting gold, silver, and brass, there is one for lead—a most useful piece of gas apparatus for electrotypers and stereotypers. The entirely new and patented principle of construction of these furnaces is fully explained by sectional drawings and half-tone illustrations.

Producer Gas Success.—The Power-Gas Corporation, Limited, of Stockton-on-Tees, supply some interesting data regarding a 6000 H.P. Mond gas plant supplied to Messrs. Butterfield and Swire's Dockyard at Hong Kong. The four gas-engines were supplied by a Middlesbrough firm, and are employed in driving dynamos directly. The plant is used for power and furnace work—forge furnaces, plate reheating furnaces, bow reheating furnaces, 67 feet long and 3 feet wide, brass melting, plate annealing, and various other such purposes. The plant after running for a year underwent final trials last December; and the Stockton Company have received eminently satisfactory certificates and data regarding the results. Using Chinese bituminous fuel, the trials of several days' duration averaged as follows: Full load, 0.92 lb. per brake-horse-power-hour; three-quarters load, 1.02 lbs. per brake-horse-power-hour; half load, 1.125 lbs. per brake-horse-power.

Gas v. Electricity at Torquay.—After considerable experience of other systems of charging, the Electric Lighting Committee of the Torquay Town Council decided at their last meeting to adopt a flat-rate of 4½d. per unit for current supplied for private lighting. In asking the Town Council last Tuesday to approve of this change, Mr. Blackler, the Chairman of the Committee, said that it would mean a loss to the undertaking of £500 a year; but they could afford it, and electricity would now be cheaper than gas. Mr. Young said the latter assertion could not be maintained. Gas was certainly cheaper than electricity, and for public lighting gave better results. The Gas Company could give a better light than that now supplied, and charge £600 or £700 a year less for it, which would mean the saving of a penny rate. Alderman Mortimer said that it was owing to the results obtained by supplying electric power to the tramways that they were able to consider the adoption of a flat-rate. Some of the small consumers would have to pay a little more; but they would be able to read the indicators for themselves, and it would be more satisfactory in every way. The Council agreed to the recommendation.

New Purifiers for the Teignmouth Gas-Works.—Among the minutes of the Gas-Committee presented at the meeting of the Teignmouth Urban District Council last Tuesday, was one stating that the Gas Manager (Mr. J. A. Gray) had produced the plan and section of new purifiers for the gas-works, the cost of which he estimated at £1200. The Committee approved of the plan and section, and instructed the Manager to forward a specification and general description of the work to the Local Government Board, with a view to obtaining their sanction to a loan of £1200. The Committee also passed a vote of thanks to Mr. W. J. B. Banbury for his services as Chairman and for the great interest he had taken in the gas-works, and expressed their regret at his retirement from the Council and the consequent loss of his services to the Committee. Mr. Wheatley, who moved the adoption of the report, said that very great improvements had been carried out at the gas-works during the years that Mr. Banbury had been Chairman; and both in regard to the works themselves and their financial position, things were in a much more satisfactory state than formerly. They were looking forward to a reduction of the price of gas shortly. Mr. Gray said he was sorry to lose Mr. Banbury as Chairman of the Committee, for he had received very great help from him. Mr. Banbury, in reply, expressed the hope that the undertaking would continue to prosper, and the gas become cheaper every year.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 79.

Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Oct. 15	7	Alliance & Dublin 10 p.c.	18-18½	-½	5 8 1	561,000	Stk.	Feb. 25	10	Liverpool United A.	222½-224½	..	4 9 1
298,955	10	"	7	Do. 7 p.c.	12½-13½	..	5 5 8	"	"	"	7	Do. B.	169½-171½	..	4 1 7
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	9-100	..	4 0 0	"	Dec. 30	4	4	Do. Deb. Stk.	105-107	..	3 14 9
200,103	5	Oct. 29	6½	Bombay, Ltd.	53-6	+½	5 8 4	"	Dec. 11	6	6	Malta & Mediterranean	43-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	44-4½	+8	5 15 6	"	Apr. 1	5	5	Met of 15 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne 10 p.c.	28½-29½	..	4 14 11	"	Nov. 13	4½	4½	Melbourne 10 p.c. Deb.	100-102	..	4 8 3
51,810	10	"	7	mouth Gas B 7 p.c.	16½-16¾	..	4 3 7	"	Feb. 25	4½	4½	Monte vid-o Ltd.	12½-12¾	..	5 9 10
53,200	10	"	6	and Water 10 p.c.	15½-16	..	3 15 0	"	Dec. 30	4½	4½	Newcastle & G't sh'd Con	107-108	..	4 3 4
380,000	Stk.	"	12½	Brentford Consolidated	247-250	+2	5 0 0	"	Feb. 25	10	10	North Midd. sex 10 p.c.	91-93	..	3 15 3
300,000	"	"	5	Do. New	186-189	+1	5 0 6	"	Nov. 27	8	8	Do. 7 p.c.	13-13½	..	5 3 8
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	+2	4 0 8	"	Mar. 31	8	8	Oriental, Ltd.	140-142	..	5 12 8
206,250	"	Dec. 11	10	Do. 4 p.c. Deb.	101-103	..	3 17 8	"	Feb. 25	13	13	Ottoman, Ltd.	6-6½	..	6 8 0
220,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	210-213	+1	5 1 0	"	"	10	10	Portsea Island A.	135-137	..	5 0 7
246,320	"	"	7½	Do. A Ord. Stk.	152-155	+2	5 0 0	"	"	10	10	Do. B.	129-131	..	4 19 3
467,000	20	Oct. 15	10	British	44-43	..	4 13 0	"	"	12	12	Do. C	119-121	..	4 19 2
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	114-117	..	5 2 7	"	Oct. 29	7	7	Do. D and E.	101-103	..	4 17 1
165,700	"	"	4½	Do. do. 3½ p.c.	85-87	..	5 3 6	"	Jan. 28	5	5	Primitiva Ord.	64-64	..	5 7 8
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	123-134	..	5 5 8	"	Dec. 11	4	4	Do. 5 p.c. Pref.	5-5½	..	4 15 3
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	"	Oct. 15	8	8	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Cape Town & Dis. Ltd.	48-54	..	—	"	Dec. 30	4	4	Do. 6 p.c. Pref.	114-12	..	5 0 0
50,000	50	Nov. 3	6	Do. 4½ p.c. Pref.	48-54	..	—	"	Jan. 2	5	5	Do. 5 p.c. Deb.	495-504	..	4 19 0
100,000	Stk.	Dec. 30	4½	Do. 6 p.c. 1st Mort.	48-50	+1	6 0 0	"	Mar. 12	10	10	Sheffield A.	236-238	..	4 4 0
157,151	Stk.	Feb. 25	5	Do. 4½ p.c. Deb. Stk.	77-79	+1	5 13 11	"	"	10	10	Do. B.	236-238	..	4 4 0
1,493,280	Stk.	Mar. 12	5½	Chester 5 p.c. Ord.	109-111	..	4 10 1	"	Oct. 29	10	10	Do. C	234-236	..	4 4 9
560,000	"	"	5	Commercial 4 p.c. Stk.	106-108	..	4 16 4	"	Jan. 14	5	5	South African	14-14½	+½	6 17 11
475,000	"	Dec. 11	5	Do. 3½ p.c. do.	10-103	..	4 17 1	"	Feb. 11	5/6/8	5/6/8	South Met., 4 p.c. Ord.	12-12½	+1	4 6 0
800,000	Stk.	"	6½	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	"	Jan. 14	3	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
200,000	"	"	7	Continental Union, Ltd.	101-103	..	6 6 3	"	Mar. 12	8	8	South Shields Co. Stk.	152-154	..	5 3 11
493,270	Stk.	"	4	Do. 7 p.c. Pref.	138-141	..	4 19 3	"	Feb. 25	5½	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
55,000	"	"	4	Derby Con. Stk.	121-123	..	4 1 4	"	"	5	5	Do. 5 p.c. Pref.	122-124	+2	4 0 8
141,935	10	Mar. 31	12	Do. Deb. Stk.	103-105	..	3 16 2	"	Nov. 13	5	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
486,390	10	Jan. 28	12	East Hull 5 p.c. Ord.	96-98	..	5 2 0	"	Dec. 30	4	4	Southampton Ord.	109-111	..	4 10 1
351,060	10	"	12	European, Ltd.	23½-24½	..	4 19 0	"	"	5½	5½	Tottenham A 5 p.c.	132-134	..	5 0 9
15,191,515	Stk.	Feb. 11	4/10/8	Do. £7 tcs. paid.	174-184	..	4 18 5	"	Dec. 30	4	4	Do. B 3½ p.c.	109-111	..	4 14 7
2,600,000	"	"	3½	Gas 4 p.c. Ord.	102½-103½	+½	4 7 6	"	Jan. 5	5	5	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
3,799,735	"	"	4	light 3½ p.c. max.	88-89	..	3 18 8	"	Jan. 5	5	5	Tuscan, Ltd.	92-94	..	8 13 0
4,193,975	Stk.	Dec. 11	3	and 4 p.c. Con. Pref.	104-116	..	3 15 6	"	Feb. 25	6½	6½	Do. 5 p.c. Deb. Red.	99-101	..	4 19 0
258,740	Stk.	Mar. 12	3	Coke 3 p.c. Con. Deb.	88-86	..	3 9 9	"	Feb. 25	6½	6½	Tynmouth, 5 p.c. max.	105-107	..	4 13 6
82,500	"	"	11½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	"	Dec. 30	3	3	Wands- 1 B 3 p.c.	131-133	..	4 17 9
70,000	10	Oct. 15	11	Do. do. 5 p.c.	117-120	..	5 4 2	"	Dec. 30	3	3	Worth 3 p.c. Deb. Stk.	12-14	..	4 1 1
123,500	Stk.	Mar. 12	6½	Hongkong & China, Ltd.	18-18½	..	5 18 11	"	"	5	5	West Ham 5 p.c. Ord.	1-2-12	+1	4 6 9
65,783	"	"	6	Ilford "A" and "C"	134-136	..	4 15 7	"	"	5	5	Do. 5 p.c. Pref.	125-127	+1	3 18 9
51,000	Dec. 30	4	4	Do. "B"	103-105	..	4 15 3	"	Dec. 30	4	4	Do. 4 p.c. Deb. Stk.	107-109	+2	3 13 5
4,940,000	Stk.	Nov. 13	8	Do. 4 p.c. Deb.	102-104	..	3 16 11	"	"	"	"	"	"	"	"
473,600	Stk.	Feb. 11	3½	Imperial Continental	182-184	..	4 7 0	"	"	"	"	"	"	"	"
195,242	Stk.	Mar. 12	6	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	"	"	"	"	"	"	"	"
				Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10								

Prices marked * are "Ex div."

Reduction in Price in South London.—The last accounts furnished to the consumers of the South Metropolitan Gas Company were accompanied by the welcome announcement that the price of gas will be reduced from the date of reading the meters at Midsummer next. Further particulars are to be issued in due course.

Water Divining at North Sunderland.—A remarkable instance of water divining has occurred at North Sunderland. Burn House, now the property of Mrs. M'Dougle, has been without water for many years; and it was contemplated to lay on a supply from the same source as that which serves North Sunderland. It occurred, however, to the agent to engage the services of a water diviner, and one visited the farm. A spot was soon discovered where he said water would be found at a distance of 15 feet from the surface. When a depth of 14 ft. 6 in. was reached, a plentiful supply of water issued from a sandstone bed, and rose to within a foot of the surface. There was enough for two or three farms. A well has been sunk; and the sinker states that it is the most successful he has ever been interested in.

River Plate Gas Company, Limited.—The report of the Directors of this Company for the year 1908 shows that the profit is £125,948, to which has to be added receipts from other sources and the amount brought forward, which together amount to £158,240. After payment of all fixed charges, making the usual ample allowance for bad and doubtful debts, and providing fully for the upkeep of the works, mains, &c., there remains £132,987. The interim dividend paid in October last, of 7s. per share (free of tax), absorbed £35,000. The Directors now place £20,000 to the reserve fund, raising it to £205,000, and £2079 to the old-age and pension fund; and they recommend a final dividend at the rate of 9s. per share, making 8 per cent. for the year (free of tax), leaving £30,909 to be carried forward. During the year £24,627 was spent out of revenue on the works and mains, &c., all of which are stated to be in most efficient order. The mains were increased by upwards of 15 miles, making a total of about 466½ miles; and on balance 3783 new house services were connected with the system.

Suicide by Coal Gas.—At the Westminster Coroner's Court last Tuesday, Mr. John Troutbeck conducted an inquiry with reference to the death of Mr. Urban M. Nosedá, aged 54, an art connoisseur and print seller, of King Street, St. James's, who was found dead in his office on the previous day. Sarah Wenham, housemaid to the deceased, said that he had been depressed since the death of his wife, and of late had been drinking very heavily. Mr. F. C. Gibbs, shop assistant, said that upon arriving at business the previous morning he found his master in his easy-chair fully dressed. There was a large heating-stove in the room, and gas was escaping from the burners, which were fully turned on. The front of the stove had been stopped up with cardboard, and pieces of paper had been placed in the crevices of the room, so as to keep the gas in. Dr. Freyberger, who made an autopsy, stated that death was due to gas poisoning, while the deceased was suffering from pneumonia and the effects of chronic alcoholism. The Jury returned a verdict of "Suicide during temporary insanity."

Gas Profits at Matlock Bath.—At the last meeting of the Matlock Bath Urban District Council, the Vice-Chairman (Mr. Reeds), who is also Chairman of the Gas Committee, moved that, as the profits would now permit of it, the Council should make a reduction of 2d. per 1000 cubic feet in the price of gas. A contrary opinion was, however, expressed, that the equivalent to the 2d. reduction should be devoted to the lowering of the general district rates; and it was pointed out that to make the reduction on the gas alone would confer a benefit on outside areas which the Council supply with gas, whereas if it was devoted to the rates the benefit would be general among ratepayers only. The motion was lost.

Swansea Gas Company.—The annual general meeting of this Company was held at the offices on Friday, the 2nd inst.—Mr. J. Glasbrook presiding. The Chairman referred in feeling terms to the late Mr. Thornton Andrews, who had been connected with the Company, as Engineer and Secretary, for fifty years, and said the deceased gentleman was recognized as one of the leading authorities in the gas profession. The continued progress made by the Company during the past year was alluded to, as well as the increase in the sales of gas; and the working of the Company generally was considered highly satisfactory. The usual dividend at the rate of 5 per cent. per annum on the consolidated and ordinary stock was declared.

Gas Workers' Wages at Stockport.—An application made by the lamp-lighters in the employ of the Stockport Corporation asking the Gas Committee to grant them seven days holiday per annum with full pay (23s.), instead of 20s. as at present, has been refused by the Gas Committee; and that decision was confirmed at the Council meeting last Wednesday by 27 votes to 15, after some discussion. The Mayor (Mr. J. Fernley J.P.), in opposing an amendment to refer the matter back, said it might appear to be a very small question in itself, as there were only 26 or 27 lamplighters in the employ of the department; but they had to consider the influence which the granting of such a concession would have on the other gas-works employees, numbering between 400 and 500. The subject of wages was settled some years ago; and, in his opinion, it was unfair to keep bringing up these small matters to try to get them through.

Leeds Gas-Workers' Wages.—At the last meeting of the Leeds City Council, Mr. Badlay called attention to a resolution of the Gas Committee adopting a Consultative Committee's resolution declining to accede to a request for increased wages from employees of the Gas Committee. These men, he said, had only received a rise of 4d. per shift during the past 25 years, despite the decreased purchasing power of money. During the period named, the salaries of the higher officials had increased some hundreds of pounds. The men were now paid 5s. 2d. a shift, and were asking for a slight concession. Mr. Ratcliffe did not agree that the concession asked for was slight. If granted, it would involve £7000 or £8000 a year. Alderman Wilson said that, with thousands ready to take the men's jobs, there was no case for an advance. Besides, "the industry was a decaying one to some extent, as the sale of gas was diminishing."

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Danger of Paraffin Lamps.—Dr. G. Danford Thomas held an inquest at St. Pancras last week on Mabel Annie Dominy, aged 15, a domestic servant at a boarding-house in Guilford Street, Bloomsbury. While she was putting out the light in her bedroom, the lamp fell to the floor, and its porcelain reservoir was smashed, with the result that her hair and nightdress caught fire. The girl ran into the dining-room, and before the flames could be extinguished she was severely burnt. She was removed to the Royal Free Hospital, where she died within eight hours of her admission. Mr. Alfred Butler, a London County Council inspector under the Petroleum Act, said that a perfectly safe oil-lamp had not yet been devised. The jury, in returning a verdict of "Accidental death," expressed the opinion that in servants' bedrooms only gas or metal lamps should be used.

Quality of Gas at Cheltenham.—The minutes of the Electricity and Lighting Committee for the last meeting of the Cheltenham Town Council stated that a memorial had been presented signed by over 200 residents and householders protesting against the inconvenience and annoyance to which they were subjected owing to the impurity and inferior quality of the gas now supplied, which, in their opinion, though nominally cheap, was practically very expensive. The effect was most felt by the poorer members of the community, owing to the necessity for alteration of burners and constant renewal of mantles. The memorialists asked the Corporation to use their influence to endeavour to obtain a remedy for the evil, which had a detrimental effect on the letting of houses to intending residents. It was resolved that a copy of the memorial be sent to the Gas Company, with an expression of opinion on the part of the Council that it deserved the serious consideration of the Directors with a view to an improvement in the quality of the gas supplied.

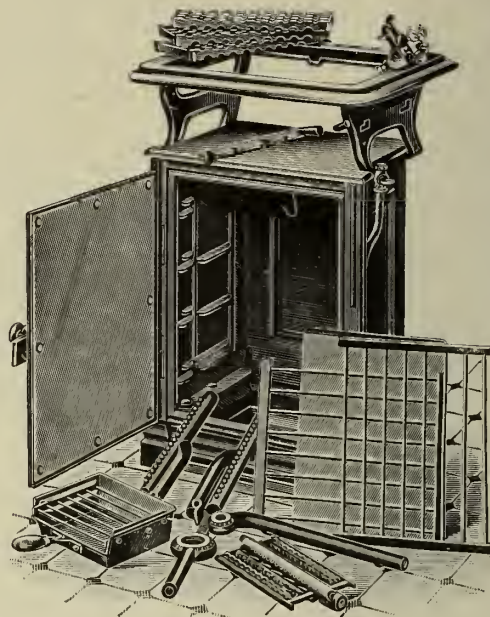
Gas-Stoves for Offices.—At the meeting of the Manchester City Council last week, Alderman Gibson moved the adoption of a recommendation of the Gas Committee on the supply and fixing at a nominal rental from March 31, 1909, of gas-fires in offices or other premises, approved by the Committee, within the city. He said the proposal was intended to "bring grist to the mill" of the Gas Committee in the increased consumption of gas. The Committee were now supplying gas-cookers at the rate of fifty per day, and augmenting the revenue accordingly. Mr. Wood moved that the proposal be referred back, upon the ground that the present time was inopportune for any such action; while Mr. Singleton advised a reduction in the price of gas all round. Alderman Gibson, in reply, said the idea of the Committee was that offices were the most likely place for gas-stoves. As to reducing the price of gas, did Mr. Singleton know that for years they had been paying £50,000 to £60,000 per annum out of the profits in relief of the rates, and that a reduction of 1d. per 1000 cubic feet in the price would mean a loss of £20,000 a year? The amendment to refer the matter back was carried by 45 votes to 30.

APPLICATIONS FOR LETTERS PATENT.

- 7452.—FABRY, R. F. F., "Recovering ammonia from coal gas." March 29.
 7464.—LEIGH, A. G., "Treating liquids in filter-beds." March 29.
 7470.—STERN, A., "Production of gas." March 29.
 7486.—ANDERSON, D., and WORSFOLD, J., "Gas-lamps." March 29.
 7497.—SMITH, J., "Shade suspender." March 29.
 7514.—SKRIWAN, E., "Attaching mantles to rings." March 29.
 7522.—GIORGI, A., "Lighting and extinguishing gas-lamps." March 29.
 7549.—KIRKHAM, W., "Gas-heated furnace." March 30.
 7581.—DUCKWORTH, J., EDDLESTON, J., and BLEASDALE, J., "Regulating the supply of gas in mills, workshops, and like places." March 30.
 7615.—PIÉPLU, H. M., "Production of gas." March 30.
 7629.—CHRISMAN, H., "Gas-meters." March 30.
 7707.—DARKE, C., "Acetylene generators." March 31.
 7710.—CALVERT, G., "Gas-stoves." March 31.
 7711.—EDE, E. P., and KEMPTON, C. H., "Inverted burner." March 31.
 7780.—DUFF, A. B., and GAS POWER AND BYE-PRODUCTS COMPANY, LIMITED, "Gas-producers." April 1.
 7782.—JOHNSON, J., "Emergency device or stopping holes in damaged pipes." April 1.
 7783.—HARRIS, W., and FOX, G. E., "Acetylene apparatus." April 1.
 7815.—BOUCHER, A. L., "Gas-stoves." April 1.
 7827.—KEITH, J. & G., "Electrical ignition devices for gas-lamps." April 1.
 7844.—DENISON, J. R., PREUSSNER, J. F., and BANKS, J. W., "Gas-singeing machines." April 1.
 7929.—PREW, C., "Alarum clock provided with mechanism for automatically turning on or off gas or other cocks at predetermined times." April 2.
 7941.—SCHWABACHER, H., "Production of air gas." April 2.
 7947.—RESTLER, J. W., "Valves and cocks." April 2.
 7975.—ROBINSON, J., "Water-tight and air-tight joint." April 3.
 7976.—MARZ, J., and ARMSTRONG, H. F., "Gas-stoves and ovens." April 3.
 7977.—TURNBULL, F., "Conveyor for coal or coke." April 3.
 7988.—BURNETT, C., "Cars for transporting coke." April 3.
 8027.—DRANSFIELD, J., "Hooks for securing gas or other pipes." April 3.
 8038.—CHATWIN, A. J., & T., and PARTRIDGE, H. E., "Facing pipes for the purposes of making joints." April 3.

The Tredegar Urban District Council have decided to apply to the Local Government Board for sanction to borrow £10,000 for carrying out extensions to the gas-works. The tender of Messrs. Drakes Limited, at £650, for new retort-settings was accepted, and that of Messrs. Willey and Co., at £885, for purifiers.

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We learn from Mr. E. J. Field, the Secretary *pro tem.*, that the registered office of the Amman Valley Gaslight and Coke Company, Limited, is now the Gas-Works, Ammanford, Carmarthenshire—not in London.

Mr. J. A. Doran, the Chairman of the Belfast Gas Committee, has given notice that he will move at the next meeting the following resolution: "That in view of the fact that the Gas Committee gave the Electric Committee on March 27, 1903, £32,500, and that the Electric Committee, though, so far as we know, they are not making any profit on their business, yet are competing for business both private and public against the Gas Committee, who are largely contributing to the reduction of the rates, this Committee desire the Corporation to consider the advisability of placing the electric concern under the Gas Committee, as it was originally."

In discussing the Budget statement made by Mr. Hayes Fisher, the Chairman of the Finance Committee of the London County Council, at the meeting last Tuesday, Sir John Benn, M.P., mentioned that Birmingham had derived profits from gas, electric lighting, and tramways, and in consequence had been enabled to reduce the rates by 2d. in the pound. The Hon. W. R. W. Peel, M.P., stated that the Municipal Reform Party, of which he was leader, did not favour the idea that people who used the tramways should pay higher fares in order to benefit other ratepayers. He advised Sir John Benn to be careful how he tried to acquire the gas undertakings in London, which were profit-sharing concerns, as a great many of the workpeople employed by the Gas Companies had shares, and also had votes. He advised him, therefore, not to make an attack upon the Gas Companies' undertakings in the Metropolis until these gentlemen had sold out.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. April 27.
GRAYS AND TILBURY GAS COMPANY. April 27.
KIRKHAM, HULETT, AND CHANDLER. April 27.
SOUTHEND WATER COMPANY. April 27.

Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. May 4. 2.30 o'clock.

TENDERS FOR

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PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.

WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

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"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, II, Bothwell St., GLASGOW.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

KRAMERS AND AARTS WATER-

GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

39, VICTORIA STREET, S.W.

HYDRATED OXIDE OF IRON.**PREPARED from Pure Iron.**

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**BRISTOL RECORDING GAUGES
AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

FIDDES-ALDRIDGE**SIMULTANEOUS Discharging-Charger.**

The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, April 6, p. 11. of Centre.

ALDRIDGE AND RANKEN,

39, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams: Telephone:

"MOTORPATHY, LONDON." 5118 WESTMINSTER.

SPENCER'S PATENT HURDLE GRIDS.**THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement April 6, p. 5.

SULPHURIC ACID.**SPECIALLY prepared for Sulphate of**

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WENNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

TO Gas Managers, &c., Wanted, Old

Condemned GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
&c., also bought.

J. WILSON, Pleasant Grove, York Road, King's Cross,
LONDON, N.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant
and Sulphate Plant.

For all Gas Joints.

For all Tar Joints.

For all Ammonia Joints.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

**SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.**

SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated Wm. PEARCE & SONS, LTD.,
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

APPLY TO THE

CHAIN BELT ENGINEERING CO.

DERBY, ENGLAND,

FOR REALLY HIGH-CLASS

ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

"HALLITE" Asbestos High-Pressure

Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers,
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, **THOMAS HORROCKS**

Albert Chemical Works, BRADFORD,

MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Sulphate of Ammonia.

GAS OILS.**MEADE-KING, ROBINSON, & CO.**

Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "Doric," Newcastle-on-Tyne. National
Telephone No. 2497.

MR. W. B. MIMMACK, for many years

Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

YOUNG Engineer, G.Inst.Mech.E.,

Student Institution of Gas Engineers, Trained on
thoroughly up-to-date Gas-Works, and having a good
Capacity for Business, is open to accept REPRE-
SENTATIVE POSITION on a First-Class Firm of
Carbonizing or Lighting Engineers.

Address No. 5079, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.**ADVERTISER (Age 28), Articled under,**

and Three Years Chief Assistant to, an Architect,
would be prepared to Work hard in any Capacity that
afforded reasonable prospects of a satisfactory per-
manent position. Has had a Wide General Experience,
including Mills, Warehouses, Transferring Machinery,
Reinforced Concrete, &c., and is thoroughly Com-
petent to prepare Drawings, Specifications, Quantities,
&c. Good Draughtsman, Surveyor, and Mechanical En-
gineer. Unexceptionable References and Testimonials.

Address No. 5078, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WORKING Manager required for the

Company's New Gas and Water Works.

Apply, by letter, stating Wages and enclosing copies
of References, to the SECRETARY, Meldreth and Mel-
bourn District Gas and Water Company, Norfolk House,
Norfolk Street, LONDON, W.C.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

URBAN DISTRICT OF SHIPLEY.

APPOINTMENT OF ENGINEER-MANAGER OF
GAS-WORKS.

THE Council invite Applications from

Duly Qualified Persons for the Post of GAS
ENGINEER and MANAGER of the Gas-Works.

Make of Gas, 180 Millions.

Salary, £250 per Annum.

The Person Appointed is to devote the whole of his

Time to the duties of the Office.

Applications, stating Age, present Occupation, and
Qualifications, with copies of not more than Three
recent Testimonials, must be delivered to the under-
signed, endorsed "Gas Manager," not later than

Saturday, the 17th of April, 1909.

Canvassing, either directly or indirectly, will be re-
garded as a Disqualification.

I. LINDOW,
Clerk of the Council.

Council Offices, Shipley,
Yorks, March 29, 1909.

TO BE LET for Show-Rooms, Work-

shops, Warehouses, &c., Two Magnificent
FLOORS, containing 9300 Square Feet and 3600 Square
Feet respectively, in Alfred Place and Chenies Street,
Tottenham Court Road, W.C. Fireproof Construction.
Built for Heavy Weights. Well Lighted. Lift.

Also Vacant SITE Adjoining, about 9000 Square Feet,
on 99 Years' Building Lease.

Apply A. J. CALEY and SON, LIMITED, Chenies Street,
LONDON, W.C.

PURIFIERS FOR SALE.

FOR SALE—Four 10-foot Square Puri-

fers, with Dempster's Dry-face Centre-Valve and
Connections Complete.

Offers to H. LEES, Gas Office, HEXHAM.

FOR SALE, Cheap, the undermentioned

GAS PLANT:—

Kirkham's "STANDARD" WASHER-SCRUBBER

to pass 250,000 cubic Feet per diem.

GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.

EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.

4-inch Cast-Iron Vertical CONDENSER.

Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.

Donkin's VALVES, 12-inch, 10-inch, 6-inch.

Apply to SAMUEL WHILE and SON, 60, Queen Victoria

Street, LONDON, E.C.

GAS-EXHAUSTER FOR SALE.

FOR SALE—A Gas-Exhauster with

Steam-Engine Complete, made by Messrs.

Gwynne and Co., of Essex Street, Strand, in 1874, de-

signed to pass 21,000 Cubic Feet per Hour at a speed of

100 Revolutions per Minute.

The Exhauster has recently been overhauled and is

in good order. It may be seen working at the Lowestoft

Gas-Works by appointment with Mr. Joseph Hawksley,

of 2, York Road, Great Yarmouth, to whom offers

should be addressed.

April, 1909.

SECOND-HAND PLANT for Sale, in

good order—

Six 8 ft. square PURIFIERS.

Six 14 ft. square PURIFIERS.

Three 12 ft. by 10 ft. PURIFIERS.

One 20 ft. by 10 ft. PURIFIER.

One 18 ft. 6 in. by 14 ft. 6 in. PURIFIER.

8-inch PIPE CONDENSERS.

STATION METER, 12,500 Cubic Feet per hour.

STATION METER, 6-inch Connections.

300-Light METER, 4-inch Connections.

EXHAUSTER and ENGINE, 10,000 Cubic Feet per

hour.

EXHAUSTER and ENGINE, 20,000 Cubic Feet per

hour.

EXHAUSTER and ENGINE, 7-inch Connection.

SCRUBBER, 16 ft. high by 4 ft. diameter.

SCRUBBER, 30 ft. high by 5 ft. diameter.

Particulars from W. DARLING and Co., 158, St.

Vincent Street, GLASGOW.

MANUFACTURING PLANT FOR SALE.

THE Directors of the Cardiff Gaslight

and Coke Company invite OFFERS for the Pur-

chase of PLANT, in good Working Condition, at their

Bute Terrace Works, comprising:

RETORT FITTINGS.

CONDENSER.

AMMONIACAL LIQUOR SCRUBBER.

TOWER SCRUBBER.

ONE PAIR OF EXHAUSTERS.

ONE SET OF FOUR PURIFIERS.

The whole suitable for Gas-Works producing Half-a-

Million Cubic Feet per Day.

Schedule, containing detailed Measurements and all

Particulars, may be obtained on Application to Mr. H.

Morley, C.E., Gas-Works, Cardiff.

Tenders to be received not later than the first post

Saturday, May 1, next.

BOROUGH OF MOSSLEY.

THE Gas Committee of the Borough of

Mossley invite TENDERS for the Supply of

Screened GAS COAL.

Specifications and Forms of Tender may be obtained

from the undersigned.

Sealed Tenders, endorsed "Gas Coal," and addressed

to the Chairman of the Gas Committee, Gas-Works,

Mossley, must be delivered not later than Wednesday

morning, April 28, 1909.

JAMES TAYLOR,
Engineer and Manager.

Gas-Works, Mossley,
April 7, 1909.

BRIDGEWATER COLLIERIES COKE WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Crude

BENZOL produced at the above Works (estimated
at 450 Gallons per day) testing 80 per cent. at 120° C.,
during the next Three, Six, Nine, or Twelve Months,
delivered into Contractor's Tanks at the Bridgewater
Colliery Siding, Wharton Hall, on the Pendleton and
Hindley Branch of the Lancashire and Yorkshire
Railway, or at the Brackley Siding on the Little Hulton
Mineral Branch of the London and North Western
Railway.

Tenders, endorsed "Tender for Crude Benzol," to
be addressed to Mr. Thomas M. Brown, Bridgewater
Coal Offices, 4, Chapel Walks, Manchester, not later
than the 26th inst.

Manchester, April 6, 1909.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above are

open to receive TENDERS for the Supply of
7000 Tons of Freshly-Worked Screened GAS COAL or
NUTS to be delivered during the Twelve Months ending
June 30, 1910, as may be required.

Forms of Tender and any further Particulars may be
had on Application to the undersigned.

Tenders to be sent, addressed to the Chairman of the
Gas Committee, endorsed "Tender for Gas Coal," on
or before April 30, 1909.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Offices,
East Retford, April 6, 1909.

**MITCHAM AND WIMBLETON DISTRICT
GASLIGHT COMPANY.**

TENDERS FOR TAR.

THE Directors of the above Company

are prepared to receive TENDERS for the Pur-
chase of the Surplus TAR produced at their Gas-Works
for a Period of Twelve Months from May 1, 1909.

Probable quantity, 400,000 Gallons.

Further Particulars and Forms of Tender may be ob-
tained on Application to the undersigned.

Sealed and endorsed Tenders, addressed to the

Chairman and Directors, must be delivered at the Gas-
Works not later than April 30, 1909.

The Directors do not bind themselves to accept the
highest or any Tender.

B. R. GREEN,
Engineer and Manager.

Gas-Works, Mitcham,
April 8, 1909.

NEWPORT (MON) GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the

Supply of about 30,000 Tons of best GAS COALS
for Twelve Months, commencing July 1, 1909, to be de-
livered on the Company's Sidings at their Mill Street
and Crindau Works, in such quantities and at such
times as may be directed by the Company's Engineer,
from whom further Information may be obtained.

Tenders will be received for the whole or part of the
above quantity.

Tenders, endorsed "Coals," to be delivered at the
Offices of the Company not later than Wednesday,
April 21, 1909.

The Directors do not bind themselves to accept the
lowest or any Tender.

By order,
T. H. HAZELL,
Secretary.

Newport, Mon., April 8, 1909.

RHYL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Rhyl Urban District Council are

prepared to receive TENDERS for the Supply of
4800 Tons of Screened COAL, to be delivered i.o.r.
Rhyl, during the Eleven Months ending the 30th of
June, 1910, in such Quantities and at such times as may
be required.

Form of Tender and Particulars of Conditions may
be obtained on Application to Mr. Leonard G. Hall,
Assoc.M.Inst.C.E., Gas Engineer.

Sealed Tenders, endorsed "Tenders for Coal," to be
delivered to me, the undersigned, not later than the
28th of April, 1909.

Approved security will be required.

The Council do not bind themselves to accept the
lowest or any Tender.

ARTHUR ROWLANDS,
Clerk to the Council.

Council Offices, Clwyd Street,
Rhyl, April 10, 1909.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

TO COLLIERY PROPRIETORS AND OTHERS.

THE Wallasey Urban District Council

are prepared to receive TENDERS for the Supply
of about 46,000 Tons of Screened GAS COAL and
CANNEL, delivered in accordance with the Terms of
the Specification prepared by, and obtainable at the
Office of, the Engineer, Mr. J. H. Crowther, Dock Road,
Seacombe.

Sealed Tenders, addressed to the undersigned, and en-
dorsed "Tender for Coal, Gas and Water Department,"
to be delivered per post, at my Office, as below, no
later than the morning of Wednesday, the 21st inst.

The Contractor or Contractors will be required to
enter into a Bond with approved Sureties, for the due
performance of his or their Contract.

The Council do not bind themselves to accept the
lowest or any Offer.

By order,
H. W. COOK,
Clerk and Solicitor.

Public Offices, Egremont,
Cheshire, April 5, 1909.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee are prepared to re-

ceive TENDERS for the Supply of about 12,000
Tons of BEST CRAVEN or DERBYSHIRE LIME,
required for the Purification of Gas at the several Gas-
Works during the Twelve Months commencing on the
1st of May 1909, also for the Supply of CAST-IRON
PIPES, RETORT CASTINGS, &c.

Specifications and Forms of Tender may be obtained
on Application to the undersigned.

Sealed Tenders, suitably endorsed, addressed to the
Town Clerk, Town Hall, Leeds, to be delivered not
later than Saturday, the 24th inst.

The Committee do not bind themselves to accept the
lowest or any Tender.

R. H. TOWNSLEY,
General Manager.

Gas Offices, East Parade,
Leeds, April 10, 1909.

**ROTHWELL URBAN DISTRICT COUNCIL,
NORTHAMPTONSHIRE.**

TENDERS FOR GAS COAL.

THE above Council invite Tenders for

the Supply of the whole or part of about 1400 to
1600 Tons of Best Screened GAS COAL and NUTS
delivered at Desborough Station (Midland Railway) in
such quantities as may be required by the Council's
Gas Manager during the Year ending June 30th, 1910.

Further Particulars can be obtained from Mr. A. T.
Harris, the Council's Gas Manager.

Sealed Tenders, endorsed "Tender for Coal," must
reach the undersigned not later than Saturday, the
24th inst.

The Council do not bind themselves to accept the
lowest or any Tender.

By order,
THOMAS TOZER,
Clerk to the Council.

Market House, Rothwell
(Northants), April 8, 1909.

ROYAL BURGH OF INVERNESS.

CONTRACTS FOR COAL, LIME, INSURANCE,
AND FREIGHT.

THE Inverness Gas Commissioners are

prepared to receive OFFERS for the Supply of
10,000 Tons of CANNEL and GAS COAL, to be delivered
i.o.h. at Ports on the Firth of Forth, or delivered free
at Inverness Goods Station, over a period of Six or
Twelve Months, at the Commissioners' Option; also,
300 Tons of LIME SHELLS, to be delivered free at
Inverness Goods Station; also, FREIGHT and IN-
SURANCE on COAL from Firth of Forth Ports to
Upper Harbour, Inverness, and for the Discharging of
Coal into Carts or Wagons at the Harbour, and
Trimming at the Gas-Works when required.

Further Particulars and Forms of Tender may be
obtained by Applying to the Manager at the Gas-Works.

Tenders, endorsed and addressed to Kenneth Mac-
donald, Esq., Clerk to the Commissioners, will be re-
ceived up to Saturday, the 24th inst.

The Commissioners do not bind themselves to accept
the lowest or any Tenders.

Gas-Works, Inverness,
April 6, 1909.

UXBRIDGE GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the Uxbridge Gas

Company invite TENDERS for the Supply of
about 8000 Tons of Clean and Fresh Wrought GAS
COAL, deliveries of which are to commence in July,
1909, and finish in June, 1910.

Tenders to be made out for the above Quantity of the
best description of Screened or Unscreened Gas Coal,
either in whole or part, from, or divided between the
Durham or South Yorkshire Pits, delivered by Barge,
free alongside the Company's Works on the Grand
Junction Canal, or by Rail to Uxbridge Station (Great
Western Railway).

Tenders are to state the name of the Pits from which
the above Description of Coal will be supplied.

Deliveries to be according to the Instructions of, and
to the entire satisfaction of, the Company's Engineer.

Tenders to be received on or before April 20, ad-
dressed to the Chairman, Gas Offices, Uxbridge
Middlesex, and endorsed "Tenders for Coal."

No Form of Tender supplied.

GEORGE J. BRISTOW,
Secretary.

Uxbridge, Middlesex,
April, 1909.

**TAUNTON RURAL DISTRICT COUNCIL
WATER SUPPLY.**

TO CONTRACTORS AND OTHERS.

TENDERS are invited by the above

Council for the following, in connection with the
Carrying of Water to, and its Distribution over, the
Parish of Stoke St. Gregory within the district.

(a.) The Supply of about 16 Miles of CAST-IRON
PIPING.

(b.) The Supply of SLUICE VALVES, HYDRANTS,
&c.

(c.) The LAYING and FIXING of the above Pipes
and Fittings.

(d.) The Construction of a 50,000 Gallon BRICK
RESERVOIR.

Specifications and Forms of Tender may be obtained
of the Engineers, Messrs. Merryweather and Sons,
Greenwich Road, London, S.E., on payment by Cheque
of Two Guineas for each Section, which will be returned
on receipt of a *bona-fide* Tender.

Tenders to be delivered to the undersigned on or
before Friday, the 30th of April inst., at whose Office,
Plans may be inspected, as well as at the Offices of the
Engineers.

(Signed) W. F. B. DAWE,
Clerk to the said Council, Taunton.

Union Offices,
Taunton.

IMPERIAL CONTINENTAL GAS ASSOCIATION. (INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 4th day of May next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors; a Dividend declared for the Half Year ended the 31st of December, 1908; an Auditor elected in the place of the late Montagu Somes Pilcher, Esq.; and the usual Ordinary Business of such Meeting transacted.

NOTICE IS HEREBY ALSO GIVEN, that the REGISTER OF TRANSFERS OF CAPITAL STOCK WILL BE CLOSED from the 20th inst. to the 4th prox., both days inclusive.

By order of the Board,
ROBT. W. WILSON,
Secretary.

Offices: 21, Austin Friars,
London, E.C., April 12, 1909.

FOR SALE.

THE Patents of my

"KOBOLD" CHARGING-MACHINE for Horizontal Gas-Retorts, which, on the occasion of the visit of the English Gas Engineers to the Tegel, or No. VI., Gas-Works at Berlin, excited the Greatest Interest, and of which the Faultless Working was recognized, as well as of my "SCHLANGE" DRAWING MACHINE for Single Horizontal Retorts are TO BE SOLD on most Favourable Terms.

C. EITEL.

Maschinenfabrik, Stuttgart.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.

NEW ISSUE OF 400 £10 "B" SHARES
AND
£2000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

By order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

NEW ISSUE OF £4000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK,
AND
200 £10 NEW ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

Estate of Thos. Hersey, Esq., decd.

MESSRS. A. & W. RICHARDS will SELL BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.

480 £20 FULL-YPAID SHARES

IN
KIRKHAM, HULETT, AND CHANDLER,
LIMITED.

Particulars of the AUCTIONEERS, as above.

THE GAS-WORKS, KINGSCLEERE.

MR. A. W. NEATE is instructed by the Liquidator, to SELL BY AUCTION, at the Swan Hotel, Kingsclere, Hants, on Tuesday, April 20, 1909, at Four o'clock precisely,

THE KINGSCLEERE GAS-WORKS, comprising Manager's House, Retort-House, Purifier, Condenser, Scrubber, Gasholder, Holder Tank, Stores, Outbuildings and Gardens, also

THE GAS MAINS AS LAID,

with Connections to Houses, Street Lamps, Columns, Brackets, Service Pipes, Meters, &c., Purchaser to take to the Working Plant, Tools, and Stock by Valuation.

Possession on completion of Purchase. Particulars and Conditions of Sale may be had at the Place of Sale, of J. BARNES, Esq., Solicitor, KINGSCLEERE, and of Mr. A. W. NEATE, Auctioneer, NEWBURY and HUNGERFORD.

Now Ready, Price 15s., Lamp Cloth.

TWENTY-EIGHTH YEAR.

ANALYSIS OF THE ACCOUNTS

OF SOME OF THE

Principal Water Undertakings

OF THE

UNITED KINGDOM,

NAMELY:

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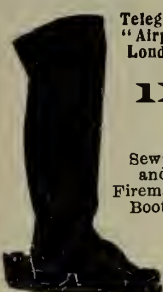
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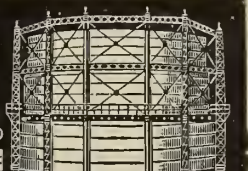


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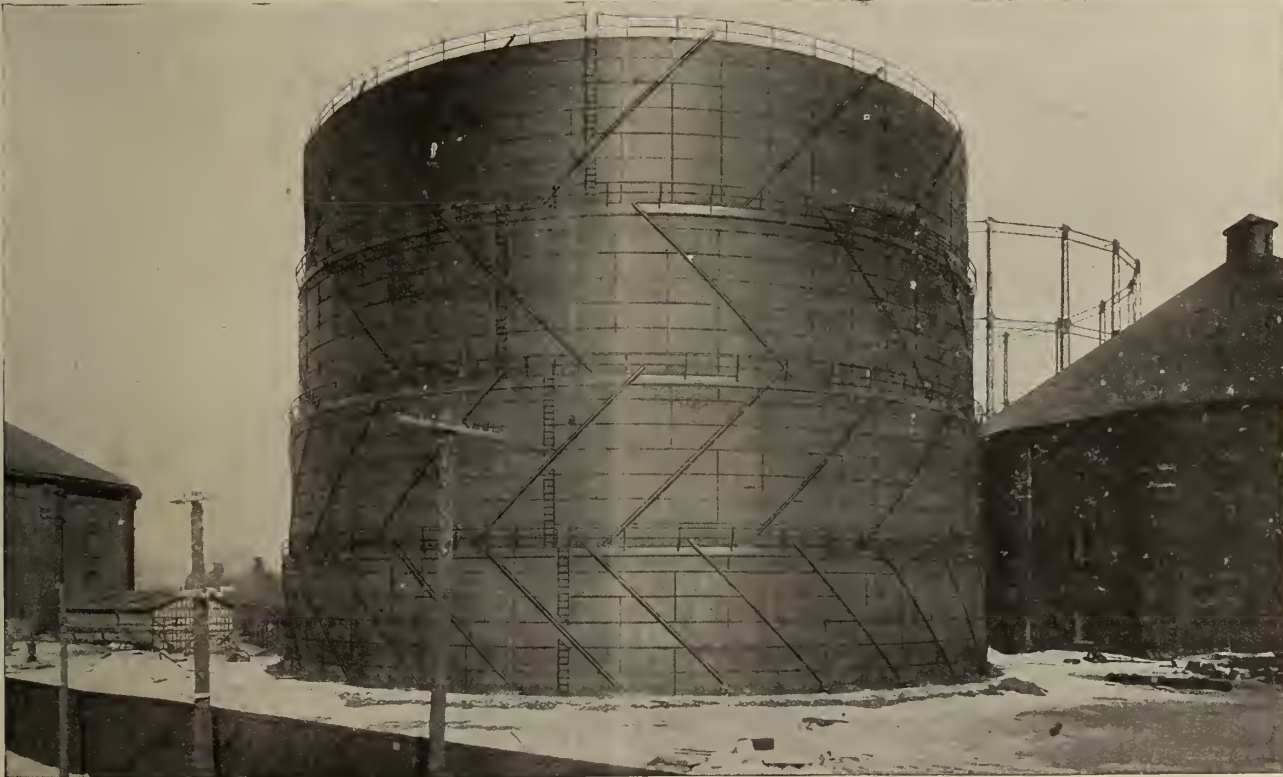


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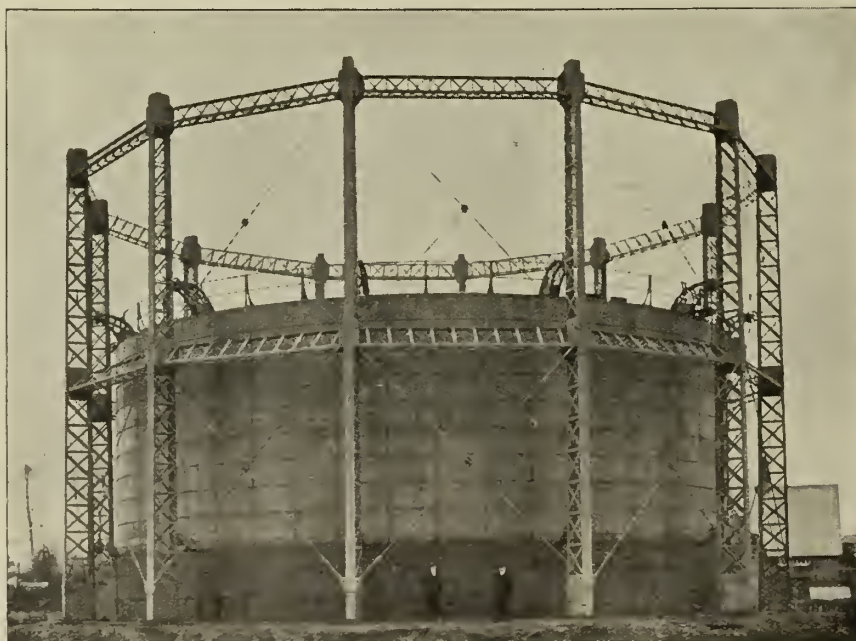
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LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
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(Patent) Inverted System

BRITISH MADE.

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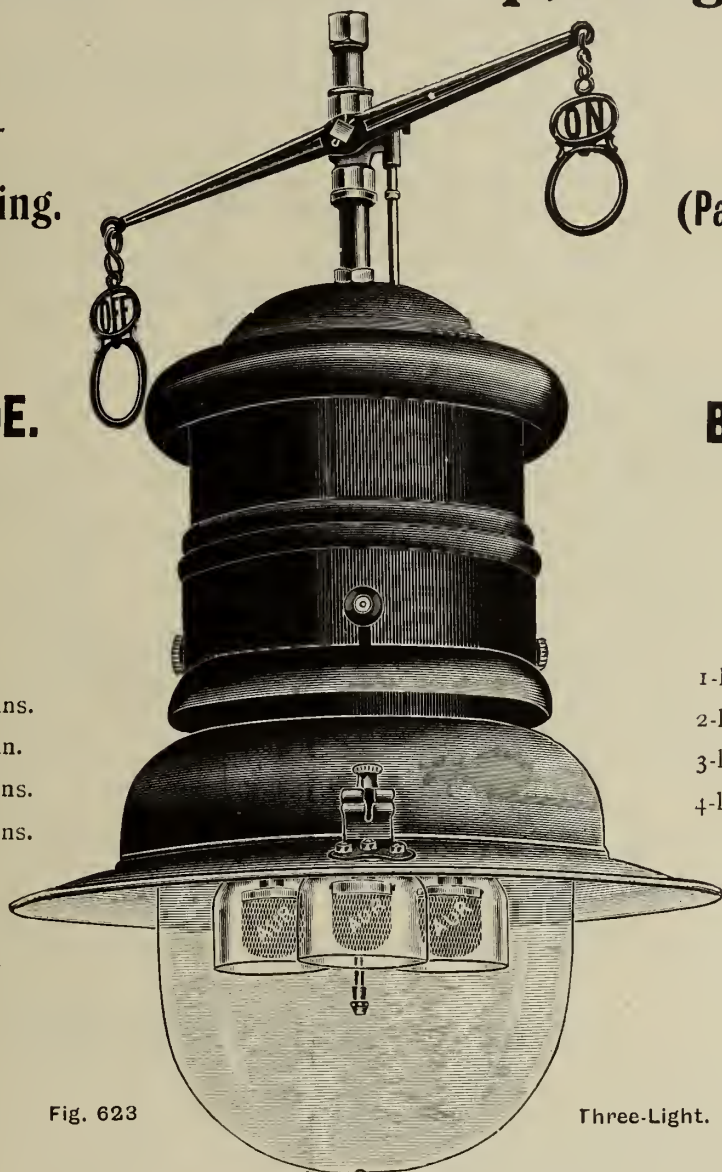


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 1 in.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 4 ins.
3-light	. . .	1 ft. 6 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

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Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	4/-	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " " In Case lots per dozen.	19/6	42/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made.
Case contains	80	48	18	12	Welsbach Mantles, each	6d.	subject as usual.		

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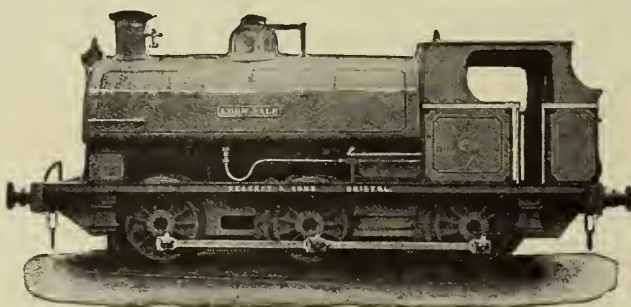
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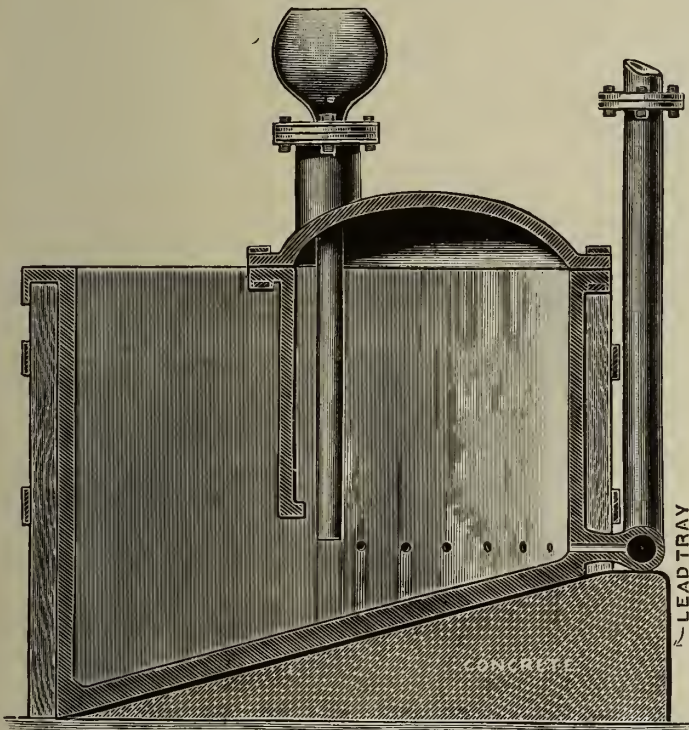
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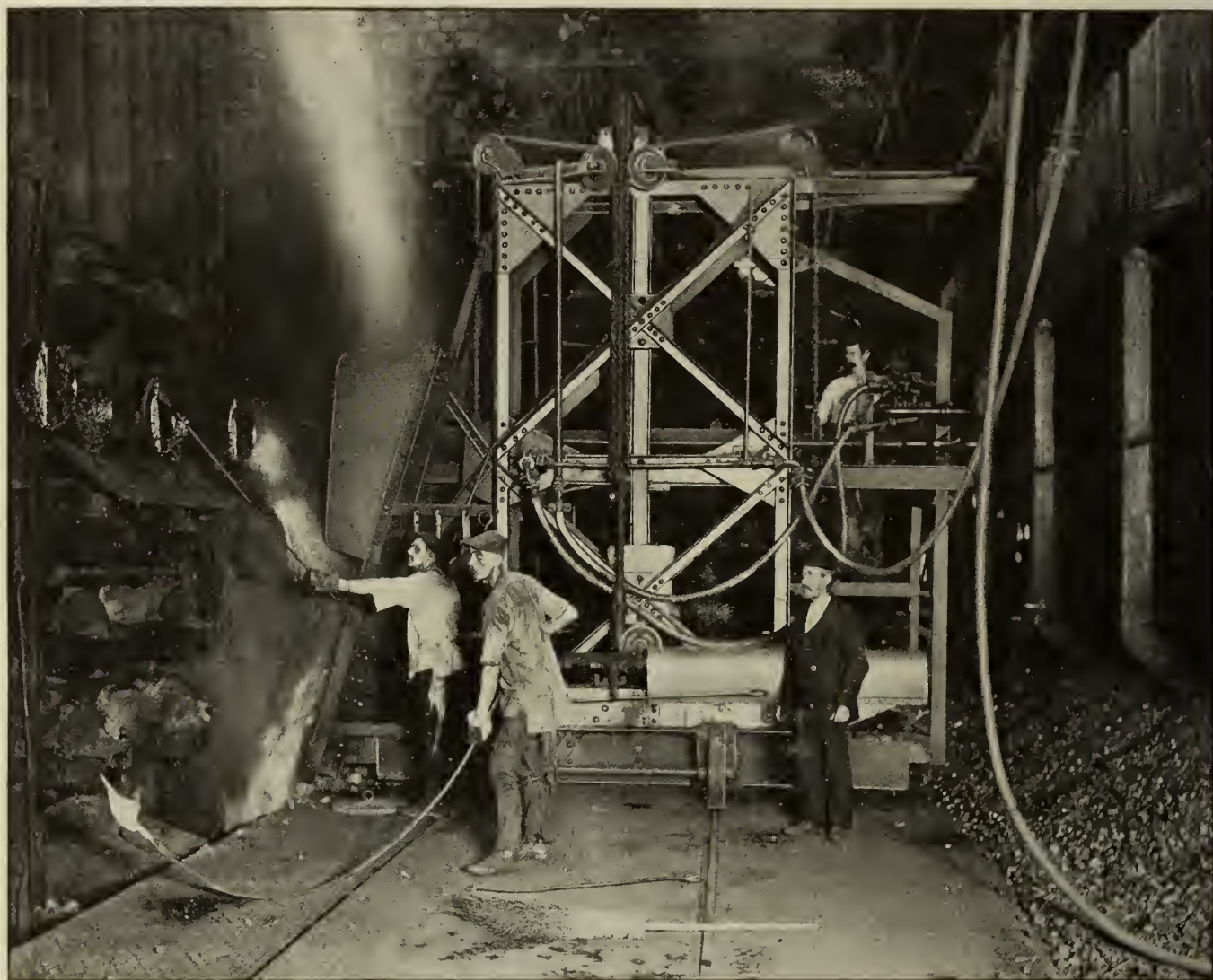
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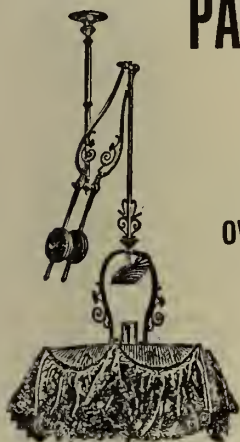
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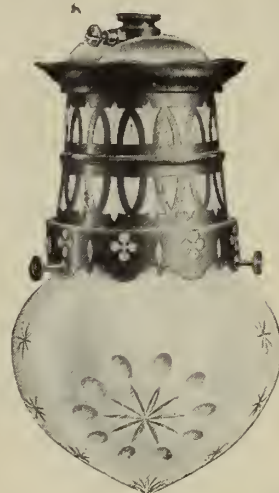
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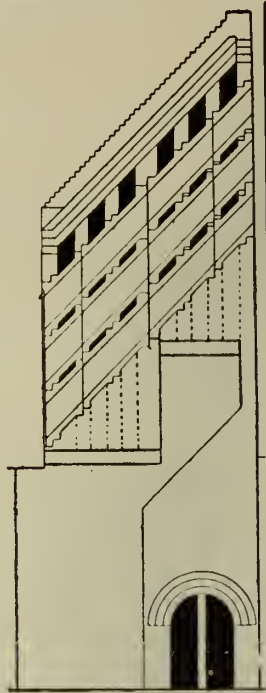
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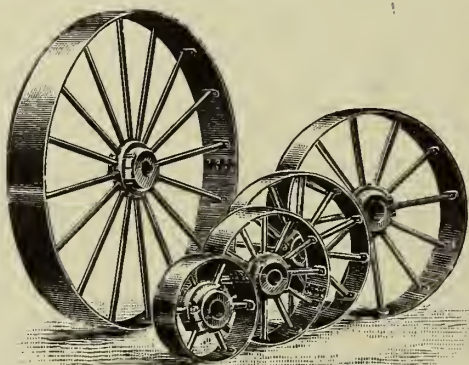
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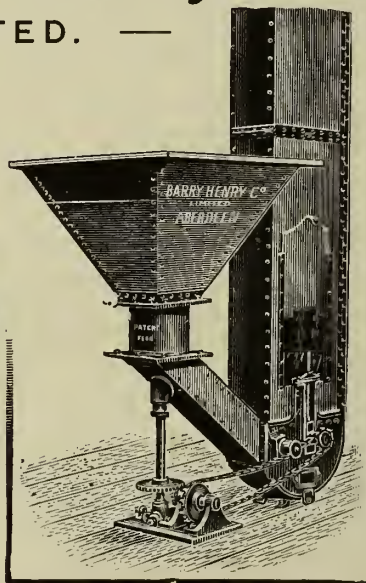
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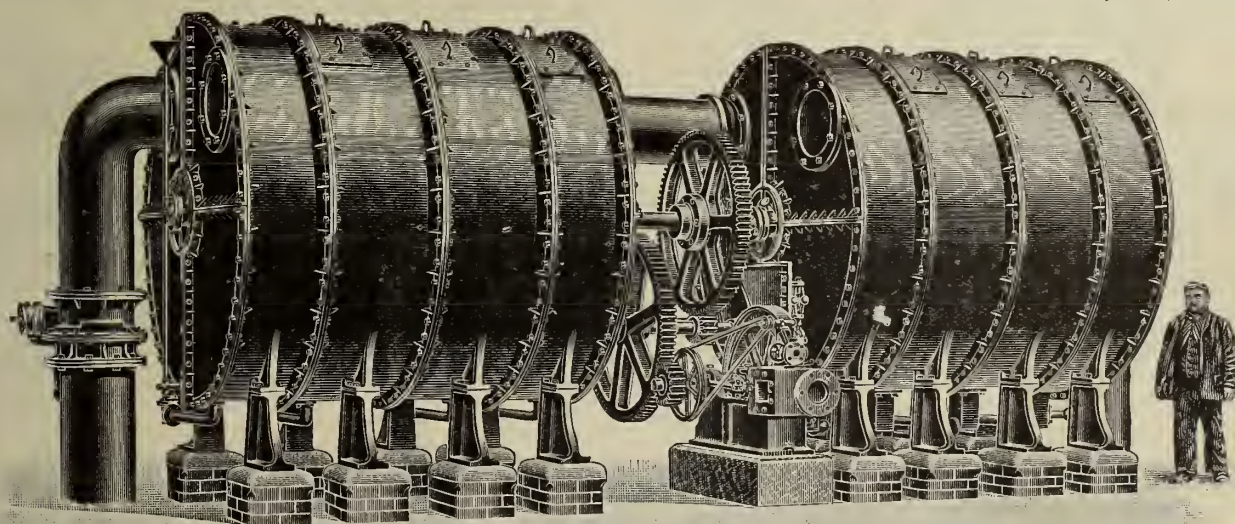
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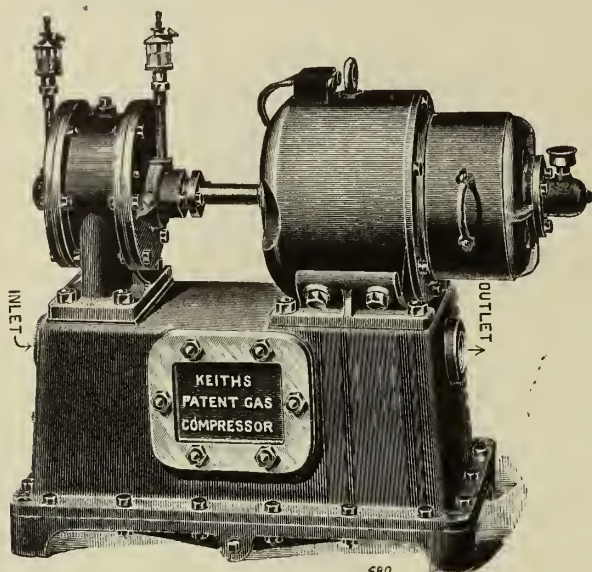


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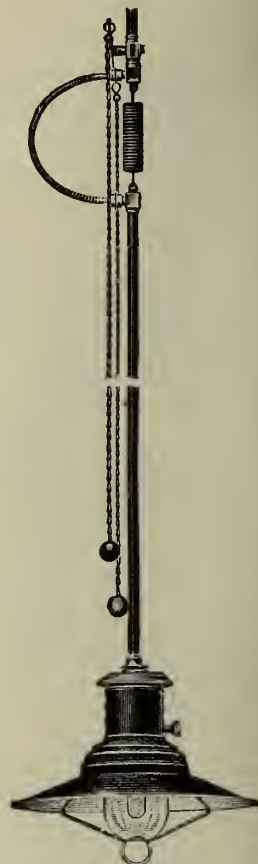
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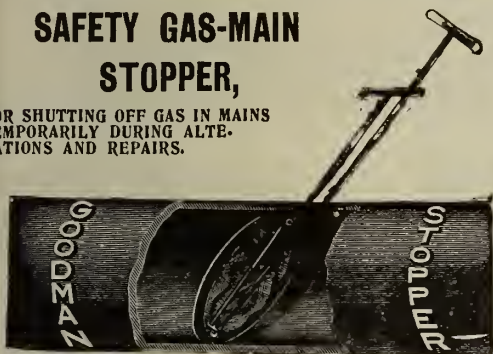
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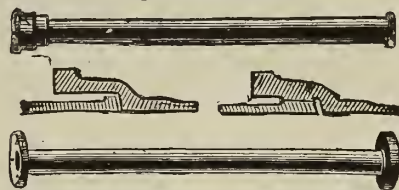
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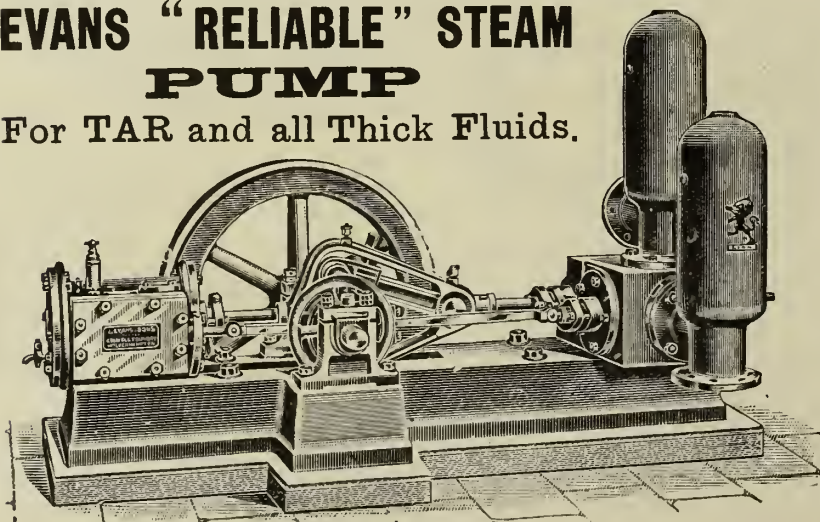
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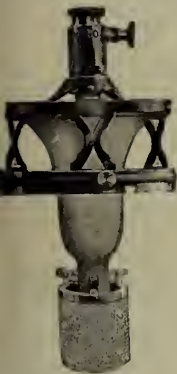
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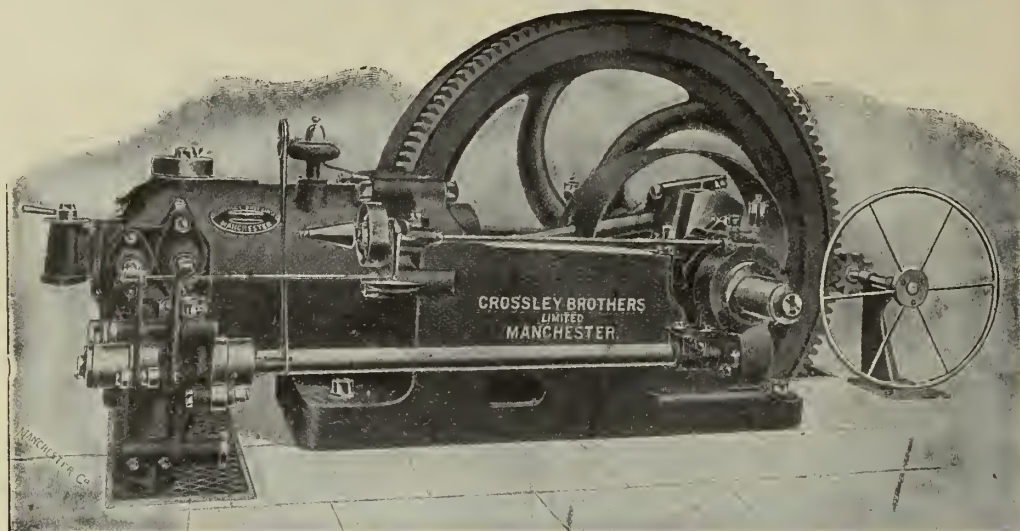
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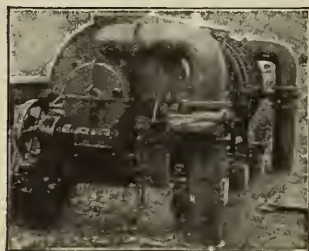
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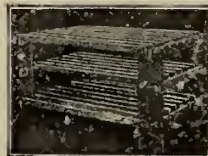


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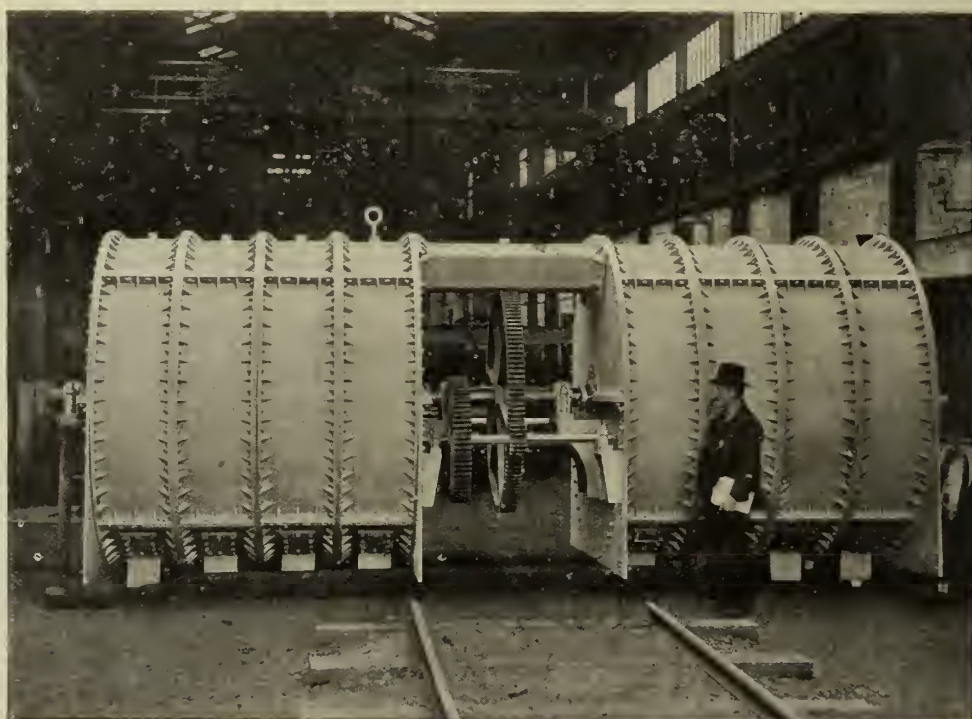
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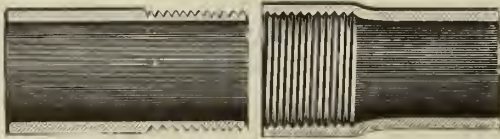
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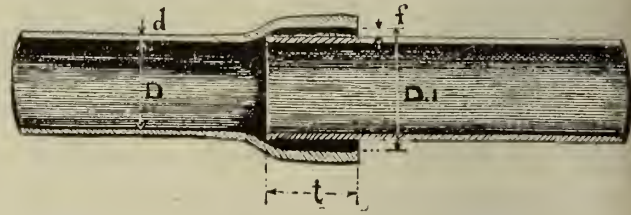
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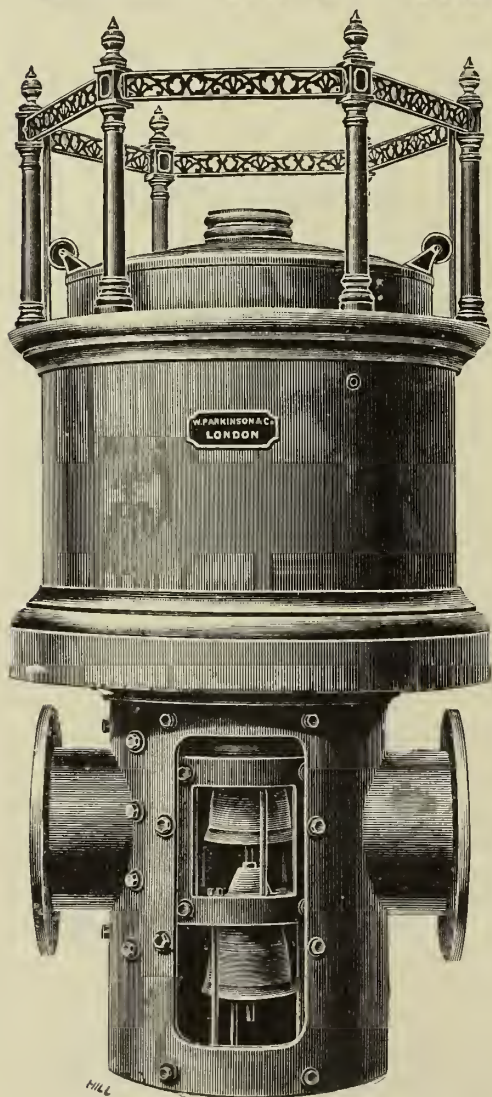
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VOL. CVI., No. 2397.—TUESDAY, APRIL 20, 1909.

EDITORIAL NOTES—GAS, &c.

Past Coal Lessons, and Present Effects.

THE futility of the coal owners entering into any undertaking among themselves, especially on a falling market, to maintain the price of gas coal at a higher level than the conditions of coal demand and trade generally warrant, has been demonstrated in striking manner during recent times. The lessons of the past two years have not been lost upon them; but we should not have referred to the matter just at this particular season, were it not that they are again counselled to take the same action that put a number of them in the North into an uncomfortable position in 1907 and in more southerly counties in 1908. The coal owners, we think, will be content to let matters rest as they are, and to continue, as they have been doing this year, securing gas coal contracts in open competition without their hands being tied by agreements or understandings in any way. The "Iron and Coal Trades Review" is the counsellor that, in the following sentences, hints that some agreement as to contract prices would probably now be useful:

There do not appear to have been any general meetings of gas or house coal proprietors as yet this year to agree upon the contract figures; and, as far as we can hear, none has been called, although it is under such circumstances as those now prevalent that some combined action would appear to be more useful than when the market is naturally strong. Last year, however, when trade was in a decidedly better position than it is now, the understanding entered into was not always adhered to; and perhaps it is thought that little cohesion would be possible this year, and that, therefore, the less said the better.

The advice comes rather late in the day, when so many important gas coal contracts have been settled for next year; and had it been given before, the coal owners would, we opine, have taken precisely the same course of independence that they are now doing, and for the reasons that are reflected in the last few lines of the quoted paragraph. When the market was in a strong position in 1907, and there was very largely coherent action in the more northerly English coal-fields, certain coal owners viewed with anything but pleasant emotions the slipping from their grasp of considerable contracts to which they had been accustomed, and their placing elsewhere; nor did they contemplate with equanimity the splitting-up of contracts and the scattering of parts into quarters that had before never been favoured with such orders. The (so to speak) mobility of the gas industry in respect of anything but negligible portions of its coal supply was a new-born experience. In the early part of last year, we heard of the Gas Coal Federation, of the "machinations" of the gas companies, and of the collieries uniting in "insisting" upon 2s. to 2s. 6d. per ton advance upon the 1906 prices. How far the "insistence" was carried is a matter of history. It was ultimately every coal proprietor for his own hand, and not a repetition of the 1907 experience for many of them. To say, as our contemporary does, that the "understanding entered into [in the "spring of last year"] was not always adhered to" is the barest of possible acknowledgments of some of the actual occurrences of the contract period. The 2s. and 2s. 6d. per ton advance on 1906 could not be commanded or enforced; and resolutions, insistence, and so forth all came to grief, where buyers did not madly rush in, on the rocks formed by the resistance of the gas industry to unfair treatment and by the market-ruling conditions of the times. The coal owners are philosophic in having, in their individual capacities, arrived at the conclusion that, if there was little value in "combined action" when the market was stronger than it is now, there would be still less to be gained by troubling to agree among themselves a price in days

such as these. The loss of contracts formerly possessed has ever a mortifying effect upon the most ardent of commercial spirits.

The coal contracts of the gas industry rank well in the eyes of the coal owners, not only on account of their volume, but because of the steadiness of requirement season by season. And notwithstanding the competition of electricity, the demand is an ever-increasing one. The Board of Trade returns indicate this. More gas is produced to-day per ton of coal carbonized; and the use of water-gas plant has not by any means diminished since 1902. Even so, the quantity of coal carbonized for gas making, by the statutory undertakings alone, increased from 14,109,219 tons in 1902 to 14,846,257 tons in 1906, which is the year of the last published returns. This is an increase of 737,038 tons; and it is worth noting that 365,932 tons of this is the advance of 1906 on 1905. In 1906, the statutory gas industry used 2 million tons more coal than the whole of the railways of the United Kingdom did in 1907, and an amount equal to upwards of two-thirds of the total used at the blast-furnaces of the United Kingdom. From which it is seen that the gas industry is entitled to not a small measure of respect; and the industry is not to be found at any time in the humour for being trifled with by those with whom business is done. Though there are those who would put the coal proprietors and the gas industry again into two hostile camps, it is hoped that the free competition of the present time will continue, without the disagreeable incidents and friction produced by the restriction, in the initial negotiations, of resolutions that, by the force of competition and individual interests, have in the end to be sacrificed, however honourable the original intention to stand to the verbal bond.

It is known that many important gas coal contracts have already been settled this year. As far back as February, statements were publicly made by prominent Chairmen as to contracts having been entered into at "materially lower prices" than those of the previous year, and a decrease of $1\frac{1}{2}$ per cent. was also mentioned for three or four companies. Apart from the general knowledge as to the position of the country's trade, the keenness of the competition among the coal trade representatives for the contracts for the ensuing year well before the customary period, was indicative of the ruling conditions; and there has been no lull in the competition. It will from what has been said be quite obvious to those who are still negotiating that the prices circulated as market quotations for gas coal are anything but stable. Many contracts, we know, have been settled at figures below those cited by market reporters, and not only for gas coal but for the steam coal required at electricity generating stations. In the North, the Newcastle-on-Tyne Electric Supply Company have entered into their contracts at prices similar to those paid in 1906; and in the South the Brighton Corporation Electricity Department are paying 2s. 8d. less per ton than the last two years. The difference between gas and electric lighting undertakings in connection with the reduced expenditure for coal that will accrue under the new contracts is that the greater part of the saving in the case of the former will go to the gas consumer; in the case of the latter, the money is badly wanted by many of them to assist over the critical time through which they are passing.

In considering the position of the coal market in the more immediate future, there are several contributory influences to be gathered together. The cloud of trade depression does not appear to show any disposition to disperse in a hurry; and the situation is anything but favourable to the coal owners and the miners in respect of the coming into operation of the Coal Mines Eight Hours Act. Its provisions will apply to all the coal-fields save Durham and

Northumberland on July 1 next; and to these counties on Jan. 1 next year. It will be remembered that the Act provides for an eight-hour day excluding windings; but there are few outside the coal industry who really recognize the upheaval there will be in practices and customs in the different coal-fields by the incoming of the Act. One well-instructed writer in these matters points out that in South Wales, the men now work four long days of ten hours and two short days of eight hours; in Lancashire, many of the pits have worked from nine to ten hours on five days of the week; and in Durham and Northumberland, the coal hewers have been working less than eight hours a day, but the boys and labourers have been working nine to ten hours, serving two sets of hewers—this being found an economical mode of proceeding. For gas undertakings supplied by coal-fields other than Durham and Northumberland, it is a very good thing the Act comes into force in the light season of demand; but in respect of Durham and Northumberland, there will be much fervent hope that the Act will glide into operation on Jan. 1 next, in the midst of the great consumption period, without causing any dislocation of supplies. It is a matter that will be worth looking into betimes. The point germane to the subject in hand is that the Act is not likely, under the stress of present adverse conditions, to be instrumental *per se* in producing any immediate turn of prices in the upward direction, though the miners themselves are not lying dormant in the matter of employing every available factor, in face of the steady decline in wages of late months, in getting the basis of wages raised. If true, however, a rumour current last week bodes no good. It was to the effect that some form of taxation generally on coal, and not on exported coal alone, would be proposed by the forthcoming Budget. The impression seemed to be that 2d. per ton duty would be levied at the pit mouth on all coal, and that there might be a further tax on royalties. But it is all nebulous talk at the moment. On the quantity of coal raised last year—261,500,000 tons—a tax of 2d. per ton would yield just about the same sum as was produced by the 1s. tax on exported coal in the last complete year it was levied—£2,180,000. The loss of this money to the national exchequer since 1906 has been keenly felt; and there will be much resentment against the Government if it is attempted to now replace the money by taking five-sixths of it, or thereabouts, from the pockets of home consumers.

Contemplating further the immediate future, the export figures referring to gas coal in the first quarter this year are significant. On coal exports generally in the quarter, there was a shrinkage of no less than 347,000 tons compared with the corresponding period of 1908; and of this gas coal—the quantity shipped being 2,187,549 tons—accounted for 252,101 tons. This large proportion of gas coal in the decline is of importance to home buyers; and there are reasons for it which cannot be attributed to the conditions of the British coal market. While there has been this decrease of 252,000 tons in the gas coal shipped, the quantity of anthracite exported has been about 60,000 tons more, household coal about 32,000 tons more, and other sorts about 42,000 tons more; while steam coal decreased by about 94,000 tons. That the price of the gas coal has nothing to do with the decline in its export during the three months is seen by the fact that the value of the quantity shipped—£1,131,209—was £315,348 less than in 1908. In other words, the quantity of coal exported was greater in the period of high prices than it is in the period of low prices. Nor can it be said that the decrease in demand is due to a diminution of gas consumption on the Continent. There is little doubt that it is owing to a variety of native causes, among which are the greater tranquillity in the Westphalian and French coal-fields, with the greater resort of the German and French gas-works to these sources of supply, and to the fact that the new systems of carbonizing on the Continent permit of more extended use being made of the cheaper varieties of home-produced coal. In view of this, much care should always be taken to specify the coal from which published carbonizing results are obtained. Some of the improved yields per ton of which there has been note made in this country during the past year, are partly due to the return from the poorer qualities of gas coal used in 1907 to the higher grades in 1908. Altogether, the position of affairs in the coal market is both interesting and instructive; and it is observed that, on all hands, the coal proprietors find themselves obsessed by sensitive conditions calling for the exercise of diplomatic treatment.

The Coalite Curtain Partially Lifted at the Plymouth Gas-Works.

THERE have been private visits to the installation of coalite plant at the Plymouth Gas-Works during the past few months by special permission of the British Coalite Company. But last Thursday the plant was thrown open for the first time to a formal inspection by gas managers; and this distinction was conferred upon the Cornish Association. Professor Vivian B. Lewes and Mr. Charles H. Parker, the son of the originator of the coalite system, were there to receive the visitors on behalf of the proprietary Company; and, of course, Mr. P. S. Hoyte, the Engineer and Manager of the Plymouth Gas Company, was also present to give cordial welcome to his *confrères*. Our local correspondent was among the visitors; and he generally describes, in an article in other columns, the plant, his own impressions, and certain details as to working picked up by the way during the inspection. He tells us that the advantages of low-temperature carbonization were demonstrated to the visitors; but, after reading the article, it is manifest that the disadvantages were also demonstrated, and that the practical gas managers from the extreme south-west of the country went away from the works quite undeceived as to which predominate in the system—the disadvantages or the advantages from the gas man's particular point of observation. The visit, however, has not by any means given gas men all they want to know about the coalite plant, its operation, and its working results. But it has lifted the veil a little; and what is seen does not mitigate doubts, nor detract from the estimates already made as to the extent of the value of the system to those whose primary business it is to make and sell gas.

As our readers are aware, the original laudatory advertisement articles that appeared in the public Press, the Cantor Lecture in which a famous and popular lecturer made himself responsible for divers remarkable assertions and computations, and the promotion of the British Coalite Company, were all founded on plant and a method of operation that subsequently had to be discarded; and why? Because the much-vaunted process as then designed and operated would not produce the substance that is known as coalite. Carbonizing the coal in masses at the low temperature of 800° Fahr., with three-and-a-half to four hour charges, there were, as any practical carbonizer would have expected, considerable physical differences between the outside and the inside portions of the mass of stuff discharged at the end of the carbonizing period. There was such disuniformity that part was coke, and part was practically still coal; but it was certainly not "coalite" throughout. Is it not possible that the defamed assumptions of the past—for they could only have been assumptions, in view of the enforced rejection of the original plant and practises that would not consistently effect the results claimed—will have as a companion in their final resting-place Professor Lewes's financial computation as presented, with much garnishing, to a Society of Arts audience some twelve months since? That financial computation was in itself a work of art; and there will be some difficulty in supporting it now under the altered "invention" and system of operation. Readers will be interested in examining the catalogue of plant presented by our local correspondent, comprising the coalite installation at Plymouth. What is there in the combination different from gas-works plant save the castings of twelve small tubes, 32 of which castings form what is called a battery? Even to the governor on the foul main, the similarity to modern gas-works practices is carried. And what is there different in the method of working from the intermittent vertical retort system, save that the coal is carbonized in thin cores in the nests of iron tubes, at a temperature of only 800° Fahr., and for shorter periods? The differences are merely of degree or quantitative. To the gas industry they will confirm what is already known of low-temperature carbonization. In their ignorance, the Directors of the British Coalite Company may conscientiously be of opinion they are doing something great and novel. But they are merely the patrons of a wild-goose chase.

However, from carbonizing in mass to carbonizing in tubes is a radical change in the system itself which has made a vast difference in the operating results. Just think. There are twelve tubes in a bunch, 32 bunches form a battery, and two batteries carbonize 112 tons of coal a day, and produce only 560,000 cubic feet of gas, or 5000 cubic feet per ton. We make out that there are 384 tubes in a battery; and, in the two batteries used, producing 560,000 cubic feet per day,

768 tubes. The charges run for four hours, which means that the 768 tubes are charged and discharged (say) six times a day. Therefore, $768 \times 6 = 4608 \frac{1}{2}$ -cwt. charges and a similar number of discharges in the twenty-four hours for 112 tons of coal. There is therefore during the day a great deal of opening and closing of mouthpieces and exits of these nests of vertical tubes, and much associated labour, such as the exercise of an amount of persuasion to cause the adhesive charges to leave the tubes, and, we imagine, the clearing of the lower mouthpieces. Hence there is no surprise that our local representative was somewhat struck by the number of men employed on the plant. He found three on each battery, or six on the two; and there were others engaged on the producers. We do not find that our correspondent states the number of shifts worked per day; but assuming three, this would represent eighteen men and (say) two for the producer work—making twenty in all in the twenty-four hours—for dealing, on the carbonizing plant only, with 112 tons of coal making 560,000 cubic feet of gas! And this is set up as the paragon of economic carbonization systems! Does Professor Lewes still maintain, as he did in a footnote to one of his tables in the Cantor Lecture of twelve months since, that “in the low-temperature carbonization ‘eleven men replace fifty men’”? Or will he now suggest that the carbonizing wages come out per 1000 cubic feet of gas produced to anything like (say) the figure to which Mr. Hoyte works on his inclined retorts? What twenty men can do in twenty-four hours in a horizontal retort-house operated on modern mechanical lines is also well known to Professor Lewes. In Mr. Hayman’s paper before the Institution of Gas Engineers last year, he showed that, under the Dessau retort system, the carbonizing wages (at rates of payment comparable with this country) worked out to about 5d. per ton of coal carbonized, with a ton yielding about two-and-a-half times the volume of gas for sale that a ton is now doing in the coalite plant at Plymouth—admitted, the former of lower candle power than the latter. And Mr. Harold W. Woodall calculated, in his paper on the same occasion, that by the Woodall-Duckham continuous system the cost of carbonizing labour, similarly realizing a large yield of gas per ton, would eventually be about 6d. per ton. We think some revision is required in Professor Lewes’s Cantor figures for labour in low and high temperature carbonization; and it would be of interest, now and hereafter, if he would put on record the exact carbonizing figures, from the Plymouth low-temperature working, per ton of coal carbonized and per 1000 cubic feet of gas made. It is feared that the Cornish gas managers left Plymouth somewhat impressed by the disadvantage to them of the system in this particular.

It was pointed out to the visitors as an advantage of the coalite plant that it occupies less space for the weight of coal carbonized than the installation of 72 inclined retorts close by, and which are carbonizing rather less weight of coal per day. This is undoubtedly a case in which comparison should be made, from the gas-works point of view, not of the quantity of raw material handled, but of the gas product, the cost of obtaining the product, and the revenue producing power of the whole of the products. To obtain by the coalite process 12,500 cubic feet of gas (which can be produced per ton in ordinary vertical retort working) carriage is paid on $2\frac{1}{2}$ tons of coal; labour is paid for to handle the $1\frac{1}{2}$ tons extra coal; and naturally, therefore, as our correspondent remarks, “the elevating and conveying ‘plant are on a rather large scale for so small a plant.’” Looked at from the gas man’s standpoint, there is the suggestion in this of heavy capital expenditure and wear and tear in the coal and coke handling plant, in comparison with experience under the high-temperature and high gas-production system of carbonizing.

A great point was made of the fuel account; and Professor Lewes indulged in a nautical simile to illustrate why it is that in low-temperature carbonization the fuel account only represents 5 or 6 per cent. of coal carbonized, as against (as he says) 16 per cent. in vertical retort working. This 16 per cent. rather applies to isolated trial settings, and not to regular operation, when 14 per cent. would be a nearer figure in, at any rate, the Dessau working. When the fuel accounts of the two systems are brought into relation with the gas made per ton, there is not, on the figures presented, much to choose between them.

The results of the low-temperature carbonization are stated to be 5000 cubic feet of gas of 18 to 20 candle power, 13 to 14 cwt. of partly carbonized coal (*i.e.*, “Coalite”),

22 gallons of tar, and 15 lbs. of sulphate. On this working, we should now like a fresh balance-sheet drawn up, including all the items of expense from cost of coal carriage and delivery throughout, with the revenue derivable, so that an analysis might be made on the basis of per 1000 cubic feet of gas, to enable a comparison to be effected with ordinary operation and trading. According to Professor Lewes, the plant at Plymouth has demonstrated all that has been claimed for the process. As will have been gathered from the foregoing, our doubts are such that we disagree with Professor Lewes. More information is required. Gas undertakings are not particularly partial to paying more than twice the amount that they are doing at present for the conveyance of raw material for the production of a given quantity of gas, nor for labour in dealing with that raw material, nor do they want to increase their capital expenditure and their wear and tear for coal and coke handling and carbonizing plant per 1000 cubic feet, nor do they desire to employ (as it appears to us) about forty men for working on the carbonizing plant alone for producing per day a million cubic feet of gas, nor do they want to do much else that the British Coalite Company would wish them to do, and which they will not do, or even entertain, until a much better case has been presented than the one that is so far before us. Altogether, we understand better now what the late Chairman of the British Coalite Company (Mr. Albert G. Kitching) meant when he said in December last that “he and his colleagues had learned so much since the contract was made with the Plymouth Company that they ‘had no intention of offering any other gas company similar ‘terms.’”

The uneasy shareholders of the British Coalite Company will unquestionably be pleased to learn that 75 tons of coalite are being produced daily at Plymouth, and up to the present are being disposed of. At what price? They would also be delighted to hear the actual profit per ton of coalite, after deducting all capital, raw material, manufacturing, and wear and tear expenses, and adding to coalite the revenue from gas, tar, and sulphate. If the shareholders are allowed to have these figures, it will supply the basis for a further comparison of the commercial results of (on a limited and precarious scale) low-temperature carbonization with those of (on a large and well-established scale) high-temperature carbonization. It must not be forgotten that the process is a wasteful one for gas production; and that much depends on the price of the coalite. The price of the coalite must not be put at any fancy figure, or at a figure that a comparatively few smoke-prevention zealots would be prepared to pay, in calculating prospects, but at one which will command a sale in competition with other fuels. There is ample evidence in the trading world that, no matter what the superior virtues of an article may be, if the price is higher than that of a competitor the fact puts a limit to the sale.

The Calorific Power Test.

THE writer of last week’s “JOURNAL” article on “Testings ‘for Calorific Power,’” which was the subject of comment in the editorial columns, has returned to the defence of his points this week. But if he did not so persistently look upon the standard of 125 calories net as an unqualified fixture, and relegate the conditions attaching to that standard to the position of an almost negligible quantity, there would not be much difference, if any, between us. There is absolute agreement with him that a standard of 125 calories net, standing by itself, for a 14-candle mixed gas would be too high; but, as pointed out last week, the history of the negotiations between the Gaslight and Coke Company and the London County Council shows that the conditions are inseparable from the standard, and must be read as an integral part of it. The 125 calories net without the conditions would, it has been made abundantly clear by the Company, have been discarded by them as impossible. Regarding the agreed standard as a precedent, the conditions must be taken as an essential part. We cannot, of course, answer for the future views of the London County Council; but they cannot by any twist of the imagination construe the terms of their agreement as representing a “stringent standard” of 125 calories net. Speaking offhand, but keeping in view the value of the lower limits in times of stress (just when ample latitude is a consideration), we prefer the margin offered by the present standard between 125 calories and $112\frac{1}{2}$ calories, with a permissible further lapse bordering on 6 calories on one day, providing the average of three days is not below the

limit of 112½, than the narrow margin suggested by our correspondent—that is, between a standard of 120 calories and 115 calories as the forfeiture point.

The writer of the article says that, "if the standard of 125 calories is *merely one to be maintained as an average*, and is not "fixed with the same intention as the illuminating power standards have been in the past (to be exceeded on all but "exceptional occasions), then there would be little cause for "apprehension." The terms indicate that the standard of 125 calories is not "merely one to be maintained as an average." It is a point to work to. The "average" is to be reckoned at 10 per cent. below that, with a time limitation of three days over which the figures to be averaged may extend. Respecting the latter part of the quoted lines, there is not the same danger of the calorific power depreciating between works and testing-stations and consumers that there is in the case of illuminating power; and therefore the same protective excess that there has perforce to be in illuminating power will not require the same representation in calorific power. As to the remark of the writer of the article that "an instrument such as a calorimeter may be faulty for a "considerable time before the fact, and the nature of the "fault, is discovered," there are so many instruments in use in the London testing-stations, and tests are made at each station day by day, that any serious variation in the returns of an instrument on any day, or succession of days, must strike an examiner as irregular, and induce an inquiry on his part as to whether the instrument is in fault. The official tests over the past two years and more do not show the variation in returns that suggest any "considerable time" passing before a fault in the apparatus is discovered.

On the whole, the official tests commend themselves as creditable both to the Gas Companies and to the instruments. At the same time, we do not hold the instruments up as either infallible or beyond improvement. It has, in fact, been acknowledged in the "JOURNAL" (Dec. 29, p. 888) that the Boys calorimeter was designed for the testing of gas of very limited range in calorific value, and that it is a pity its scope should be restricted by its present hard-and-fast proportions and construction. In view of this feature of its design, makers of water gas may not find it of that general service they desire for works' purposes. Scope for error, however, is also to be found in the user of this or any other calorimeter, and in his calculations of the net value from the gross.

Reformation of the Street Lamp.

Is the best use being made of the opportunities of the day in the matter of the improvement of the appearance of the means by which lighting by gas is performed? Inspection of the standards and lanterns used in several towns induces an opinion on the negative side; and it is feared that, unless there is an alteration, this will as time passes prove exceedingly detrimental to the interests of gas lighting, and be used as a fair reproach when creating disfavour towards gas and favour towards electricity. Having regard only to the aspect of the question of public lighting to which particular consideration is now being given, and not to the fact that possession stands for much (though not for so much through municipal ownership of electricity undertakings as it would otherwise do), the age of street lighting by gas is somewhat to the disadvantage of the illuminant, in that there are on the hands of gas undertakings or the lighting authorities classes of lamp-posts and lanterns whose style and suitability to purpose bear the impress of antiquity—the period of design being one when the amenities of the streets were but vaguely considered, when a rigid plainness and sameness of lamp structure ran through the country, and when efficiency and effect of the structure for the destined purpose were not thought out with critical care. The old lamp columns and lanterns, save in some places in the main thoroughfares, are being perpetuated now by patching adaptation, though the time is favourable for beginning to make a sensible change.

When these old lamps were being converted from flat-flame to upright incandescent burners, there was less room for warning than there is now; but the conversions of those times accentuated the ugliness of the old quadrilateral lantern, and the objections to its four ribs and the frame of the square bottom, which when the lamp was alight threw heavy diagonal shadows across the roadway, from a dense square of shadow at the foot of the standard. These shadows were intensified by the introduction of incandescent gas mantles; the greater the candle power, the greater the depth of shadow.

The only good thing to be said about the shadows is that they have had with incandescent burners more stability than they had with the flickering open flames of the batwing era. At the time of the change from the low efficiency to the higher efficiency lighting of the incandescent mantle, Sir George Livesey grasped, and thankfully, the opportunity for doing away with the quakerish and ineffectual public lamps of the flat-flame régime. Sir George has been charged with being in his works a despiser of the ornamental, and with being obdurate in drawing the line in expenditure at the point where utility ends. In his works, in his person, and by his words, he declared in his day what most people believed of him. But this was the one thing in which his soul was not precisely represented by his acts and words. No man ever revelled in Nature's beauty, and no man admired and had an eye for the picturesque, more than he. When, as we say, there was change from the old system of lighting to the new in South London, Sir George consulted professors in the art of lamp column and lantern design, and he even put artists on the job. All with no effect—the former he declared to be limited in their conception by custom and tradition, and the latter to be all for the ornate and with no idea of utility and practicability. So Sir George set to, and himself designed the "Eddystone" lamp column, of graceful curve, but destitute of the nooks and crevices that give harbourage in many other designs to dust and rain. He also designed a lantern that avoided certain of the defects of the old four-sided one with its amplitude of light-disturbing framework. The new lantern being trilateral in form, with slightly curved panes, the shadows of two of the three ribs followed the line of the gutter at the side of the road, and so were almost unnoticeable. What Sir George did in this matter formed the most extensive departure at the time from ancient types of column and lantern, in any area of the country.

In the application of the inverted gas-burner to street lighting, a good opportunity is again before the gas industry. But we are sorry to see that the propensity persists in many places for adapting the ancient types of lantern to the new burners, to save expense and, as incidental to parsimony and patching, perpetuate the reputation for ugliness. Remember the utility of the street-lamp is for the night; its appearance for the day. The streets have greater use made of them during the hours of daylight than during the hours of darkness, and for a much greater number of hours. During those hours of daylight day by day, upon the eyes of the multitudes traversing the streets the appearance of the gas standards and lanterns falls, and in the majority of cases that appearance is not impressive. Even when fitted with an inverted gas-burner, the combination of the ancient and the modern is not striking—in some cases, to look upon, it is positively hideous. The gas industry has to do its part in altering this state of things. The trend of the times is to town betterment. The standard in this respect has been very materially raised. The architectural features of our cities and towns have largely changed. The process is continuing; and local authorities are constantly scheming some fresh improvement. The public lamp is a feature of street equipment; and it must not be behind. It must be a thing not of reproach to gas, and not a standing suggestion of an obsolete system of illumination. The street lamp in its outward form has not advanced with the advance in efficiency of the system of gas lighting. But the inverted gas burner comes to our assistance in this matter of adding to the picturesqueness of the streets. With a gracefully curved swan-neck attached to the tops of the old footpath standards, or a harp-shaped extension of refuge standards, and an inverted burner lamp suspended from the adaptor, it is wonderful the change effected in the appearance of the columns and of the street. The impression of stuntedness and old-fashioned types is thus readily removed.

We quite appreciate that this means expenditure; we appreciate, on the other hand, that in these times the gas industry is largely fighting lighting authorities who are closely allied to the electrical competitor; and we further appreciate that the public must be pleased, and not be allowed to become influenced by the notion that in the matter of appearance—æsthetic or artistic, or whatever other descriptive term may be considered apposite—the gas-lamp is unfitted to stand in the same street as the electric lamp. Apart from the questions of efficiency and cost, the pendant arc lamp from the curved top of a standard takes us completely from the past in street illumination. In a measure, notwithstanding the cumbrous nature of most arc lamp columns, and the heavy

appearance of the arc lamps themselves, the change from the ubiquitous straight-lined lantern and standard of the past pleases the eye. The same—and we may claim more—effect can be got out of the gas-lamp column, by adaptation, and the use of suspended inverted gas-lamps, which are not so heavy looking nor so long as the electric arc lamp. This is a matter that requires serious attention. Something has been done, but not enough. A good impression is made by activity; a bad impression by negligence. It is not a question to-day of letting matters go as they will, but of making good use of opportunity, and, as far as possible, of "Taking Time by the Forelock." Standard and lamp manufacturers might surely do a good business by making a speciality of "adaptors" for old-fashioned street lamp columns, to fit them for use with inverted gas-lamps.

There is one other point. It has been noticed in certain towns that, where the trolley-wire system of tramway traction has been installed, inverted and upright incandescent gas-lamps have been fixed on the trolley standards. The wisdom of this, in one respect, is open to some little doubt. The huge standards when set up near gas-lamps throw dense shadows, and thus completely spoil the uniform effect of the lighting. The heavy standards also add very substantially to the number of obstructions on the pathway. What cannot be helped must be endured. There is no question that, for light-diffusion purposes, with the trolley-wire standards in position, they are better supports for the gas-lamps than independent columns. But (this is the one point of doubt) there is, unless the lamps are fitted with an exceedingly good anti-vibrator device, a large destruction of mantles—inverted and vertical the same—owing to the vibration to which they are exposed throughout the car-running hours. This is the one drawback. Some constructions of lamps are not so bad as others; and, of course, situation also causes variation in results. The experience is not peculiar to incandescent gas lighting. Metallic filament lamps, especially when the filaments are cold, find the trolley-wire standard anything but a position of comfort and safety. It is, however, a subject upon which, if anyone has found any particular methods of fixing and use more favourable than others for gas-lamps supported by the tramway standards, it would be serviceable to have the particulars published in our columns.

Cooking by Gas and Electricity.

In view of the claims put forward on behalf of electricity for cooking purposes, the attention of our readers may be called to the letter from Mr. Cyril G. Davis, the Managing-Director of the Davis Gas-Stove Company, Limited, which appears in our "Correspondence" column, giving the results of tests carried out in the Company's laboratories with an electrical cooker and two kinds of gas-stoves. It will be seen that even the least economical of the latter appliances was better than the one operated by electricity.

Empties and Gas and Electricity Supply.

It has been a matter of observation in recent years that there has been a tendency to increase in the amount of unlet property in the areas of the London Gas Companies. The Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) referred, at the last meeting, to the number of vacant shops and residences in the Company's district, and mentioned that they have 18,000 supplies on which capital has been spent in the provision of them, but which are now idle, owing to the users having departed elsewhere. Again at the Commercial Gas Company's meeting, the Chairman (Mr. W. G. Bradshaw) stated that they have no fewer than 7000 unoccupied houses in their district, and 7300 supplies which are not being used at the present time. The figures, of course, are large owing to the extent of the districts. But there is satisfaction in knowing that each year brings its addition to the number of consumers. The causes for the increase of the empties are ascribed to the migration of householders further afield owing to improved travelling facilities, to the development of new estates, and changes from old-fashioned property to that of more modern style. The local rates also suffer through this increase in unoccupied premises. In Paddington, for example—in the Gaslight and Coke Company's area—the loss to the borough revenue last year consequent on untenanted premises was equal to a rate of no less than 5½d. in the pound. What is true of the London Gas Companies is also true of

the electricity supply undertakings, as was instanced by Colonel R. E. Crompton, at the meeting of the Kensington and Knightsbridge Electric Lighting Company. In the comparatively small district of this Company alone, he said they have upwards of 500 houses empty, which are wired for the electric light, and which have contributed to the Company's income in times past. This suggests that those municipalities owning electric lighting undertakings that have spent money on wiring houses must have a fair proportion of their capital lying idle, and must have some difficulty in arranging their accounts so as to show that the income from fitting-up the houses balances the outgoings associated with it. Another serious point for electricity suppliers mentioned by Colonel Crompton is the growing favour of private electric lighting plants among large users. Harrod's Stores have installed a private generating plant for the supply of their extensive establishment, and so has His Majesty's Office of Works for the supply of some of the museums.

Free Gas for Public Lighting.

In connection with the Oldham Corporation Bill, the authorities in the out-districts are likely to raise the question of the propriety of the Corporation taking the gas required for the public lighting without payment from the gas undertaking. Under an existing Act of Parliament, the Corporation are limited as to the amount of profit they may appropriate from the concern in aid of the rates; but it seems to us they violate the enactment by not paying for the gas used in the public lamps. To the value of that gas, the rates benefit. The gas is not made and distributed for nothing; and the money expended in doing this comes out of the gas consumers' pockets. What the Corporation are doing is equivalent to taking their fixed amount of profits in aid of the rates, *plus* (also in aid of the rates) the cost of producing and distributing the gas for public purposes. There are some folks who seem to think the Corporation are justified in their action; but we are of the contrary opinion. It represents unequal taxation; and we hope the out-townships will strongly contest the point in the Parliamentary Committee-rooms. There are some remarks on the subject in the "Town and District Notes" appearing in the "Oldham Chronicle" which seem to be argumentatively a bit unsteady. After saying that the Mayor is of opinion that the whole cost of public lighting might be met out of the funds of the Gas Department, our contemporary says: "No doubt it would be a pleasant thing for the ratepayers to be relieved of the direct payment [the expenses other than the cost of the gas used] for the lighting of the town, and to get something more from the out-districts; but we believe *the present system to be the equitable one.*" After saying this, however, the "Chronicle" proceeds: "All the people benefit by the good lighting of the town, and *for it they should pay.*" Rating them, though there are various anomalies in the system, is the best way of proportionately sharing the cost of municipal undertakings." Then let all the ratepayers pay proportionately for gas used for public purposes, and not put the charge only on to the gas consumers inside and outside the administrative boundary of the Corporation.

The Price of Coalite.

A well-known firm of coal dealers have sent a circular to those who, within their knowledge, have taken an interest in "coalite" as a fuel. These privileged individuals are offered supplies of the precious substance in this way, as (though regular quantities can be sold in certain districts) "the supply is still too limited to allow of the fuel being advertised in the usual way." The price asked is 1s. 6d. per sack; but 20 sacks are required to weigh approximately a ton. Therefore, the cost of coalite is about equal to 30s. per ton in these times of lower priced coal. Coalite, however, is swollen out in such a manner (thus symbolizing the ideas of the Coalite Syndicate and the British Coalite Company, as well as the advertisement statements of the former) that a ton occupies the same space as 2 tons of coal. The point has an important bearing upon the question of domestic fuel storage, as a cellar which will store 1 ton of coal will only accommodate ½ ton of coalite. Another important point which the privileged ones learn from the circular is that the cellar in which the fuel is shot (or at least that part set aside for the storage of coalite) should be free from coal, coal-dust, or coke. From this, it is assumed that it is essential there should be no adulteration of the coalite. Assurance is also

given in the circular that 15 sacks of coalite will last about as long as 1 ton of coal, so that "the price compares favourably with that ruling for the better class house coals." Most householders will require something more than the unsupported assertion of a typewritten circular to induce belief in all the statements. It is noticed that the circular is headed April, 1909; but the date is omitted. Should it have been the 1st?

No Special Gas Display at Shepherd's Bush.

Some time since, it was decided there should be no special appeal for funds for a Gas Section at Shepherd's Bush Exhibition this year; but there was a suggestion that, if it was thought desirable to do anything at all, the London and Suburban Gas Companies should take upon themselves the entire responsibility. It has now been definitely determined not to have any special demonstration at the exhibition this year; but the Companies concerned will content themselves with pursuing their ordinary advertising and educational propaganda in their districts. The proposition that was introduced to the electrical industry some time since, that a special effort should be made by them, has also dropped out of sight. Apparently the London electricity suppliers and the electrical manufacturers are not impressed with the suitability of a popular exhibition of the kind (to which the majority of visitors go solely on pleasure intent) for making an annual display. There is another point. The exhibition authorities did not last year encourage anything of the kind being repeated. There was a disposition on their part to grab every possible penny from the exhibitors, and not to lose an opportunity or neglect an excuse for doing so—no matter how much the latter did in hiring space and organizing an attractive show. It is probable the Gaslight and Coke Company will be exhibiting in the chemical section.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.			£	s.	d.
April	5	Previously acknowledged	90	19	15
"	8	John Niven, Clayton	0	10	6
"		J. Wilson, Huelva, Spain	0	10	6
"	13	Bromley and Crays Gas Company	21	0	0
"		Alexander Dickson	5	5	0
"		Heywood Corporation Gas Committee	3	3	0
"		Newport (Mon.) Gas Company	21	0	0
"		North British Association of Gas Managers	31	10	0
"		Walter Whatmough, Heywood	0	10	6
"	15	Hereford Corporation Gas Committee	5	5	0
"		John Witten, Gorleston-on-Sea	1	1	0
"	16	Leighton Buzzard Gas Company.	2	2	0
"	17	Burton-on-Trent Corporation Gas and Electricity Committee	5	5	0
"	19	James Lees, Tonbridge	3	3	0
Total			£91	20	1

Scottish Junior Gas Association.—The general meeting of the Scottish Junior Gas Association (Western District) will be held in Glasgow next Saturday evening. The business will comprise the election of office-bearers and a lecture by Mr. H. O'Connor, F.R.S.E., on "Suction Gas."

The Weights and Measures Acts.—A report by the Board of Trade on their proceedings and business under the Weights and Measures Acts during last year has been issued. It is stated that the regulations made in 1907 appear to be working satisfactorily, and certain practical difficulties which in the first instance were raised by some manufacturers of weighing and measuring appliances are now being overcome. During the year, there was a re-verification of model gasholders under the Sale of Gas Act which were deposited with the Chief Magistrates of Edinburgh and Dublin in 1860; and in appendices are given lists of standard gas apparatus verified at the Standards Office for local authorities and others, and an abstract of returns recently furnished to the Department of the number of gas-meters annually tested by inspectors. The official fees received at the Standards Office on account of testing work and the examination of candidates under section 8 of the Act of 1904, amounted to £592 4s. 6d.—an increase of £282 12s. 6d. on the amount taken during 1907. The annual reports received from inspectors show that 3,204,584 weights, 2,284,133 measures, and 614,985 weighing instruments were examined; 4,072,058 weights, 7,564,032 measures, and 375,412 weighing instruments were stamped; and a sum of £38,867 14s. 4d. was received in fees for stamping.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 174.)

It is the unexpected that always happens. Who could have foreseen that the bright close of the Stock Exchange for the Easter holiday would so soon suffer a reverse? Money was cheap as the proverbial drug; and the horrible Eastern bogey really seemed to have been finally laid. So, when the markets reopened on Tuesday, there was a great show of cheerfulness, and the tendency was quite promising. But business remained small; and soon an uneasy feeling crept in that perhaps the upward move had been a little overdone. The best prices of the day were not maintained, though Consols finished $\frac{1}{8}$ up. Next day came the news of the fresh troubles in Constantinople, and markets became very sensitive, though calm views prevailed before the close. Prices generally were lower—Consols falling $\frac{1}{16}$. On Thursday, the opening indicated steadiness; but business fell very quiet, and weakness supervened later on. Markets were uneven; but Consols were again a loser. Friday was quite a weak day, and realizations were on a free scale. Consols dropped another $\frac{1}{8}$; most of the gilt-edged quality were down; and the Foreign Market showed weakness in Eastern European lines. Things continued thus on Saturday; and everything fell in sympathy with everything else. Railways were much depressed; the Foreign Market was flat; and Consols touched $84\frac{3}{4}$ —a good $1\frac{1}{2}$ below Tuesday's best. It was account week; and one small failure was announced on Wednesday. In the Money Market, the supply was abundant, and rates were easy. Discount was fairly firm. Business in the Gas Market was naturally moderate only—not getting all at once into full swing after the interval. But the ruling tendency was just as good as it has now for some time past been, and a number of issues improved on their last quotations; while none showed any counter-movement. In Gaslight and Coke, there was a fair amount of business done in the ordinary at prices ranging from $102\frac{3}{4}$ special to $103\frac{3}{4}$ —a rise of $\frac{1}{2}$. In the secured issues, the maximum realized from $88\frac{1}{4}$ to 89; the preference 105 and 106 (a rise of 1); and the debenture 86. South Metropolitan was firm and extremely quiet. Transactions were marked at from $122\frac{1}{2}$ to $123\frac{1}{2}$. The debenture fetched 86. In Commercial, the $\frac{1}{2}$ per cent. changed hands at 106 (a rise of $\frac{1}{2}$); and the $\frac{3}{4}$ per cent. at 102 free and $102\frac{1}{2}$. In the Suburban and Provincial group, Alliance and Dublin old made 18 *cum div.* and $17\frac{5}{8}$ *ex div.*, Brentford new 188 and 189 (a rise of 1), Brighton ordinary 154, British $41\frac{1}{16}$ *ex div.*, South Suburban 121, ditto debenture $125\frac{1}{2}$, West Ham 119 to $120\frac{1}{2}$, and ditto preference $125\frac{1}{2}$ free. The Continental companies were very little dealt in. Imperial realized from $183\frac{1}{2}$ to $184\frac{3}{4}$ (a rise of 1), and European fully-paid 24 and $24\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres was done at $131\frac{1}{8}$ and $131\frac{3}{16}$, Primitiva at $61\frac{5}{16}$ to $6\frac{1}{2}$, ditto preference at $5\frac{1}{8}$, River Plate at from 14 to $14\frac{1}{4}$, and San Paulo debenture at $50\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Certain Problems affecting Cost and Reliability—The Search for Solutions—Linking-up the Partial Remedy for Collapses—A Duplicate Generating Plant also Suggested—Plans for Cheapening: Overhead Wires for Distribution; the Stannos and Kuhlos Systems for Interiors.

THE professionals of the electrical industry are doing their utmost to find solutions of the several problems that besiege them in relation to the domestic use of electricity. They have to render installations cheaper; lower the cost of the necessities to utilization; increase the efficiency of the articles offered to the public; find a way of pegging along without materially increasing the price of current as the consumers providing the backbone of the business reduce their consumption, and therefore curtail their payments; as well as do something to ensure continuity of supply, and so avoid those disagreeable breakdowns which disturb the even tenor of the ways of the business man, upset the home arrangements, prevent the holding of, or shorten, evening performances at places of entertainment, and at times put churches into darkness before the collection has been made. This is a pretty heavy list of difficulties, and still it is not exhaustive. But with these difficulties supplementing his daily duties at the station, and his endeavours at annexing new business connections, and at remedying the complaints of existing consumers, the central station engineer need not complain that he has not enough and to spare to occupy his time and his mind.

There is no intention of calling particular attention to all these difficulties. There are, however, two or three of them which have not been referred to lately in the "Memoranda," but which have had renewed attention paid them in the electrical world. There is the question of relieving the consumer from the annoyance, business loss, and "intellectual and moral damage" sustained by the collapse of the electrical energy. This is a serious matter for electricity distributors, and it gives to electricity an advertisement that it could well do without. The experience of consumers has led many to adopt secondary means of lighting, and to advise friends and neighbours contemplating the use of electricity not to follow their own foolish example by abandoning completely the old and reliable illuminant. It is, too, a testimonial

to the unreliability of electricity that the London County Council insist upon duplicate supplies taken from separate generating stations, for theatres, music halls, and places of entertainment; and in the useful little brochure "Hints on Fire Protection" prepared by Captain J. de Courcy Hamilton, the Chief Officer of the London Fire Brigade, he says that, "in public buildings and large establishments, current should be obtained from two separate sources, or there should be available a good secondary means of lighting, such as gas or lamps." In the public interest and protection, there is not the least objection on our part to gas taking secondary place where electricity is employed, seeing that gas occupies the primary place in the majority of dwellings and other premises; and, in most places where electricity is being used for lighting, gas has considerable employment for other purposes. But, of course, electricians do not like the damaging certificate that a secondary lighting service by some other illuminant gives to electricity. That is quite natural; and therefore they have been looking round to see what can be done from their own resource to remove the stigma. The intercommunication or linking-up scheme of the London Electric Supply Companies, as ratified by Parliament last year, has been feverishly jumped at by several electricity undertakings as affording them, perhaps not immunity from any prolonged cessation of supply, but something by which to claim the increased confidence of the public. Linking-up is not sufficient to ensure an absolute continuity of supply. However well-equipped a station may be, it would hardly be likely to be of such dimensions, and have so much stand-by plant, that it could maintain its own load and take up that of a neighbouring station as well. Furthermore, one station (unlike a gas-works with large quantities of gas in store) could not on sudden demand immediately relieve the necessities of a neighbour.

Among others, we see that the Engineer of the Beckenham Electricity Department is conferring with his fellow officer of the South Metropolitan Electric Light and Power Company on the subject of linking-up the two undertakings for mutual protection in case of breakdown; and the Board of Trade have been asked by the parties to state whether linking-up is permitted in the present state of the law. The proposition is the more interesting as it is remembered that for some weeks the larger station of the South Metropolitan Electric Supply Company was, about Christmas, 1906, put out of action by a boiler explosion, the greater part of the district was without a supply of electricity, and several consumers returned with all speed to gas, which had never treated them in this manner. Since then there have been some occasional disturbances of supply in the Company's area, but not with such far-reaching consequences. Had the intercommunication scheme been in existence during those few weeks that the South Metropolitan Electricity Company would like to blot out of their history, what amount of assistance could the Beckenham electricity station have rendered to relieve the situation in the extensive area of the Company to whom the fates had been so uncharitable? The Local Government Board are also taking notice of these failures of electricity supply; and, at a recent inquiry into an application for a loan of £12,520 for extensions at the Keighley electricity station, the Inspector (Mr. H. Ross Hooper) urged the desirability of providing against a possible breakdown by having a duplicate alternating generator, and of increasing the sum to be spent on mains. His suggestion was that the amount asked for should be enlarged by £10,000. Of course, the argument against this is that stand-by plant largely increases the capital charges without, though protective, being productive, and that this would be an additional source of outgoing that would necessarily make itself felt in the tariff to consumers. But in any public service upon which so much depends, such as artificial illumination, assurance of constancy should be made at almost any cost.

Turning from this matter to the question of cheapening the supply of electricity by lightening the external charges for distribution and the internal ones for installation, there has been a revival of the advocacy of overhead distribution wires, and several proposals for cheapening the wiring of consumers' houses. There are not a great number of electrical engineers who are favourable to aerial wiring for distributing electricity for lighting; and really there is no sufficient public necessity to be served, nor a sufficient public demand to be met, to grant to electricity distributors the right to cause the streets to be more hideous than they are in many places being made at present by the trolley system of tram traction, supplemented by, in main streets, the huge standards for arc lamp lighting. We have commented on this matter in the past in relation to the whilom argument in which electricians were wont to delight, as to electric arc lamps minimizing the hindrances to traffic in the streets by reducing the number of gas-lamp columns. Who are the bigger sinners now—electricians or gas men—with the trolley wire system so extensively the vogue? Upon this comes the advocacy for overhead lighting wires for the sake of cheapness. There are a few (we have not heard of many) who are wroth with the Board of Trade for refusing to allow the running of wires overhead for the supply of electricity in Farnham. Harder things have been said of the Board of Trade over this matter than the occasion justifies; and so antique an epithet as "grandmotherly" has been hurled at that admirable representative of bureaucracy for damning the scheme by withholding consent. The "Electrical Review" cruelly slaps in the face this important, but "grandmotherly," department of our national government by reminding it that consent is given to

overhead wires for tramway, but is denied for lighting, purposes. The apparent inconsistency is made the subject of light ridicule by our contemporary. The inconsistency looked at through the public glasses is not so great as it appears to the electrical eye. The tramways are a public convenience—used by the rich and the poor alike; and a convenience that continues its usefulness during all the busy hours of the day. Overhead electric light wires would not have the same claim upon the public. Their use would be limited; they would continually disfigure the public thoroughfares merely for the service of the few; and, as a matter of fact, there is no comparison between the cost of laying underground an electric lighting wire, and the cost of executing the work necessary to electrical traction. If only that there must be a limit put to the use that our electrical friends make of space just above our heads, the Board of Trade should be supported in their decision in this respect. The next Traffic Commission will, if aviation is to be one of the future systems of locomotion, be called upon to extend their inquiry to the question of obstructive aerial wiring.

Then there is the internal wiring problem. It is ever with us. It is cheaper installation that is said to be essential. Just so. There have been several systems devised. But one after the other they have been found to have their own peculiar defects and requirements to make them secure and serviceable; and in the end there has not been found much (if any) saving upon their predecessors. But no matter what cheap form of wiring is introduced, there are other charges connected with installation from the street cable to the meter, with the provision of lamps, and with the attempt (if not successful) to compass security, which charges cause installation to be more expensive than simple gas piping and fittings. One idea of the cheaper wiring is to capture the "six-light man," which is another funny little way that the electricians have, through description, of making a man of small estate feel his littleness in relation to the electricity suppliers' existing patrons. They are always talking, too, of inferior class of installation being good enough for these people, and six poor illuminating lamps being as many as they want in their houses. If the patronage of these people is wanted, it is not the proper way to go to work to try to make them feel small, to treat them as inferior beings, and to apportion to them less illumination than to other classes of people. There is another aspect of the question, and that is as to how far—no matter the cheapness of the wiring portion of the installation—these six-light consumers would be a paying part of the business with the class of lamps proposed for them. Sometimes their consumption would not be enough for the meter to make note of; and, taking the average income from such installations—pooling the whole lot good, bad, and indifferent—there is very little chance of any remunerative branch of the business here. What did West Ham find last year in connection with the slot meter business that the Electricity Department tried to establish in artisans' dwellings and other small class houses? The cost of collection, repairs, and capital charges amounted in the financial year to £251, and the revenue to £362—leaving only £111 with which to pay generating and works' costs, distribution, and the other expenses associated with the supply up to the meter. It is not known whether the figures include loss on capital expenditure through removals and empties. From the figures, however, the probable success of the six-light man can be gauged. To lighten the capital charges for this class of consumer, surface wiring has been proposed; and the houses of such consumers are the worst possible in which unprotected wiring should be fixed. The fire insurance people were not enamoured of the notion, and responsible electrical engineers protested against wiring that has earned a bad reputation, and lends itself to indifferent work.

Eureka! The electrical papers are with one accord announcing fresh promising wiring systems somewhat similar in style; and they do so after the manner that the daily populars would announce the discovery of a rich new gold-field. So far is it believed that the right thing has come at last, that one contemporary refers to it as "A Solution of the Wiring Problem," and solemnly declares that there is little doubt the Stannos and Kuhlos systems of wiring, more particularly the former, will give "a very distinct impulse to electric lighting." Kuhlos wires are made, according to the description, by wrapping plain or tinned brass or copper sheet round ordinary rubber insulated conductors; and this wiring is supported by small clips nailed to the wall, and then bent round the wire. In the Stannos system the wires are also encased in tinned sheet copper. The copper is lapped twice round the wires; the second lapping being soldered thoroughly to the first. The details need not be stated here. The all-important point is—quite apart from reliability, safety, and sightliness—that wiring on the Stannos system can, so it is averred, be easily carried out at less than 10s. per point, including a carbon filament lamp. Nevertheless we doubt, when all costs are taken into consideration, the profitability of the six-lamp man for lighting only. Why, too, suggest putting into the six-light man's house the low efficiency carbon filament lamp? Is this to ensure registration of the current when only one lamp is used, or a larger consumption than would be obtained from these poor people if they used the metallic filament lamp? It would not be right to rob these people of the greatest amount of illumination they can get from a given consumption of electricity, simply because electricity meters prefer big consumptions to little ones, and electricity stations do not detect profit in the small lighting consumers; nor would it be right to do them out of lamps that have the reputation among electricians of such unprecedented longevity. Let us see. Is the

average life of metallic filaments yet above 2000 hours? Their life expands in print to such an extent that it is difficult to keep pace with all the records of assumption. But say the laboratory figure is now 2000 hours. The six-light man who wants the greatest illumination for his money would be profoundly interested when he discovered it was necessary to spend a sovereign or more—perhaps a week's wages—every year in renewing these lamps. He would probably debate with himself whether it would not be cheaper to quietly move than to pay for the renewals if he had an agreement of any duration with the electricity suppliers.

MUNICIPAL RIVALRY IN BUSINESS.

RIVALRY between different municipal undertakings in the same town produces strange results at times. That there should be rivalry where all are theoretically working in the common interest is remarkable, and is only to be accounted for by the fact that different committees and officials, in their anxiety to make a good showing for their own departments, are apt to lose sight of the fact that the same ratepayers will gain or lose by whatever happens. The interests of the ratepayers are, indeed, too frequently sacrificed to those of a department, especially if the undertaking which is to be bolstered-up is the municipal electricity works. There was a case in point at the last meeting of the Worcester City Council. A few years ago, at the suggestion of the Corporation Electricity Committee, electric pumping plant was installed at the water-works, and current was supplied to the Water Committee at 1½d. per unit for the operation of the plant. On taking stock last year, the Committee found that they were paying for pumping by electricity something like four times the cost at which it could be done by steam. The actual amount paid to the Electricity Committee was £922; while, according to the estimate of the City Surveyor, the work could be performed by steam for £205. With the prospect of making such a saving, the Water Committee, being prudent men, discontinued the use of the electric plant. Their economical intention, however, left the interests of the Electricity Committee out of account. What was to become of their business if it lost so large and profitable a customer? A quite pathetic appeal, tempered by some unkind reflections upon the City Surveyor for interfering in the matter, was made to the City Council to compel the Water Committee to use the electric pumps, whatever the cost might be. It was said that water power used for running part of the electricity plant was actually wasted; and that, instead of the £200 which is being spent on coal for steam-raising at the water-works being a real economy, it is absolute waste. The argument did not appeal so forcibly to members of the Water Committee as perhaps it ought to have done. What they were most concerned with was the getting of the pumping done cheaply; and the Chairman bluntly said that they were not going to let the Electricity Committee dictate to them as to how it should be done, or what they should pay for it. The cost of pumping by steam power is, it seems, ½d. per 1000 gallons, against 2½d. which it cost to do it by electricity at 1½d. per unit. A suggestion that the Water Committee might consider the idea of reverting to electric pumping if the current were supplied at ½d. a unit horrified the members of the Electricity Committee, who wanted to know what other users of electricity for power would say in face of such a demand from a municipal department. As the members of the Council were apparently not prepared to answer this question, or to decide which Committee should bear the burden of the electricity undertaking, they decided to refer the whole matter to a Special Committee, who, it is understood, will try to look at it from a purely business point of view.

"Transactions" of the Society of Engineers.—We have received the "Transactions" of this Society for the year 1908. The volume contains the Inaugural Address of the President, Mr. Joseph W. Wilson, who filled the position for the second time, the papers submitted during the session, with the discussions thereon, accounts of the vacation visits, notices of deceased members, the annual report and balance-sheet, and a list of the winners of the Society's premiums. The papers are fully illustrated. A useful feature of these volumes is the general index, which extends from 1857 to the close of last year. The volume has been produced under the editorship of the Secretary, Mr. A. S. E. Ackermann, B.Sc. (Engineering).

Gas-Engine Plant at Frodingham.—The current Engineering Supplement to "The Times" contains some particulars of the first installation in this country of Klein gas-engines for blowing furnaces. This engine is a double-acting two-cycle one of the Körting type; and 68 of them, none of less than 500 H.P., have been installed in other countries. The plant which has been started at Frodingham consists of four single-cylinder double-acting engines, each of 1050 H.P.; and it is stated that they are giving every satisfaction in service both in regard to economy and reliability. Tests show that their efficiency ranges from 75 to 77 per cent.; while one of the engines is stated to have run continuously for six weeks. The capacity of the plant is about 21,000 cubic feet of air per minute compressed up to 13 lbs. pressure. A Klein engine of 2000 H.P. has been designed for an iron-works abroad.

COALITE PLANT AT PLYMOUTH GAS-WORKS.

[FROM OUR OWN CORRESPONDENT.]

As the first coalite plant erected in the country in connection with a gas-works, the installation which the British Coalite Company have made at Plymouth is naturally an object of interest; and the members of the Cornish Gas Managers' Association, who were offered an opportunity of seeing it in operation on Thursday last, mustered in strong force for the occasion. Professor Vivian B. Lewes placed his services at the disposal of the visitors, and explained the process and what is claimed for it. Mr. Charles H. Parker, son of the inventor of coalite, under whose superintendence the plant has been erected, also acted as a guide. It was not the fault of either of these gentlemen if the visiting party went away without seeing all there was to be seen and hearing a good deal about the advantages (as entertained by those interested in the system) of low-temperature carbonization. The members of the Association present included: Mr. S. J. Ingram, of Truro; Mr. H. E. Riley, of St. Austell; Mr. W. Nicholls, of Penzance; Mr. F. Portass, of Newquay; Mr. R. Greenaway, of Bodmin; and Mr. H. H. Hoare, of Falmouth, who acts as Hon. Secretary of the Association. Mr. W. P. Tervet, the Engineer and Manager of the Devonport Gas-Works, Mr. Gardiner, the Chairman, and Mr. Walker, the Manager, of the Worthing Gas Company, and Mr. P. S. Hoyte, the Engineer and Manager of the Plymouth Gas Company, were also of the party.

GENERAL FEATURES.

One of the things which most impressed those who saw the plant for the first time was its small size and its compactness. Attention was drawn to the fact that it occupies far less space and bulks less hugely than an installation of 72 inclined retorts which stands close by, and is carbonizing rather less weight of coal per day. It is a striking comparison in its way; but it has obvious limitations, and is not applicable at any point beyond that of the weight of coal handled. Still, the coalite plant is unquestionably neat and compact. It consists of three batteries of stills (or retorts), two of which are in operation, while the third, which is intended as a stand-by, is approaching completion, and could probably be started in a week if necessary. An area of about 100 feet by 70 feet contains it all. Each of the batteries is 52 feet long by 13 feet wide. The height from the ground to the top is 16 feet; while a space of 15 feet between the units provides ample room for operating the valves and for other working purposes. At one end of the batteries are arranged the producers for making the producer gas with which the settings are heated; while at the other end are the conveyors for taking away the coalite as it is discharged from the stills. These stills are the central and cardinal feature of the whole process.

DEPARTURES FROM THE ORIGINAL.

As has been explained in the "JOURNAL," there has been considerable departure from the original plan for the manufacture of coalite. Difficulty seems to have been experienced with the original plant in producing fuel of consistent quality. In carbonizing coal in large masses at low temperature the tendency seems to have been to produce an article which was either coke or coal, but was not coalite. With the apparatus now in use, carbonization is carried to the exact point desired, and there is neither coke on the outside nor coal in the centre of the small charges which are now dealt with.

DESCRIPTION OF THE PLANT.

Each still consists of twelve tubes, cast together—32 of them set vertically constituting the battery. The tubes have a diameter of 4½ inches at the top and slightly expand to 5½ inches at the bottom; and the length is 9 feet. In the arrangement of the setting the supplies of producer gas and secondary air are so controlled as to maintain a constant temperature of about 800° Fahr. For working purposes, two of the stills are treated as one. The travelling hopper by which the coal is supplied is divided at the bottom so as to discharge its contents into two mouthpieces; while one handwheel on the outside of the battery opens simultaneously the discharging valves of the pair of stills. A novel feature of the setting is the arrangement of the hydraulic main. There are 16 dip-pipes, each of which is fitted with a cock, to be closed during the time occupied in charging. On the end of the foul main of each of the settings is a governor. From the foul main the gas passes to one of Messrs. Cutler and Sons' condensers. Two of Messrs. Holmes and Co.'s improved Pelouze and Audouin tar-extractors have been put up for removing the tar from the gas; and there is a meter—of Messrs. Willey and Co.'s make—with a capacity of a million cubic feet per day, for registering the quantity of gas made. The purifying and storage of the gas are undertaken by the Gas Company, to whose mains it passes after leaving the meter. The plant also includes a Bryan Donkin exhaustor, tar-pumps, tanks for separating the tar and liquor, and wells for their storage.

ELECTRICALLY DRIVEN ELEVATING AND CONVEYING PLANT.

The Coalite Company have also put down a couple of Bache engines and dynamos for generating current to drive the conveyors, elevators, exhaustor, and blowers. The engines, which were supplied by Messrs. Davey, Paxman, and Co., are of 75 H.P.; and one is sufficient for the work required—the other being kept

as a stand-by. The elevator and conveyor plant is on a rather large scale for so small a plant. This arises partly from the fact that the quantity of coal handled is large in comparison with the gas produced, and partly from the necessity of adapting the new plant to its surroundings. The coal is in the first place raised by an elevator to a hopper which runs the whole length of the three batteries, and has a capacity of 100 tons. From this store the travelling hoppers, which contain the measured quantity of 12 cwt. for the dual charge, receive their supplies. On leaving the still, the coalite drops on to conveyors (in connection with which there is provision for quenching it), and is carried to an elevator that raises it to the screens and hoppers ready for bagging. As sent out, the coalite is in clean, sizeable pieces. The breeze comes in useful for the producers.

LABOUR REQUIRED—CHARGING SIMPLE—IN DISCHARGING A TENDENCY TO STICK.

In working practice, the operation of charging the stills seemed simple enough, though there appeared to be more men about than the size of the setting warranted. Three men are needed for the work of each setting—one being occupied in attending to the discharging valves and other operations on the ground floor, while two open the mouthpieces, shut-off the dip-pipe, bring the hopper into position, fill the stills, and screw the mouthpiece down again. Men are also required to attend to the producers; and though it was said that three are sufficient for the working of each battery, more than this number appeared to be employed. The cost of the labour, as compared with other gas-making processes, would be worth considering. Possibly allowance should be made in the case of Plymouth for the fact that the plant has been only a short time in operation, and everyone is comparatively new to it. The discharging and charging operations are as nearly as possible automatic. With some classes of coal, it was stated, the coalite falls off itself immediately the valve at the bottom of the retort is opened; leaving the still ready for another charge. What the visitors actually saw on Thursday last was that the material had a tendency to stick to the tubes; so that bars had to be used to loosen the mass round the mouthpiece and cause it to drop.

WORKING RESULTS AND THE FUEL ACCOUNT.

The charge consists of 6 cwt. of coal per still, or 12 cwt. for each pair; and the time occupied in distillation is from 3½ to 4 hours. The products of distillation per ton of coal are roughly 5000 cubic feet of gas of from 18 to 20 candle power, 13 cwt. to 14 cwt. of coalite, 22 gallons of tar, and about 15 lbs. of sulphate of ammonia. Special value is claimed for the tar; and the Coalite Company are credited with the intention to become their own tar distillers. At present the tar is sold, and the sulphate is treated in the Gas Company's plant on the works. In the process great importance is attached to the maintenance of a uniform temperature. This, it is claimed, is easily arrived at by using producer gas and the arrangement of the setting; the brickwork being so constructed that the stills are not in direct contact with the heating gases.

One of the great economies pointed out for carbonization at low temperatures is the small quantity of fuel which is required. This plant is said to need for the producers only 5 or 6 per cent. of the weight of fuel carbonized, as against 23 per cent. for horizontal retorts in ordinary gas-making practice, 18 per cent. for inclined retorts, and 16 per cent. for vertical retorts. Professor Lewes accounts for this by saying that it is in carbonization as in the speed of a ship. Up to a certain point, you may drive your ship with a very modest consumption of coal; but immediately you get beyond this moderate speed, every knot which is added costs more in proportion to the others. Carbonization at high temperature for the extraction of every particle of gas the coal is capable of yielding is, he submits, in respect of fuel correspondingly expensive.

CONTENTION AS TO THE PROOF OF CLAIM.

Professor Lewes contends that this installation has demonstrated the truth of the claims which have been made for coalite. It is certainly interesting as a practical working of what had previously been conducted only in a more or less experimental fashion and without reference to the gas question. So far, the demand for coalite in the Plymouth district is said to have kept pace with the supply. The carbonizing capacity of each of the two batteries in operation is nominally 56 tons of coal per day, producing 35 tons of coalite and 280,000 cubic feet of gas. Rather better results than this are understood to have been achieved. The contract with the Gas Company is to provide a minimum of 500,000 cubic feet of gas daily. This is being done; and at the same time the Company are making and selling 75 tons of coalite daily.

Tarring Metal Pipes.—Two plans are in use for coating metallic pipes with a protecting surface of tar. In the one case the pipe is first heated and plunged into cold tar; and in the other the pipe, without preliminary heating, is slowly lowered into the hot tar. Under the former plan, the metal has been dilated by heat and contracts in the tar bath. On being withdrawn, the air bubbles can readily be brushed away; but the adhesion is not perfect. In the latter case, the metal slowly expands, and the tar adheres much more firmly. Moreover, if the pipes are heated before being tarred, there is a risk that they may become fissured. The fissures being filled with tar would not be visible after the removal from the bath.

TESTINGS FOR CALORIFIC POWER.

[COMMUNICATED.]

THE calorific power standard proposed by the London County Council and accepted by the Gaslight and Coke Company appears likely to awaken the interest which so noteworthy an innovation entirely merits. The writer, in his article on "Testings for Calorific Power" in the "JOURNAL" for April 13, puts forward a view which you state in your "Editorial" on the subject does not meet with general acceptance; and it is to this point that some attention may be usefully given.

The main point in the article was to the effect that the new standard of 125 calories (net) is too high. That this view is the right one is borne out by the fact that the Gaslight and Coke Company themselves and their own experienced advisers "objected to the standard fixed—viz., 125 calories per cubic foot—on the ground that such a value could not be obtained with any degree of certainty from 14-candle gas;" and, further, "they only accepted it on the understanding that it was not to be expected of them that the standard would be regularly maintained." This entirely endorses the views of the writer on this point. In the "Editorial" you state that you do not suppose it would be possible to propose any standard value that would please everybody concerned.

The writer would point out that, while agreeing with the Company concerned on this all-important matter, he went further, and expressed the opinion that a standard which, by their own showing, was too high should not have been accepted, entirely for the reason that their action would probably be taken as a precedent for other companies. There is, however, one matter in connection with the calorific power standard which would cause the most vigorous dissident of the standard to modify his expressions of discontent; and that is the nature of the standard imposed. Does the higher figure of 125 calories or the lower one of 112½ denote what is at present represented in the illuminating power standard by 14 or 16, as the case may be? If the higher figure, it will be as though a company were constantly supplying a quality of gas lower than their standard of 14 or 16 candles, but yet not so low as to reach 13½ or 15½ candles—the penalty limits that are now proposed.

This would be rightly considered the reverse of satisfactory with our present illuminating power standard. Will this consideration not apply to the new calorific power standard? If not, and if the fact that two or three tests a week are below 125 calories (net) will not be looked upon with disfavour by the London County Council, the position is at once modified and rendered easier of compliance, though not altogether satisfactorily, as a well-conducted gas company rightly takes a pride in allowing a fair margin above any fixed standard of quality. The penalty limit of 112½ is entirely satisfactory, and so, too, is the additional provision of a further limit of 6 calories below the figure of 112½. In fact, these wholly reasonable limits seem out of keeping with the stringent standard of 125 calories (net)—the standard proper. A standard of 120 calories and a penalty limit even slightly higher than that fixed—say, 115 calories—would have been at least complied with for weeks on end without any great trouble, which is more than can be said for the accepted standard of 125.

Those who maintain that a standard of 125 calories is a fair one must agree to one of two alternatives—either that the 14-candle mixed gas now supplied to the Metropolis is deficient in calorific power, or that it should be permissible to constantly—say, two or three times a week—supply a gas below the fixed standard of quality. Your "Editorial" and the Gaslight and Coke Company's own statements suggest the latter procedure as being justifiable. According to Mr. Broadberry, of the Tottenham and Edmonton Gas Company, who supply 14-candle mixed gas, this is found to vary between 123.7 and 126.2 calories (net), and doubtless between wider limits on occasions. These figures would appear to tally fairly closely with those of the Commercial Gas Company, though rather lower than the average of the latter's test. Mr. Broadberry, who has had experience of a calorific power standard, and who apparently welcomes the new test, evidently does not consider that the standard of 125 is one to be regularly maintained, if his own figures interpret him rightly.

As regards repairs to the Boys calorimeter, it would appear from the statement alluded to in your "Editorial" that the sole justification for disparaging the apparatus was the frequency with which it had been undergoing repairs during the current year. This fact was mentioned rather to illustrate the writer's own experience of the apparatus, and the experience of others, than to impute unreliability to the instrument on that score alone. It is true, however, that an instrument such as a calorimeter may be faulty for a considerable time before the fact, and the nature of the fault, is discovered. It may be that the writer's experience of the apparatus has been a particularly unfortunate one; and he trusts that this is so.

In conclusion, the writer would repeat that if the standard of 125 calories is merely one to be maintained as an average, and is not fixed with the same intention as the illuminating power standards have been in the past (to be exceeded on all but exceptional occasions), then there would assuredly be but little cause for apprehension.

PERSONAL.

Mr. WILLIAM CASH, who, as announced in the "JOURNAL" a fortnight ago, has resigned the secretaryship of the Bournemouth Gas and Water Company, has been appointed a Director, in place of the late Mr. S. L. Rymer.

The Directors of the Windsor Royal Gaslight Company have accepted, with regret, the resignation of their Chairman, Mr. J. L. HOLLIS. Mr. W. B. HOLDERNESSE has been unanimously elected to fill the vacancy; and in the same manner Mr. F. B. BUCKLAND has been appointed Vice-Chairman.

Mr. JAMES MILLER, of Blackburn, who has recently returned from Ceará, Brazil, where he held the position of Works Manager of the Gas Company, has been selected for the management of the Dolgelley Gas-Works—a position which was advertised in the "JOURNAL" for the 6th inst. Mr. Miller was Manager at Ceará for eleven years, and formerly held the position of Manager of the Thurso Gas-Works.

After 35 years' service with the South Suburban Gas Company, Mr. R. WYLLIE, one of the Workmen-Directors, has retired. He has been a member of the Board with Mr. W. G. Waller, as a representative of the employees, for some three years. In a contested election for the vacant place of honour, Mr. GEORGE ROSS, who is the foreman in the mechanical and fittings department of the works, has been elected by the employees by a good majority. A report of the proceedings at a presentation to Mr. Wyllie appears on p. 171.

At St. Mary's Church, Newport, Essex, last Wednesday, the marriage was solemnized of Mr. NORMAN SIMPSON COX, son of Mr. John H. Cox, the Manager and Secretary of the Sunderland Gas Company, with Miss MARGARET HEATON WATERHOUSE, younger daughter of Mr. W. Waterhouse, M.A., J.P., of Newport. Among the bridegroom's numerous presents were cheques from Mr. and Mrs. Charles Hawksley and the Directors of the Sunderland Gas Company, a presentation tea-tray from the Company's officials and foremen, and a silver tea service from Mr., Mrs., and Miss Jolliffe, of Ipswich. Those of the bride included a pearl necklace from the officials and foremen of the Sunderland Gas Company.

There were upwards of fifty applicants for the appointment of Assistant Works Manager for Australia advertised in the "JOURNAL" for the 9th ult.; and the position, which is with the North Shore (Sydney) Gas Company, has been obtained by Mr. EDGAR FOSTER, at present an assistant to Mr. J. Ferguson Bell at Derby. Mr. Foster, who is thirty years of age, was formerly a student at the Sheffield Technical Institute, and was afterwards apprenticed to Messrs. Newton, Chambers, and Co., Limited, of the Thorncliffe Iron-Works, where he obtained practical experience in the workshops and drawing office. On the completion of his term, he remained with them in the capacity of draughtsman; leaving, after eight years' service, to go to Derby. During the time (four years and a half) he has been with Mr. Bell, all the drawings for the extensive alterations which have lately been carried out at the Derby Gas-Works have passed through his hands. We congratulate him on his appointment, and wish him success in his new sphere at the Antipodes.

OBITUARY.

In the notice calling the meeting of the Imperial Continental Gas Association, for May 4, the proprietors are informed of the death, on the 27th ult., of Mr. M. S. PILCHER, who was for many years one of the Auditors.

The death occurred recently at Tamworth, at the age of 76, of Mr. WILLIAM ARNOLD, who was well known throughout the Midlands as a land surveyor and valuer, and was one of the oldest Magistrates of the borough. He was at one time Chairman of the Tamworth Gas Company.

Intimation is just to hand of the death, some weeks since, of Mr. MATTHEW MILDRED, of Bankside, S.E., who succeeded to the business formerly carried on by the late Mr. Alfred Williams, and was prominently connected with this gentleman in his office, of Hon. Secretary and Treasurer of the Society of Engineers—a position he held up to the time of his death in 1894. Mr. Mildred was elected a member of the Gas Institute in 1873.

A copy of the "Cincinnati Post" for the 26th ult., which came to hand a few days ago, records an instance of consideration of an old employee, to which it may not be out of place to briefly refer. About fifty-eight years ago, the concern which has developed into the Stacey Manufacturing Company was started in Cincinnati to undertake the supply and erection of gas plant. Two years later, an Englishman named John Taylor entered their service as a mechanic. He saw the firm grow from one employing only twenty men till it reached its present dimensions. He seems to have been a thoroughly conscientious workman, his rule of conduct having been to do what he would have expected of his employer if their places had been changed; and until he reached the age of 74 he wielded the sledge with the best of men. After fifty-six years of work, his faithful service was rewarded by a pension.

PARENT GAS COMPANIES IN THE UNITED STATES.

[COMMUNICATED.]

ANY comparative study of the conditions of gas supply in the United States and in Great Britain, at once reveals in the former country a continually increasing number of "parent" companies, each operating from two to thirty separate gas-works, while in the latter, as far as the writer is aware, there may be large stock holdings by the same individual in several companies, but there is no corporate control of groups of companies. Why this should be so is not apparent; but, presumably, the reason is to be found in British laws, rather than in temperament, as Ireland furnishes an example of several small works under common ownership—probably English capital, which, as every "JOURNAL" reader knows, controls through many parent corporations (some of considerable size) numerous groups of gas-works on the Continent. Yet in spite of this fact, British gas-works, as said before, stand singly.

In the United States, parent companies date approximately from the year 1880, about which time the United Gas Improvement Company was organized. In attempting to sell carburetted water-gas apparatus, it became possessed of gas properties, until gradually its chief interests lay in selling gas. Its capital stock, on which it earns about 12 per cent., and pays 8 per cent., is \$45,000,000; and this will be increased to \$50,000,000 in May. In addition, the value of its properties, represented by the bonds and stocks of the individual companies, far exceeds its own capitalization. It supplies gas (and in some instances electricity as well) to over 5 million people. It is the largest of our parent companies, of which there are more than twenty of varying capitalization—the smallest about the size of the Irish company. In general, these parent companies have been formed by a combination between a banking (or bond) house and a gas engineer or manager. The latter persuades the bankers that a certain gas-works is capable of earning more money than under present management. A company is formed which buys, or leases at a fixed dividend, the existing concern. The purchase price is usually recouped to the buyers by the sale of bonds, while any stock issued will be of value only if the prediction as to increased earnings are fulfilled. If this first experiment succeeds (and there have been few failures), another company is bought; and in this way a group is formed. As year by year various available companies are bought up, it generally happens now that geographical considerations can have little weight in the composition of any group, which, though of only a few companies, may represent properties separated by 2000 miles. This, of course, adds to the expense and difficulties of common management, and must be borne in mind when considering later on the attitude of the parent companies towards Gas Association meetings.

Much has been, and still could be, written on the subject of company promotion and capitalization on the basis of expected earnings, instead of investment. This matter is beyond the author's present scope; but it should be stated that, as far as the gas consumer is concerned, the advent of a parent company has usually resulted in a cheaper price and a more efficient service. Also, as yet the "innocent investor" in gas securities has received a proper return for his money. "As yet," for in some instances there will probably be a scaling-down of securities when over-capitalization has been great, and investigation following State Commission control discloses a wide discrepancy between investment and securities issued.

Why does the advent of a parent company usually result in cheaper gas and more efficient service? For the same reason, undoubtedly, that lowers wage-cost of output with each increase in the wages of skilled mechanics. In the employ of the parent company will be found men who are brighter and more energetic than those holding similar positions in the purely local companies. Then, to still further improve their employees, the parent companies have learned to utilize competition and association. The benefits of competition with his fellows is denied the average gas manager in America; for no working results are published, and it is almost impossible to know what economies are being attained by other men whose conditions are largely similar to one's own. The manager working for a parent company is told at least once a year, if not oftener, how his results compare with those obtained by his associates; and he sees promotion follow success, and dismissal due to failure. Pride and ambition are thus strongly enlisted in the struggle to excel; and each year new records are made.

Association—the meeting with other men engaged in the same lines of work, and the chance thus afforded of exchanging in formal meeting or informal chat, views and information on all points of mutual interest—is, of course, theoretically open to any man with membership in one or more Associations. The general rule, however, holds in this country that the smaller gas companies, when locally owned, are rather averse to paying the Association due and meeting the expenses of their employees. As America is a land of magnificent distances, and attendance at the American Gas Institute involves a journey of 1000 miles each way for many of the members, it is easily seen that if the company will not pay the bill, the trip is out of the question for just those men who, isolated as they are each in his own town, would be much benefited by contact with their fellows. The formation of State Gas Associations has been of great good in this

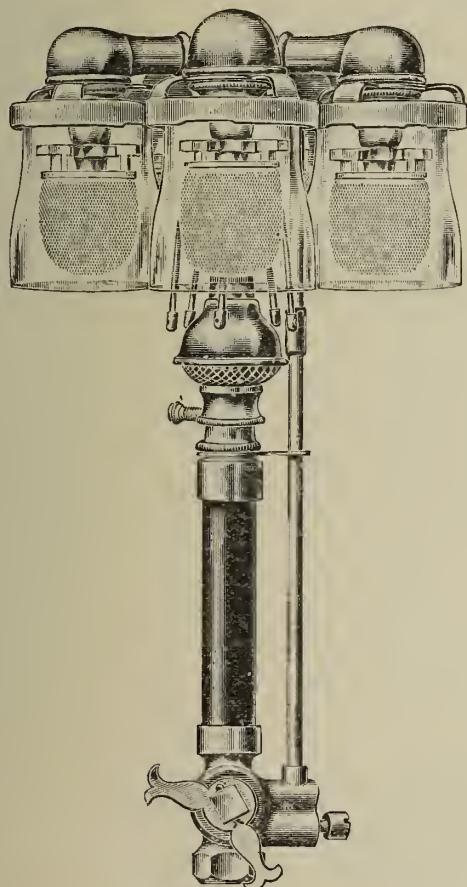
respect; as to these latter Associations, the men just mentioned are more generally able to go.

The parent companies believe so strongly in the value of association that besides paying the dues and meeting expenses of their responsible employees for at least one, and in some cases three Associations—viz., American Gas Institute, National Commercial Gas Association, and the local State Association—they also bring their employees to the home office once a year, and devote from two to six days in discussing every feature of the business from manufacturing, through distribution and accounting, to new business. In the benefit to be derived from the meeting room, there is no doubt that these parent company meetings are greatly superior to those of the ordinary Gas Association. Discussion is far more free and general; and the presiding officer does not have to call for speakers.

These meetings do much to produce an *esprit du corps*; and those in attendance can hardly fail to return to work with renewed enthusiasm. Along with the work, some form of entertainment is usually provided. This may vary from a theatre party, or a steamboat excursion, to the elaborate programme of the United Gas Improvement Company, which, after a meeting lasting for six days, sends a party of 200 men 60 miles to Atlantic City for a two-day outing—chartering a special train and monopolizing a big hotel. The horror of some local directors (not to mention municipal boards) at the thought of such expense as applied to their hard-working superintendent or secretary, may quite easily be imagined. But, as has been said before, the parent companies are achieving success; and while, of course, there are among us many broad-gauged local companies with talented and progressive employees, yet more and more the employees of the parent companies seem to be coming to the front in both individual and association work. It would be hard for us at the present time to think of the gas business in the States as existing without parent companies.

AN UPRIGHT INVERTED CLUSTER.

THE accompanying illustration shows a new upright inverted cluster burner which has been recently introduced by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. It will be seen that the burner embodies a special fitting, which carries glass cylinders; and the light is thereby intensified. It is also provided with a special flash bye-pass to each light, and a gas-regulator, ensuring



J. & W. B. Smith's New Upright Inverted Cluster Burner.

the correct mixing of air and gas and perfect combustion. The cluster can be supplied any height, and in two, three, four, five, or six light; and it is substantially made. The firm have supplied several of these clusters to gas companies for converting large street-lanterns of the ordinary upright incandescent type into inverteds; and they have given great satisfaction. The fitting should prove a very useful one for this purpose.

COMPANIES AND RATING.*

USEFUL law books have reached us dealing respectively with the subjects of companies and rating, both matters which largely enter into the conduct of gas, water, and other undertakings, and in which it is important that those engaged in the control of such concerns should endeavour to keep themselves well informed. Nowadays, there must be few who are not at some time or other brought into contact with the statutory enactments relating to limited liability companies, and in connection with which they desire to ascertain their responsibilities and duties, or who may not have to consider the position of their industrial affairs in regard to the important and burdensome matters of assessment and rating. Books, therefore, that impart information upon such questions are of great utility to the gas engineer and manager and others in the conduct of their companies and the guidance of their business.

On the 1st of this month, there came into operation the Companies' (Consolidation) Act, 1908. As its name implies, it is a codifying or consolidating Statute, which collects and embodies various previous enactments relating to companies. It is "an Act to consolidate the Companies Act, 1862, and the Acts amending it." It does not introduce any new law, but effects a much needed work of collection. There are 296 sections in the Act; and familiarity with these would have been much facilitated had there been in each case a reference to the old section of whatever Act which was replaced by the new consolidating Act. This drawback is remedied by such a publication as that under review, "The Companies (Consolidation) Act, 1908," by Mr. Frank Evans and Mr. Humphrey H. King, Barristers-at-Law; for Part III. of their handy compilation gives a comparative table showing what sections of the previous Acts correspond with those in the new Act. Part II.—to work backwards—of their book forms the bulk of it, and sets out, in good print, in full, the text of the Statute which now controls all company matters. Each section, where necessary, has short explanatory notes; and references to many cases are given. The Act is itself divided into ten parts, and the six schedules of it are also to be found in this small handbook.

The first thirty pages of it contain an admirable and concise survey of earlier enactments relating to company law. These pages form Part I.; and a glance at them may not be without interest. The learned authors seem to trace the modern company from the old Guild Merchant and Craft Guilds; but we are doubtful if any such ancient and honourable descent can be substantiated. However, we are not here concerned with that, and will at once pass to the Joint-Stock Companies Act of 1844, which was "An Act for the Registration, Incorporation, and Regulation of Joint-Stock Companies." This Act did not limit the liability of members, whose individual property might be attacked by a creditor of the company. In 1855 came the Limited Liability Act, which introduced the blessed word "Limited," and under which members were not liable for judgments against the company, save only failing the company's assets, and then but to the extent of their not-paid-up shares. In the following year (1856) came another Joint-Stock Companies Act, which repealed that of 1844, and originated the mysterious "seven" requisite to form a company. It also formulated the memorandum and articles of association, and contained many clauses exactly reproduced later in the Act of 1862. This latter enactment has remained the principal Act right away to the Consolidating Act of 1908. It classified companies into limited, unlimited, and guaranteed, and contained the details of their formation, registration, management, and liquidation. No power was given to reduce capital; but this was allowed by the succeeding Act of 1867, if such reduction was confirmed by order of the Court of Chancery.

Then followed the Companies Acts of 1877, 1879, and 1880, which made certain ameliorations, and gave slightly extended powers. A trio of important measures was produced in the year 1890. First, there was the Companies (Memorandum of Association) Act, which gave power to alter the objects of the company, subject to approval by the Court. Then there was the Companies (Winding-Up) Act, which enlarged the previous jurisdiction of such matters, and which created (for this purpose) "official receivers." Thirdly, there was the Directors' Liability Act, which provided that directors and others should be liable for loss due to untrue statements in a prospectus, unless they reasonably believed them, or such statements were by an engineer reasonably believed to be competent, or were contained in a public official document. This Act is reproduced in section 84 of the new 1908 Act. To continue the survey: The Companies Act, 1900, differentiated between private and public companies, imposing more stringent conditions on the latter than the former. A private company was afterwards defined by the Act of 1907 as one in which the rights to transfer shares were restricted; the members were limited to fifty; and no subscriptions were invited from the

* "The Companies (Consolidation) Act, 1908, with a General Survey of Earlier Enactments, Notes on the Act, and a Comparative Table of the Old and New Acts." By Frank Evans, of Lincoln's Inn, Barrister-at-Law, and Humphrey H. King, B.A., LL.B., of the Inner Temple, Barrister-at-Law. London: Butterworth and Co., and Shaw and Sons; 1909. [5s. net.]

"Konstam's Rating Appeals, 1904-1908. Vols. I and II. Reports of Rating Appeals heard before the London and Other Quarter Sessions, the King's Bench Division, the Court of Appeal, and the House of Lords, 1904-1908." By E. M. Konstam, of the Inner Temple, Barrister-at-Law, Joint Editor of Ryde and Konstam's Rating Appeals (1894-1904). London: Butterworth and Co., Law Publishers; 1909. [12s. 6d. net each.]

public. Finally, there was the Companies Act of 1908, which enabled companies incorporated abroad in British possessions to hold land in our country, as now provided by section 275 of the consolidating Act.

Without going into any more detail, enough has been said to show that the legal handbook under review contains interesting introductory information, and the important company codifying Act is to be found conveniently compiled in this small volume, which, together with its index, will prove of great use to those consulting it.

Of the two volumes of rating appeals, considerations of space will only allow of a brief notice. They are a continuation of the well-known series of reports associated with the name of Mr. Walter C. Ryde, the last of which appeared in 1904. Here will be found by those interested, all the reports relating to rating decisions, among which, needless to say, are some of the greatest importance to gas and water undertakings. Thus we find fifteen pages devoted to the case of the *South Metropolitan Gas Company v. Woolwich Union and Other Assessment Committees*, which occupied Mr. R. Wallace, K.C., and his colleagues for several days in February, March, and April, 1907. So, too, is given the appeal to the King's Bench Division in *Ipswich Gas Company v. Ipswich Union*, the gist of which decision is that in rating a gas company's undertaking upon a basis of the gross receipts, prepayment meters and fittings should be treated as being provided by the hypothetical tenant, and the capital representing them should be allowed for.

Of water cases, there is the *Metropolitan Water Board v. Assessment Committees of the City of London, Greenwich, and Woolwich Unions*, in which "the Court declined to calculate the rateable value of the whole undertaking at a percentage on the structural value," but first ascertained the rateable value upon a basis of gross receipts and then apportioned it among the parishes in proportion to the gross receipts earned in each parish.

There are several important railway rating decisions, such as that by the House of Lords, on Dec. 7 last, in *Great Central Railway Company v. Banbury Union*; and there is also the House of Lords' decision in *Kirby v. Hunslet Union*, on the question of considering the value of machinery on premises in arriving at their rateable value. We mention such cases as these—and there are many others—to show how important and far-reaching are the reports contained in these two volumes, which must be properly studied to be fully appreciated.

We suppose it would be the bulk which would prevent the two volumes being issued in one—though the 800 odd pages are numbered in sequence. The inconvenience of two volumes, however, is minimized by there being a duplicate index in each volume. For the same reason that this has been done, we think the list of "Cases Reported" might also have been inserted in the beginning of Vol. II. We notice, further, in some instances the decision of the higher Court does not follow immediately after that given in the lower Court. This leads to some confusion, as in the cases of *Green and Stead v. Newport Union*, and *Great Central Railway Company v. Banbury Union*. The House of Lords' report of the former is on p. 777, not on 177 as given on p. xiii. These are, however, but mere points of convenience and detail in volumes involving a great deal of learning and of labour.

A SURVEY OF MODERN ORGANIC CHEMISTRY.*

THE work before us forms a useful addition to the popular "Contemporary Science" series of text-books; and as a survey of the scope and methods of modern organic chemistry, for the use of those who have had no general training therein, it should prove very acceptable. It is in no sense a book of reference to chemical products, but (on the other hand) an attempt has been made to show the place occupied in the general scheme of classification of organic compounds by the more important technical substances which the organic chemist has utilized or has been instrumental in producing. The book will not be of much value to even the elementary student of organic chemistry; but it discloses in an attractive manner, for the benefit of others, something of the field of his studies.

Gas men who have not had occasion or opportunity to become students of this branch of chemistry may find a few hours pleasant "scientific recreation" in Dr. Keane's book. They will gain in the fourth chapter—dealing with the "Aliphatic Hydrocarbons"—some light on the nature of the hydrocarbons present in coal gas and petroleum, and on acetylene. But we doubt whether they will get any information thereby of direct service to them in their daily avocations. The fifth chapter, which refers to the "Cyclic Hydrocarbons," naturally has a good deal about benzene and other constituents of coal tar; and in the eighth chapter, on "Derivatives of the Hydrocarbons," many compounds derived therefrom are mentioned. Cyanogen and picric acid come under brief notice in Chapter X., which deals with "Derivatives of the Hydrocarbons containing Nitrogen." The rest of the work, covering 500 pages, can scarcely be said to have any special interest to readers of the "JOURNAL."

An advanced student of chemistry from any of our Universities

should be competent to write such a survey of modern organic chemistry without falling into any misstatement of fact. It needs, however, further, a good sense of the relative significance of different items, a good command of the pen, and a good power of imparting instruction, to write such a survey as successfully as Dr. Keane has written it in the pages of the little volume now under notice.

A WATER-CIRCULATING HOT-PLATE.

THE securing of an efficient supply of hot water when gas is the fuel employed for cooking purposes has been a problem to which many people have applied themselves; and, among other methods of attaining this end, attention has in more than one direction been turned to the possibility of utilizing the waste heat from the burners of the cooker hot-plate. The advantages of being able to obtain a supply of hot water in this way are so obvious that they make the idea an exceedingly attractive one. Hot water without any extra cost is a very useful consideration to be able to place before both present and prospective users of gas-cookers. One of the inventors who has given time and thought to this question of the utilization of waste heat is Mr. W. H. Pirrie, who took out patents having this object in view in 1906, 1907, and 1908. An abstract of the specification of the latest patent appears on another page of this issue. After much experiment, it is confidently believed that a thoroughly satisfactory method of carrying out the idea has been arrived at; and last week a Company—the Water Circulating Gas-Cooker, Limited—was duly registered, for which we learn sufficient capital was at once forthcoming to go to allotment. The Chairman of the Directors is Mr. C. E. Ryder Terry, of the Imperial Stove Company, Leamington, who has devoted himself whole heartedly to the perfecting of the arrangement.

Some days ago, a practical demonstration was given of the invention, which consists of the turning of the cooker hot-plate

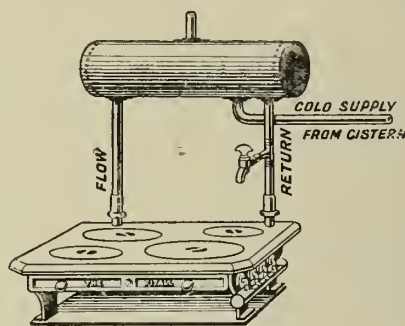


Fig. 1.—The "Fitall" Water Circulating Hot-Plate.

into a shallow tank, in which water circulates; and it was then shown that a supply of really hot water was obtainable when the cooking burners were lighted and turned down—that is to say, by utilizing heat which would otherwise have been entirely wasted. The hot-plate receptacle, which has an inside depth of $\frac{3}{4}$ inch, holds about three-quarters of a gallon of water. By an arrangement of stops inside, the stream of water is forced in certain directions, so that no portion is allowed to remain "dead" in any part of the tank; and the trouble of furring does not arise, as the water leaves the receptacle at less than boiling-point. The water enters at the bottom on one side, and passes out from the top at the other.

The hot-plate can be connected with the hot-water cistern by the ordinary flow-and-return pipes; and the boiling-burners will thus, while they are being used for cooking, keep up a continuous supply of hot water to the cistern, without any increase in the consumption of gas. To provide for the possibility of hot water being required (say) early in the morning, when cooking has not recently been in progress, the hot-plate is furnished with two special geyser burners—one consuming 7 cubic feet per hour and the other about 12 cubic feet of gas—the use of which will give a plentiful supply. In fact, it is claimed that in this way 40 cubic feet of gas, costing $1\frac{1}{2}$ d. with gas at 2s. 10d. per 1000 cubic feet, will give a hot bath. By keeping the small geyser burner alight during the night, the warm bath will be found ready on rising in the morning. Other claims put forward for the arrangement are that in winter the kitchen will be warmed by the hot-plate, which acts like a steam-radiator, and that plates and dishes can easily be kept warm by it. The hot-plate is closed, in a similar manner to the ordinary kitchener, and when the cooking vessels are placed in the circular apertures over the flames, the gas cannot pass uselessly away round the sides. It is stated that, notwithstanding the large quantity of water heated, there is no loss of heat to the cooking vessels, and that frequent trials by gas companies have proved that a kettle will boil on the new hot-plate in exactly the same time as on an ordinary gas-cooker, and with the same consumption of gas.

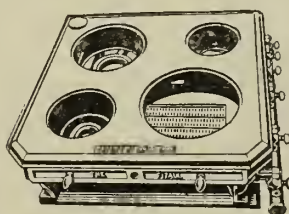


Fig. 2.—Hot-Plate with Covers Removed.

An important point about this water-circulating hot-plate—which has been named the "Fitall"—is that it can be easily fitted

* "Modern Organic Chemistry." By Charles Alexander Keane, D.Sc., Ph.D., F.I.C., Principal and Head of the Chemistry Department of the Sir John Cass Technical Institute. London and Felling-on-Tyne: The Walter Scott Publishing Co., Limited; 1909. [6s.]

to practically any make of gas-cooker; thus converting the ordinary open grid top into a closed range. This is a matter which (if the invention proves to work as satisfactorily in prolonged use as it is said to have done during careful trials) will appeal to those gas authorities who may have on hand a stock of cookers the ovens of which are all right, but the burners perhaps not quite of the latest pattern. If by merely fitting to them the water-circulating hot-plate they enable their consumers to discard the coal-range both in winter and summer, they will indeed be "killing two birds with one stone." As to the working of the arrangement in actual every-day practice, we are not, of course, personally able to speak; but it is certainly worthy of the careful consideration of all who are interested in the increase of the use of gas for cooking purposes. If it should turn out that the invention has now been brought to such a state of perfection as those who are connected with it confidently believe to be the case, there seems good reason to hope that they will not lack the reward of which they will be deserving for their efforts to solve what has been admittedly a difficult problem. It may be added that one of the London Gas Companies, after having made exhaustive tests, have ordered several of the hot-plates for their show-rooms, with a view of placing them on their district.

GAS OFFICE METHOD.

By W. B. MIMMACK, F.C.I.S., of St. Mary Cray.

THE details and figures with which a gas undertaking has to deal require to be kept in such form that any information or combination of figures that may be called for can be readily obtained. This need is apt to lead to complication of work and records, and the employment of unnecessary clerks; and even with them, in times of pressure, some of the work more remote from the immediate cash returns gets behind. The loss of a clerk, a further glut of work, or some similar occurrence, and the arrears get omitted, continuity is broken, and thereafter estimating takes the place of actual returns.

Every department should be subject to regular and constant check, not by a junior clerk, but by a responsible officer. This is impossible to a busy man, unless a very expeditious and certain method is adopted. Card systems are legion; and actual experience with many does not warrant their introduction. The following methods, however, have these advantages: (1) Saving of time, and therefore of clerks. (2) A regular check, absolute and expeditious. (3) Any information that may be called for is obtainable immediately. (4) Superior oversight ensures great efficiency. (5) Ordinary 5-inch by 3-inch cards can be worked for the whole system. (6) Cheapness.

ORDINARY METERS.

For ordinary meters, use green cards stacked end-up in rental-ledger order, in plain boxes or drawers whose ends are a little higher than the cards, and whose sides are half the height of the ends. The cards do not require to be kept in place by any metallic contrivance. On the upper half of one side should be recorded the name, address, and number of the cooker and meter; while on the lower half special information is noted by the inspectors from time to time. On the other side, three columns should be ruled, for the date, reading, and consumption. They will last for four years, and can be called for and handled singly. The cards should be punched for placing in the binders, which are in two varieties, and hold nearly enough cards for a man's day's readings, if the cards are of good, thin quality.

The inspector takes out two binders, so carrying more than the day's work, which is always an advantage. When at the close of the day he returns the results of his day's inspection, two more books are made up for him; and the rental clerks start work at once on the cards brought in. They can divide them in the most convenient way, and the cards can be passed from one to another continuously; but if one clerk is using a bound book, he monopolizes the whole of its contents. Dead matter is eliminated; and no spaces are left for new consumers, new roads, &c. Should a question arise in the correspondence department, it is not necessary to stop the rental clerks and fetch away a bookful of entries; a card only is withdrawn, and work does not stop.

When the inspector's rounds are complete, there remain a lot of indices unread. He takes the books—or at best a specially prepared list—on the old plan; but now the actual cards only are bound up and in what order he likes, which makes an economical, straightforward job. Demand notes are thus delivered in a very short time; and the collector can get to work much sooner. The inspector will fill up from observation all the meter and cooker details, &c., and be checked against the history books and agreements; the whole being easily kept accurate and up to date.

White cards are used for forms of application for gas, salmon cards for agreements for hire of cooker, and blue ones for fires. All are stacked together in trays, Broadway-up, and held in position with folding bars; and they form permanent records. On one side of the form of application is the name and address and date of application; while the other side will read as follows:—

I hereby request the above Company to supply me with gas at the premises described on the other side hereof (subject to the Company's Acts of Parliament, and to their terms and conditions, of which I hereby acknowledge to have received a copy, which I will retain for

future reference), and to fix a meter for — lights; the register of the meter to be taken, accounts furnished, and payments made as the Company direct.

Signature and address where recently supplied with gas in own name and by ordinary meter, or name of bankers.

Failing this a deposit must be sent, on which interest at the rate of — per cent. per annum will be allowed.

This set of cards are arranged (like the rental cards) in districts, streets, &c., by the use of tab cards, and in rental order. The salmon and blue cards will have the number, description, and date of fixing cooker on one side, and will read as follows on the other:—

I ——— of ——— do hereby agree to take on hire from the ——— Gas Company a cooking-stove (or fire) [for details see other side], at a rental of ——— per annum, payable quarterly (fractional parts of quarters to be charged as full quarters), and to pay for any damage, apart from fair wear and tear, that may be done to the stove while in my possession; and I agree to rent the stove for a period of not less than one year from date hereof. And I further agree to return the stove to the Company in a good and sound condition at the expiration of this agreement. Signed and dated.

SLOT-METERS.

In the matter of slot-meters, there is no uniformity of method. Some plans are costly and absurdly accurate; while others are costly at any price, because so inaccurate that nobody knows what the results really are. Collection costs some companies 2½d. per 1000 cubic feet; and it can be done for ¾d. What can be more costly and more unnecessary than having the meters set fast, dividing up the contents of the money-box, and after calculating what is due to the company giving a receipt for the amount and handing the surplus to the consumer, and obtaining a receipt for it? Time and stationery are both wasted; and no wonder the collector is found running about with money in his pocket belonging to Mrs. Smith, who left her house empty and the front door open when the money was collected. Perhaps he gets over it by signing the receipt himself, at the risk of gaol; and all in the sacred name of prevention of fraud.

Prime cost the installation on a pink card, both sides. Detail the fittings used and the cost price in the middle columns, leaving the outside columns for the number of articles or quantities; and carry out and total. Head the card with the name and address, meter and cooker numbers, and fitters' and service layers' names. No time will be charged on the card, as that will go through the time books. Buff cards are used for application forms; one side being reserved for the applicant's use, and the other for the landlord's consent.

Stack the pink and buff cards together in district order of streets, &c., and in the same order as the collection cards. A card is thus easily found when one wants to know the cost of any particular installation, or what gas-fittings are in the house. The half-year's cards should be kept together until the close, then totalled, and there will be shown the cost of all material used in new slot installations. The cards can afterwards be distributed in the trays.

COLLECTION OF PENCE.

For collecting, have buff cards similar on the one side to the blue meter-reading card, but ruled on the other side for date, reading, consumption, and cash. Bind up these as for index-reading, but at the back have a blue card ruled double on each side (and otherwise plain) for consumption and money. Every collection will be entered on a buff card, and then on the blue. The blue will be totalled and tally with the money in the bag; and the consumption will be totalled and compared with the money. If the meters are looked after and the make of meters is good (see Mr. Alfred Colson's paper read before the Institution of Gas Engineers in 1904), the consumption can be kept tallying with the cash all the time.

These cards can be run through daily in a few minutes by a responsible officer, and the whole service kept in perfect order. One should pay the cash into the bank by the blue cards, get them initialled by the cashier, stack them in order of date, and they will agree with the pass-book; and there will be a rapid reference right from the pass-book through all the collections to the original outlay. There are no books attached to this scheme; it being conducted in the most efficient manner entirely without book-keeping.

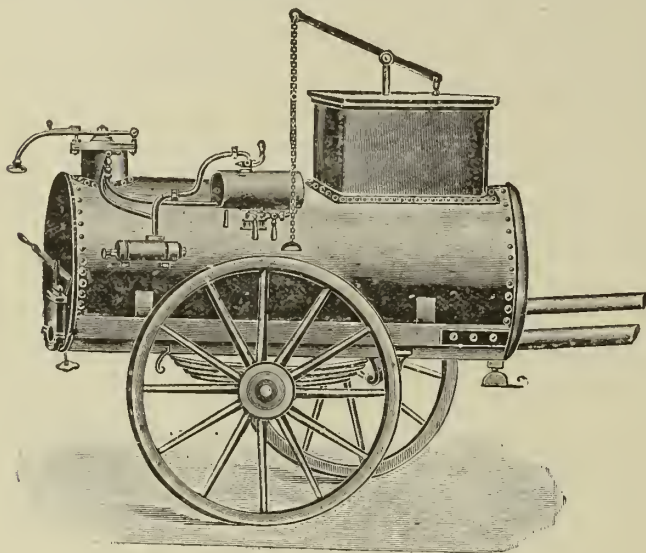
There should be a separate column kept in the cash-book for blue card payments. This should be totalled at the end of the half year, and when reduced to gas, the figures could be relied upon absolutely. The only risk, of course, is that a card may be lost. When the buff cards are first written up, they should be all numbered consecutively, which would secure them. There are additions which have to be made; and when this is necessary, put in a temporary red card, double numbered, first with the number of the buff card (after which it goes when sorted into its district), and then with its own consecutive number—i.e., all red cards will be separately numbered 1 to, and form a second set. When all are written up again in two or three years' time, the red cards will disappear.

At any time it is possible to tell from the last consecutive number how many new slots have been put in since a certain date. No figures require extracting; they are there, and can be calculated mentally.

It may, in conclusion, be remarked that burner maintenance can be similarly dealt with.

WEGNER'S PATENT ASPIRATOR.

We have received from Mr. Bernard F. Browne, the Engineer of the Primitiva Gas and Electric Light Company, Limited, of Buenos Ayres, the accompanying illustration and particulars of Wegner's patent aspirator, which he employs for emptying syphons and similar work. He says it is also adapted for drawing spent lime from ammonia plants and for similar semi-fluids, though they may contain both brick or other rubbish. Mr. Browne thinks the utility of the aspirator for application in both gas and water works will be appreciated; and we thank him for enabling us to bring it under the notice of our readers.



The aspirator consists of a container (the one shown in the illustration is of 500 litres, or 110 gallons, capacity), above which is a large saddle or vacuum chamber, with air-tight hinged lid in complete communication with the container. On one side of the latter there is fixed externally a 3-litre ($5\frac{1}{4}$ -pint) tank, with a glass graduated measure; and to this is attached a small force-pump. The vacuum in the container is obtained by exploding a small charge of the liquid in the 3-litre tank. This liquid is called by the patentee by the name of "Vaculine." It is a light petroleum distillate; but for lack of this Mr. Browne has employed pentane. To make an operation, it is necessary to pump into the container about $\frac{1}{4}$ litre (0.44 pint) of the spirit, and wait half-a-minute for it to diffuse in the air of the container. This done, the smaller hinged circular cover on the small saddle at the back of the machine is lifted, and a lighted match dropped in, when the cover is immediately replaced and locked. The resultant internal explosion immediately lifts and again closes instantaneously the large hinged lid on the vacuum chamber, having expanded the air in the container to about ten times its original volume, and allowed the excess to escape. Thus only about one-tenth of the original air remains in the container and the chamber above it. This cools down so rapidly that there is an immediate vacuum in the machine of three-quarters of an atmosphere—say, 23 inches of mercury. This is equivalent to a suction of 7 metres, or 23 feet. If it be desired to draw the full contents of the container, this may be done in less than half-a-minute. This vacuum will, however, last for hours, and may be used gradually, as, for instance, in the emptying of syphons, where the cart is drawn through the streets or about a works, when thirty or more syphons may be emptied with one explosion, according to the extent of their contents. These machines are made in all sizes up to 2000 litres (440 gallons).

Mr. Browne states that by the use of a flexible pipe and of suitable cocks, the vacuum thus obtained may be communicated separately to any number of stationary or fixed containers. The machine can also be arranged to draw from any reasonable distance by means of special flexible hose manufactured by the patentee.

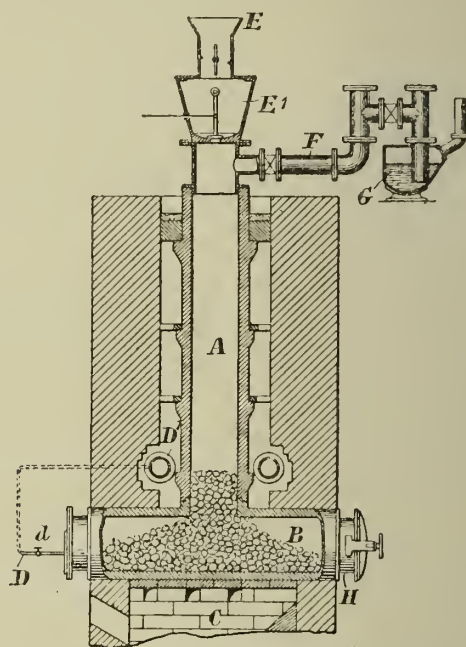
Waverley Association of Gas Managers.—The Hon. Secretary of the Association (Mr. W. Young, of Penicuik) intimates that the ninety-third meeting will be held in the rooms of Messrs. Ferguson and Forrester, Limited, 129, Princes Street, Edinburgh, next Friday. In the business is included a presentation to Mr. A. Bell, sen., of Dalkeith.

Joint Meeting of Yorkshire and Manchester Junior Gas Associations.—The fifth annual joint meeting of these Associations will be held at Rochdale on Saturday, the 1st prox. They will be received at the Town Hall by members of the Gas Committee of the Corporation and the Gas Engineer, Mr. T. Banbury Ball, and the party will proceed to the gas-works, which will be inspected under Mr. Ball's supervision, and of which each member will be presented with a printed description. After the inspection, the party will partake of tea in the Town Hall.

AN AMERICAN GAS-MAKING PROCESS.

A French patent has been taken out by the International Gas Development Company of the United States, for an improved process of gas manufacture, by which, the operation of the plant being continuous, it is claimed a great saving in the cost of production is effected. The process consists in first of all making water gas by passing steam, preferably superheated, through a layer of coke heated by some external source. The gas then rises through a vertical retort, also heated from the outside. Pulverized coal is dropped into the retort, so that a rich gas is given off by it in falling, and while it is in intimate contact with the ascending water gas. This rich gas and certain hydrocarbons emanating from the tarry vapours carburet both the water gas and the poor gas produced by the continuation of the distillation process. While falling, the coal undergoes partial transformation into coke, drops out to the bed of hot coke on the bottom of the retort, and continues to produce gas until it is completely deprived of its gaseous properties, after which it can be removed. The mixture of coal gas and water gas is continuously drawn off and subjected to the ordinary process of purification; but no fixation by superheating is required. If necessary, the gas can be enriched by the addition of oil or oil gas.

The accompanying illustration shows, in section, apparatus suitable for carrying out the process.



A is a vertical retort opening into a horizontal retort B situated at its base. These two retorts are heated by the furnace C, which may be of any type, and burn any suitable fuel. A steam-nozzle D terminates in the horizontal retort, and is provided with a valve *d*. The steam can be superheated by conveying it through the opening D¹ into the furnace. The vertical retort is surmounted by the double hopper EE', separated by the partition shown. The lower hopper has a workable valve to regulate the run of pulverized coal into the retort. The upper hopper is emptied occasionally into the lower one, in order to maintain a constant supply of coal. The gases are drawn off by the pipe F, and pass to the hydraulic main G. The coke produced is removed at H.

The working of the apparatus is as follows: The horizontal retort and the lower part of the vertical one can be filled with coke and brought to the requisite temperature by external heat; or, instead of employing an initial charge of coke, coal can be utilized, either pulverized from the hopper or a separate charge. When coal is used, it must be partially or totally distilled before commencing the manufacture of water gas. In both cases, however, as soon as there is a hot layer of coke, the superheated steam is admitted into the horizontal retort, and pulverized coal into the vertical one. This coal first throws off its rich gases (C₂H₄) and the tarry vapours, and then, as distillation progresses, its poor gases (CH₄) for some time after falling on to the layer of coke, and finally becomes an incandescent mass. The superheated steam is driven through this mass, and is decomposed, forming water gas, which, mixed with the poor gases from the coal—all at a high temperature—ascends in the vertical retort in close contact with the falling coal, the decomposition of which it assists, and at the same time combines with the light-giving matter contained in the tarry vapours disengaged in distillation. The quantity of carbon extracted from the coke will depend upon the amount of steam admitted into the retort. For example, no endeavour will be made to extract more than 20 per cent. of its carbon, and in some cases not more than 5 per cent., as coke is a valuable bye-product. The process is continuous; and when once the apparatus has been started and regulated, it requires but little attention.

THE STRAINS ON TANGENTIALLY GUIDED TELESCOPIC GASHOLDERS.

The "Journal für Gasbeleuchtung" recently contained a communication by Herr J. Schmidt, of Dortmund, on the "Determination of the Normal Strain on a Telescopic Gasholder Bell Guided in Independent Framing by Means of Tangential Rollers"—it being assumed that the structure does not depart from the circular shape. It is impossible to reproduce in full the calculations of the author; but the following abstract will serve to show the scope of the paper and the conclusions to which it leads. The author observes at the outset that it is remarkable that this question has never yet been raised, although it affords an explanation of the behaviour of the bell and the encompassing framing of the holder in strong wind. He proceeds as follows.

It will be seen that the normal pressures in these circumstances deviate very considerably from the force of the wind acting on the bell, as soon as the condition is laid down that the resistances

in the guide-framing must be proportional to $\sin \phi$ (fig. 1). Proof is afforded thereby that these resistances must follow quite a different law in regard to the very flexible cup-rings of the bell and the portions of the guide-framing on which they are working. It appears that it is most correct to take up the normal pressures, which according to a certain law, are caused by the wind, directly by tangential or mixed guide-rollers. That law differs according as the coefficient of reduction is assumed to be 0.57 or 0.67; and it need only be observed that, with the same total force of the wind, the latter coefficient leads to a somewhat lighter framing.

Uncertainties would arise according to which of such framings was adopted for the whole of the calculation; but they would not be greater than when the resistance was taken, according to the former method, to be proportional to $\sin \phi$. Niemann's calculation leads to the same result. The latter assumption is not permissible only when the bell has a trussed crown, because in that case the crown, being, in effect, a rigid disc, ensures equally great deflection of the upper points of the framing.

With a view to simplifying the otherwise somewhat involved investigation, it will be convenient to regard the whole guide-framing as replaced by a sheet metal envelope encompassing the bell and directly taking up the force of the wind. There is thus obtained, instead of the framing with a finite number of angles, one with an infinite number. So far as the deformation of the entire structure is concerned, the results thus obtained will not in any case deviate appreciably from the truth, as the whole investigation refers primarily to holders of moderate or very large size, which therefore would have a tolerably large number of angles. The whole investigation in this way passes over to a determination of the deformation to which a sheet-metal cylinder firmly held at its base is subjected under certain normal pressures. Further, the calculation may be made by assuming as known the normal strain which is to be investigated, and thus, through the deformation of the closed cylinder, proof is obtained that, under this strain, all horizontal sections of the cylinder remain circular, and, consequently, all deflecting moments in this direction disappear. This is obviously the simplest way. The lateral strains occurring in the cylinder provoke longitudinal strains in it; but they are of no effect on the deformation of the separate horizontal sections. As the examination must refer only to changes of shape of the horizontal sections, the longitudinal strains in the cylinder do not come into account.

The modern guide-framing of a gasholder owes its stability chiefly to the properly calculated inclined ties or diagonals. These cause the columns at the angles of the framing to act as masts, which take up the vertical components of the inclined ties in virtue of their great resistance to fracture. Such a framing is therefore composed mainly of separate frameworks placed tangentially to the bell, which would possess very small stability in a radial direction, because of their height, if they were separated from one another by the columns at the angles being detached. On this account it has been customary to resolve the roller pressures into tangential forces in the direction of the adjacent planes of the framework. If, now, such a framing must remain circular in all its horizontal sections, the horizontal resistance of any panel of the framing which opposes the forces moving the bell is a tangential force proportional to $\sin \phi$. This force can be deduced in a simple manner from the equally great deflection of the single panel in the direction of the wind. This argument applies for a framing with any number of angles—i.e., for the sheet-metal cylinder with an infinite number. It is, of course, assumed that the sheet metal of the cylinder is of small thickness compared with the diameter of the cylinder. As it was premised that the horizontal sections remain circular, it follows that the resistance of the elements of the periphery may be calculated as a tangential force in a horizontal direction proportional to $\sin \phi$ without regard to the normal strain on the cylinder (see fig. 2). This resistance is a linear function of the length of the cylinder. It is equal

to zero at the free end, and is greatest at the firmly-fixed base of the cylinder. Its increase is therefore constant for the length of the cylinder l ; and as this increase influences the distortion of the element of the cylinder by the length l only, it may be assumed that the differential of this resistance is $t = c \times l \times (R d \phi) \sin \phi = c R \sin \phi d \phi$, in which R represents the radius of the sheet-metal cylinder in centimetres, and c is a constant which has yet to be determined.

On considering the element of the cylinder starting with the length l , and assuming the normal pressure on the element of the area $l \times R d \phi = R d \phi$ to be $n = A (R d \phi) (1 - \cos \phi) = AR \times (1 - \cos \phi) d \phi$ in which A signifies a constant indicating the intensity of the strain. Taking AR as the radius r of an imaginary circle, the graphic

solution of $\frac{n}{d \phi}$ shown in fig. 3 is obtained. This n is with $\phi = 0$ equal to *nil*, and with $\phi = \pi$ attains its highest value $2 AR d \phi = 2 r d \phi$ and becomes constant between 0 and π . On resolving each pressure element n into two components parallel



Fig. 2.

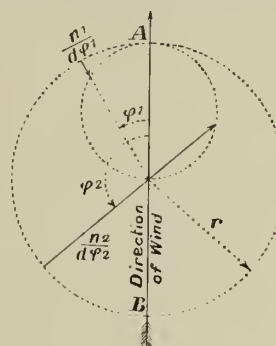


Fig. 3.

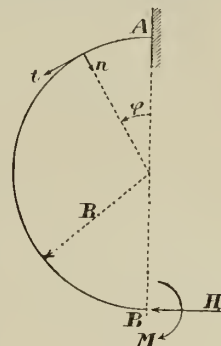


Fig. 4.

and at right angles to the direction of the arrow, the first component is found to be equal to $n \cos \phi$, and the sum of these forces for the whole circumference to be equal to $AR\pi$. On resolving similarly each element t of the resistance into two components parallel and at right angles to the direction of the arrow, the sum of the first components for the whole circumference is equal to $R c \pi$. Since the force and resistance are equal—i.e., $AR\pi = R c \pi$. $c = A$ and generally $t = AR \sin \phi d \phi$ and $n = AR (1 - \cos \phi) d \phi$. As the subsequent investigation does not depend on the value of A , AR may be assumed in the sequel to be equal to 1, or $A = \frac{1}{R}$. Then simply $t = \sin \phi d \phi$ and $n = (1 - \cos \phi) d \phi$.

Following this procedure, the distortion of the element of the cylinder in question, having the length l and the radius R , may be determined. Let this element be cut in the direction of the arrow AB , and imagine the left half firmly fixed at A , and the end B free to move under the unknown horizontal force H , and subject to an unknown deflecting moment M (fig. 4). The latter must be such that the horizontal deflection and the angular distortion at the spot B of the completed ring are equal to *nil*. Then the equations will be as follows:—

I. THE HORIZONTAL DEFLECTION OR DISPLACEMENT OF THE POINT B.

(a) By the Forces n .

The horizontal displacement of the point B by the force n is

$$d \xi_1 = \frac{n R^3}{EJ} (0.5 \phi \sin \phi + 1 - \cos \phi)$$

and thence, taking all the forces n , by integration, it will be found that

$$\xi_1 = \frac{17}{8} \pi \frac{R^3}{EJ}$$

in which expression E is the modulus of elasticity of the material of which the cylinder is composed, and $J = \frac{1 \times \delta^3}{12}$ is the moment of inertia of the longitudinal section of the cylinder having the thickness δ .

(b) By the Forces t .

In the first place, t is resolved into its components $v = t \sin \phi$ and

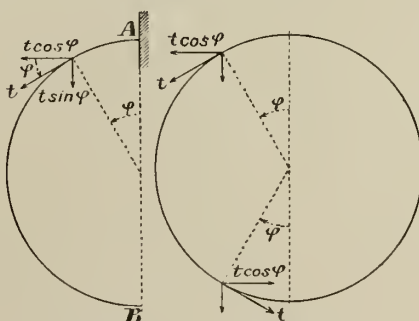


Fig. 5.



Fig. 6.

$h = t \cos \phi$ (fig. 5), and then the differential of the horizontal displacement of the point B by the forces v and h is equal to

$$d \xi_2 = \frac{v R^3}{EJ} (0.5 \sin^2 \phi - 1 + \cos \phi + \phi \sin \phi) - \frac{h R^3}{EJ} (0.5 \sin^2 \phi - 0.25 \sin^2 \phi + \sin \phi - \phi \cos \phi)$$

whence it may be shown that

$$\xi_2 = \frac{7}{8} \pi \frac{R^3}{EJ}$$

(c) *By the Forces n and t Jointly.*

The total displacement by the forces n and t together is therefore

$$\xi_1 + \xi_2 = \frac{17 + 7}{8} \pi \frac{R^3}{EJ} = 3 \pi \frac{R^3}{EJ}$$

(d) *By the Force H .*

Signifying this displacement by ξ_3 , then similarly it will be found that

$$\xi_3 = - \frac{HR^3}{EJ} \left\{ \frac{\pi}{2} (1 + 2 \cos^2 \pi) - \frac{3}{4} \sin 2 \pi \right\} = - \frac{HR^3}{EJ} \times \frac{3}{2} \pi = - 1.5 \pi \frac{HR^3}{EJ}$$

(e) *By the Moment M .*

Indicating this displacement by ξ_4 , then

$$\xi_4 = - \frac{MR^2}{EJ} (\sin \pi - \pi \cos \pi) = - \pi \frac{MR^2}{EJ}$$

In order now that the total displacement of the point B may be equal to 0

$$\xi_1 + \xi_2 + \xi_3 + \xi_4 = 0$$

or

$$3 \pi \frac{R^3}{EJ} = 1.5 \pi \frac{HR^3}{EJ} + \pi \frac{MR^2}{EJ}$$

whence we obtain equation (1)—viz.

$$3 R = 1.5 H R + M.$$

Let us pass on to the angular distortions of the end point B, which is regarded as free to move.

2.—THE ANGULAR DISTORTIONS OF THE POINT B.

(a) *By the Forces n .*

Indicating the angular distortions by ω , the differential of the angular distortion of the moveable end B by a single force n is

$$d \omega_1 = \frac{n R^2}{EJ} (1 - \cos \phi) = \frac{R^2}{EJ} (1 - \cos \phi)^2 d \phi$$

whence it follows that

$$\omega_1 = 1.5 \pi \frac{R^2}{EJ}$$

(b) *By the Forces t .*

$$d \omega_2 = \frac{v R^2}{EJ} (\phi \sin \phi + \cos \phi - 1) - \frac{h R^2}{EJ} (\sin \phi - \phi \cos \phi)$$

and putting in the values of v and h , and solving, it is found that

$$\omega_2 = 0.5 \pi \frac{R^2}{EJ}$$

(c) *By the Force H .*

$$\omega_3 = - \frac{HR^2}{EJ} (\sin \pi - \pi \cos \pi) = - \pi \frac{HR^2}{EJ}$$

(d) *By the Moment M .*

$$\omega_4 = - \pi \frac{MR}{EJ}$$

As the sum of all the distortions is equal to *nil*, it follows that

$$\omega_1 + \omega_2 + \omega_3 + \omega_4 = 0$$

and therefore

$$1.5 \pi \frac{R^2}{EJ} + 0.5 \pi \frac{R^2}{EJ} = \pi \frac{HR^2}{EJ} + \pi \frac{MR}{EJ}$$

whence we obtain equation (2)—viz.

$$2 R = H R + M.$$

On subtracting equation (2) from equation (1), we find that $R = 0.5 H R$. Consequently, $H = 2$. Inserting this value in equation (2), it becomes $2 R = 2 R + M$ and, consequently, $M = 0$. Hence the deflecting moment at B is equal to *nil*.

The sum of all the horizontal components of the individual forces n may now be determined. It may first be observed that

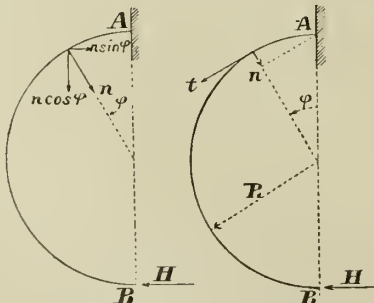


Fig. 7.

Fig. 8.

the sum of all the horizontal components of the individual forces t is equal to *nil*, as $t \cos \phi$ always occurs of the same dimensions twice acting in opposite directions (see fig. 6). The first sum for the half-circumference (fig. 7) will be found to be equal to $+2$, or equal to H . Hence the longitudinal pressure at the point A, at which the cylinder element is cut is equal to *nil*.

The deflecting moment M_0 resulting at the apex A (fig. 8) is calculated from the arc terminating at A, and is found to be

$$M_0 = 4 R - 4 R = 0.$$

Thus at the point A the moment is likewise equal to *nil*. We may thus also suppose that the cylinder is cut at A without the supervision there of a longitudinal force and a moment, and without disturbing the state of equilibrium thereby. Then the deflecting moment for any position C on the arc (fig. 9) is found by calculation to be

$$M_C = \cos \phi + \cos \phi_1 - 0.5 \cos \phi_1 - \cos \phi_1 - \cos \phi + 0.5 \cos (-\phi_1) = -0.5 \cos \phi_1 + 0.5 \cos \phi_1 = 0.$$

Thus the desired proof is obtained that the deflecting moment is in general equal to *nil*—i.e., with the assumed normal strain on the cylinder proportional to the function $1 - \cos \phi$ the cylinder remains perfectly circular. Fig. 10 shows the whole amount of

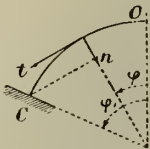


Fig. 9.

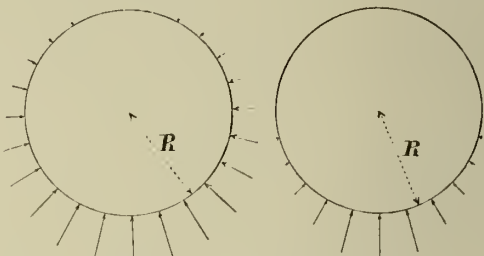


Fig. 10.

Fig. 11.

this normal strain for R assumed to be of any size. Fig. 11, on the other hand, shows the strain on the cylinder by wind on the basis of the coefficient 0.67. It will be seen how widely different these kinds of strain are from one another. In order to prevent distortion of the very elastic ring formed by the cup of the bell, it is desirable to transmit the force of the wind directly to the windward side of the holder, either by tangential rollers or by radial rollers pressing outwardly on the columns at the angles. In order, however, to utilize the guide-framing throughout its whole circumference, and to protect the rings formed by the cups against distortion at right angles to the direction of the wind, radial rollers acting on the inside are, moreover, not to be despised. The same effect was obtained by the old so-called mixed guide-framing, consisting of both tangential and radial rollers. In all cases the standards must be calculated not only to withstand fracture, but also to resist distortion tangentially and radially. The determination of the pressure of the rollers remains, as hitherto, a very untrustworthy calculation.

In bringing these considerations to a close, it may be worth while calculating also the whole force P resulting from that normal load and pressing the thin-walled cylinder in the direction of the arrows. A comparison may thus be made between it and the force of the wind. According to the foregoing calculations, the component of the force n in the direction of the arrow is equal to $n \cos \phi = AR(1 - \cos \phi) \cos \phi d \phi$. It will then be found that the sum of all these forces for the whole circumference and a cylinder of unit length is

$$P = 2 AR \frac{\pi}{2} = AR \pi$$

But when $\phi = \pi$ the specific pressure

$$\frac{n}{R d \phi} = A [1 - (-1)] = 2 A.$$

Indicating this maximum specific pressure by p , we have

$$P = 0.5 p R \pi, \text{ and for the length of cylinder } L,$$

$$P = 0.5 p R L \pi = 0.25 \pi p (2 R \times L) = 0.735 p (2 R L).$$

This force is thus about 17 per cent. greater than the force of the wind

$$0.667 p (2 R L).$$

A simple contrivance for lowering plate girders was used recently on the Pere Marquette Railroad, for replacing a truss bridge by girders. The two girders were set up, riveted to the cross frames, the ties placed, and the completed section slung from cantilevers between two gondola cars which were filled with coal. The cantilever "rig," according to the "Railway and Engineering Review," consisted of six 8-inch by 16-inch timbers projecting beyond the end of each car, resting on blocking at the forward end and at the rear, and under a 12-inch by 12-inch cross-wise timber bolted to another under the floor. A similar beam was placed across the top flanges of the girders, and bolted by long bolts to the lower flanges. Heavy 2½-inch rope was passed under this timber several times, and up over a bolster on the cantilevers. The girders were lowered by easing-off the ropes.

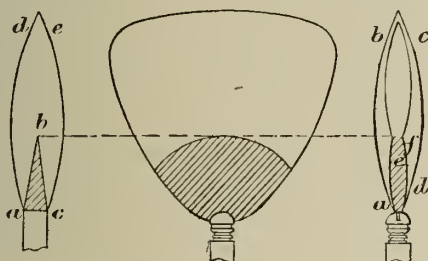
THE THEORY OF FLAME AND OF INCANDESCENT MANTLE LUMINOSITY.

The "Transactions" of the American Illuminating Engineering Society for February, which have just come to hand, contain the text of a paper by Mr. W. H. Fulweiler on the above subject, read by him at a meeting of the Philadelphia Section of the Society. Many of the matters referred to in the communication have been dealt with in our columns from time to time; but the author has brought them together, and, embodying them with the results of his own researches, has produced an interesting contribution to the proceedings of the Society. The following extracts from the paper will give an indication of the character of his work.

The paper opens with some observation on luminosity, which the author says may be properly defined as a form of radiant energy which, acting on the human eye, produces the sensation known as light. He points out that, while luminous radiations may be excited in several ways, the most useful one is the raising of a solid body to a high temperature. He then goes on to show that, according to Kirchhoff, both the total energy and the energy of every wave length emitted by a "black" body must be greater than that from any other body at a given temperature. Carbon approaches very closely a black body, and therefore is less efficient than the metals, such as platinum, tungsten, and tantalum, and probably the mixture of thorium and cerium used in making the gas-mantle; so that if carbon could be raised to the temperature at which tungsten and tantalum may be regularly worked, it would give more light than they do, but would be less efficient. The author considers that the question of high working temperature is even more important, as between carbon and the thorium mixture, in open flames, where the oxidation of the carbon puts even a lower limit on its possible working temperature, while the mantle may be worked up practically to the highest heat attainable with the flame. He closes his introductory remarks by explaining that flames may be divided into three general types—the non-luminous bunsen flame, used for all heating purposes and in the Welsbach burner, the luminous open-flame burner of the fishtail or the argand type, and the incandescent mantle. He then deals with each kind successively.

THE BUNSEN FLAME.

The bunsen flame is formed when a mixture of gas and air burns freely in the atmosphere, and it has the structure shown in the accompanying diagram. There is a small sharply-pointed inner cone enclosed by the zone *abc*, surrounded by the less sharply defined outer cone which is enclosed by the invisible zone *adec*.



In the inner cone there is the air-gas mixture burning in the zone *abc* to carbonic oxide, carbonic acid, hydrogen, and water diluted with the atmospheric nitrogen brought in with the air. These gases, excluding the nitrogen, form the constituents of the water-gas reaction, which in a normally-burning flame comes into equilibrium at the temperature of the zone *abc*, which is about 1550° C. The zone *abc* consequently furnishes a continuous supply of diluted water gas to the upper cone, which, gradually increasing in temperature, burns to carbonic acid and water in contact with the atmospheric oxygen in the zone *adec*, in which the temperature rises (according to Féry) to from 1710° C. to 1870° C. Thus there is a mass of glowing gas surrounded by the thin zones where the actual combustions are taking place. This condition is further shown by the fact that oxygen has never been detected in analytical quantities in the upper cone.

The relative positions and colours of the two combustion zones are mutually dependent on the air-gas ratio delivered by the burner-tube. The inner cone thus represents a stationary explosion, and its attitude is dependent upon the fact that the velocity of the explosion is slightly less than that of the gases issuing from the burner-tube. Thorpe* has given some values for the velocity of explosion with different air and coal gas ratios:—

Air		Velocity in		Air		Velocity in	
Ratio	Coal Gas.	Inches per Second.		Ratio	Coal Gas.	Inches per Second.	
6.50	.	.	11.4	5.00	.	.	39.7
6.00	.	.	24.2	4.75	.	.	36.7
5.50	.	.	32.2	4.33	.	.	29.0
5.25	.	.	38.6	3.33	.	.	3.8

These facts are plainly shown by the long blue inner cone with a small air-gas ratio and its gradual shortening with increasing air, until finally the zone *abc*, now a bright green in colour, becomes violently agitated, vibrates in and out of the burner-tube once or twice, then forms a detonating wave, and explodes, usually

igniting the jet of gas at the base of the tube. It is now said that the burner has "struck-back" or "lighted-back." Certain factors, however, may limit or modify this action. If the top of the burner-tube be covered with wire gauze or a porcelain button containing a number of small holes, the velocity of the issuing mixture is increased, and thus a higher air-gas ratio may be used than with an open tube. Moreover, as the explosion flame approaches the gauze or button, the heat is absorbed so rapidly that the explosion velocity is diminished.

The colour of the cone, as already mentioned, varies with the air-gas ratio. According to Lewes,* with air and coal gas in the ratio of 2.3 : 1, it is blue, changing to a bright green when the ratio reaches 3.4 : 1.

The temperature gradient in the inner cone from the burner-tube to the zone *abc* is very steep; rising from a few degrees above that of the atmosphere to upwards of 1500° C. with extreme rapidity. In the upper cone from the zone *abc* to *adec* the rise is more gradual, first on account of the fact that the conduction increases approximately as the square root of the temperature, and secondly because of the larger surfaces enclosing the upper cone permitting the rising current of gas to be more quickly heated by conduction. While the zone *adec* has the highest temperature—from 1750° C. to 1870° C.—it is so thin, and its position is shifting so continuously, that one does not ordinarily secure the advantage of its high temperature; and it is found that for practical work the body to be heated must be buried quite deeply in the flame.

Coming to the luminous flame, by gradually decreasing the air supply from the bunsen the inner cone elongates, and the top of the zone *abc* disappears. The upper cone first becomes tipped with yellow, and the luminosity extends downward towards the inner cone till the flame becomes entirely luminous, when the air supply is completely cut off, and the luminous zone apparently merges into the upper portion of the inner cone. As a matter of fact, it encloses the upper portion of this cone; but it is here so thin that its effect is lost. Thus there is obtained the original form of the gas-flame.

The early flames were merely small single jets, imitating the candle, and not giving much more light; but later several jets were collected at one burner. These developed into rows and circles, thereby giving the fundamentals of the argand and slit or batwing burners. About the year 1820, the increase in luminosity that was noted when two of the single jets impinged on one another led to the union-jet or fishtail burner; while about 1854 the principle of recuperation was tried with a double chimney argand burner.

A flat luminous flame appears simple enough; yet there has been an enormous amount of work done on it—much of it misdirected in vain efforts to find facts to fit pet theories. Sir Humphrey Davy in 1817 gave the first—and, in general, the accepted—explanation of the phenomenon. He held that the luminosity was due to hot particles of carbon heated by their own combustion. Tyndall suggested that the luminous particles need not be burning. These views were generally accepted until Dr. Frankland, in 1867, began hunting for some recondite reasons. He showed that non-luminous flames could be made luminous by increasing the pressure, and he decided that the luminosity was due to the dense carbon vapours in the flame, and not to particles of carbon. He showed that the factors influencing luminosity were access of oxygen to the flame, velocity of the hydrocarbon vapours, and pressure of the atmosphere.

Stein showed in 1875 that the particles held by Frankland to be hydrocarbon vapours were really pure carbon with some occluded gases. Soret, in 1874, followed by Burch, and later by Stokes (1878), examined the flame spectroscopically, and showed that it did contain particles of carbon, and had some property of reflection that increased with the richer gases of high candle power. Knapp showed that loss of luminosity might be caused by neutral gases which could not oxidize the carbon particles; while Wibel held that this result was caused by the lowering of the temperature, and that it was shown by the flame regaining its luminosity by heating. Barentin and Blochmann demonstrated that this result might have been caused by the expansion in volume in the heated tube opposing such a back-pressure to the rising column of gas that the necessary quantity of air was no longer drawn into the tube. Heumann, in 1877, mixed the diluting gas in a holder previous to heating, in order to overcome the last objections, and showed that the effect was due entirely to the cooling and diluting effect of the nitrogen of the air, while with pure oxygen the increased activity of the combustion overcame the diluting. Stein showed, however, that he could decompose coal gas with a flame rendered non-luminous with nitrogen. Landoldt and Blochmann took up the study and analysis of the gases in the flame, and the preferential theory of combustion was widely discussed.

In the early nineties, Lewes† brought out his acetylene theory. His claims were: (1) That the luminosity of hydrocarbon flames is due to the localization of the heat of formation of acetylene, which is formed in the flame in the carbon and hydrogen produced by its decomposition. (2) That such localization is produced by the rapidity of its decomposition, which varies with the temperature of the flame and with its composition. (3) That the average temperature otherwise would not be sufficient to produce the incandescence of the carbon particles in the flame. This theory

* See "JOURNAL," Vol. XXX., p. 61.

* See "JOURNAL," Vol. LIX., p. 795.
† *Ibid.*, loc. cit.; also Vol. LXV., p. 796.

was in conflict with the work of Armstrong, Haber,* and Bone on the chemical questions relating to the formation of acetylene, and with the work of Smithells and Thwaite on the physical side relating to flame temperatures.† The work of Smithells showed that the use of ordinary thermo-couples did not give indications nearly high enough, owing to the rapid conduction of heat along their length, so that it was not certain that the temperatures would not suffice to explain the incandescence of the carbon particles. This question has been cleared to a considerable extent by the work of White and Traver‡ and Haber and Reichert, so that one can now make fairly accurate determinations of flame temperatures by using two couples of different thicknesses simultaneously. The late work of Bone and Coward, on the decomposition of the hydrocarbons by heat, seems to have given a very clear idea of the origin of the carbon particles.

Consider now the probable mechanism of an ordinary open flame. The thin sheet of undiluted gas rises from the top of the burner and immediately commences to expand. The hydrogen, owing to its great diffuse power, and to some extent the methane, rush to the outside of the rising column of gas, and are immediately burned, in contact with the atmospheric oxygen, along with a very small percentage of the general constituents of the gas in contact with this burning zone. The outer burning zone forms, as it were, an intensely hot envelope for the illuminants in the gas, which, from their high specific gravity, rise straight from the burner tip, thereby protecting them from the inrush of oxygen, and intensely heating them by conduction.

The general structure of the flame will then be as follows: Referring to the diagram, there is an inner cone, shaded as in the bunsen burner, surrounded on the sides by the zone *ef*, where the bulk of the hydrogen, some methane, and probably carbon monoxide are burning. The remainder of the gas is heated by conduction as it rises straight up between these hot walls. Measurements in this central core of gas show that its temperature increases from about 200° C. just above the tip to over 1100° C. at the edge of the luminous zone. At this temperature (or, say, 1200° C. as Smithells' measurements were probably in error to this extent) the hydrocarbons are decomposed.

Considering the various causes which tend to increase or diminish the luminosity of the flame, it is found that they may be divided roughly into two classes—those that affect the formation and quantity of the carbon, and those that determine their temperature. Under the first class the effect of diluents may be considered. In general, one may consider that diluents act in two ways—by dilution, thus decreasing the concentration of the carbon particles per unit of area, and also in small quantities in reducing their temperature in the upper cone, while in large quantities this temperature is reduced to such a point that the hydrocarbons are not decomposed—probably when below 1000°C.—and they burn directly in the outer cone to carbon dioxide and water with a non-luminous flame. That the cooling effect of diluents is an important factor was shown by Wibell and Heumann, who rendered non-luminous flames luminous by restoring to them, by preheating, the heat absorbed in heating the diluent. Moreover, separating the carbon particles chemically, using chlorine, will render a non-luminous flame luminous.

With flat-flame and argand burners, it has been found that, by increasing the width of the slit or by the use of larger holes, with proper pressure regulation, the duty, or the light evolved per cubic foot of gas burned per hour could be increased. Just what limit may be placed on this extension is not known; but as the pressure must be increased with widening the slit, the consumption of gas is increased, so that it would probably be the practical size of the resulting flame. The increased width of the slit results in a slightly thicker core of carbon particles, thereby increasing the concentration per unit of area, and slightly lengthening the time during which they may be heated, so that they may approach more nearly the temperature of the zone *abcd* in the diagram.

The question of the proper burning pressure is another point of importance in realizing the full duty from any burner. With any given size slit, as the pressure is increased, the duty rises to a maximum when the flame is just short of smoking, then falls rapidly with a further increase of pressure. There would appear to be some relation between the velocity with which the gas leaves the tip and its power of expanding by diffusion. As the pressure is increased beyond this critical point, an injector action is set up by the sheet of gas drawing air into and mingling with it, thereby destroying the luminosity as noted above, and burning directly into carbon dioxide and water.

Considering now the factors that influence the temperature of the carbon particles in the flame, the size of the outer zone *abcd* has already been mentioned as influencing the temperature gradient. With argand burners, it has been found that the intensity may vary widely by using different sizes of chimneys. If one could protect the carbon from the atmospheric oxygen for a longer period, and thus allow it to assume more nearly the flame temperature, or could raise the temperature of the cold (comparatively speaking) inner core of the flame, a higher average temperature of the carbon could be secured in the luminous cone. This result is attained in the regenerative burners which were first brought to a practical form by Siemens.

The average output per cubic foot per hour of 16-candle

coal gas burned under the best conditions in the various types of burners, would be about as follows:—

	Candles.
Regenerative	10'00
Standard argand	3'20
Ordinary argand	2'90
Flat flame No. 7	2'44
Flat flame No. 1	0'85

INCANDESCENT MANTLES.

It has been seen that in the open-flame burners the luminous effect is limited by the inability to bring the radiating body—carbon—to the temperature of the flame. In the incandescent mantle, on the other hand, there is obtained a fixed radiating zone of constant dimensions that may be heated to any practically attainable temperature. The basic idea of using a fixed incandescent solid was probably originated by Gurney in 1826, when he heated a cylinder of lime in the oxy-hydrogen flame. Drummond, however, perfected the idea; and it now bears his name. Later, buttons of zirconium and magnesium oxide were tried for street lighting in Paris. They were heated by an oxygen and coal gas flame; but they were soon abandoned on account of their inconvenience and expense. Talbot in 1835 discovered that calcium oxide in a finely divided state became incandescent in the flame of a spirit lamp; and Gillard, about 1848, used a basket of platinum gauze to secure a useful light from his non-luminous water-gas plant. The subject seems then to have dropped till about 1875, when there was a revival of the use of metallic mantles by Palmer in 1876, Lewis in 1881, Popp in 1882, and Sellon in 1886, who made use of platinum generally as the incandescent body. In 1880, Clamond exhibited a basket mantle made of infusible oxides. In 1885, the Fahnehjelm comb, which was intended for water gas, was patented. In 1886, Welsbach brought out his first mantle. It was very fragile, and quite inefficient, as the influence of cerium was not understood until 1892, when the 99 per cent. of thorium and 1 per cent. mixture was brought out. This really put the mantle technically on a commercial basis; the other difficulties being entirely mechanical.

When a mantle is placed over a bunsen flame, owing to the fact that the mantle is colder than the flame, there is a layer of gas molecules separating the flame from the mantle. As the velocity of the gaseous mixture passing through the mantle is increased by burning larger quantities of gas in it, the insulating layer is diminished in thickness, and the mantle temperature rises. This action explains to some extent the increase in efficiency due to higher consumption of gas per unit of time. Again, with many ordinary burners, the efficiency of the injector action of the mixing-tube rises rapidly with increasing pressure and the corresponding increased volume of gas delivered, so at the high pressures at the burner tip a greater air-to-gas ratio is secured. The output of the gas rises as the air-to-gas ratio is increased (other factors being equal), until it reaches a maximum apparently, with ordinary burners, when the ratio is about 12 per cent. less than that required for the complete combustion of the gas.

In considering the relative efficiencies of various gases in the mantle, one should remember that the burner and mantle combined is a heat-light engine of rather low efficiency—about that of the ordinary slide-valve steam-engine—and that the energy delivered as light must bear some direct relation to the energy put into it as heat per unit of time; so that, as in the gas-engine, it is the heat per unit volume of combustible mixture that is the determining factor, with the assumption, of course, that the air required is properly supplied in each case.

In general, it is found that the air required for the complete combustion of a gas bears a fixed ratio to the heating value of the gas. Casaubon* found that the volume of air required for the complete combustion of 1 volume of gas multiplied by 112'9 gives the heating value of the gas in British thermal units per cubic foot. He used a cerium mantle, and noted the ratio of air to gas when the mantle changed from red to white. Therefore, for nearly all gases, the heating value per unit volume of mixture would be closely the same, and the luminosity would depend on the volume of mixture burned per unit of time or the total heat energy expended.

M. Sainte-Claire Deville made an exhaustive test on this point, and showed that, contrary to the earlier belief, the theoretical flame temperature is not important, but that for any given burner there is a particular rate of heat consumption per unit of time that yields the maximum of efficiency, while the maximum luminosity or intensity per unit of area will be secured at a rate from 50 to 60 per cent. in excess of the efficient rate. This is quite what one would be led to expect, in general, from any transformer of energy.

Considering the displacement of the zone of final or complete combustion of the bunsen flame (*adec*) by the influence of the mantle, it is found that as long as the temperature of the mantle is above 1400° C. the water-gas equilibrium holds at the surface of the mantle, which will therefore always be surrounded by a reducing atmosphere.

Regarding the composition of the mantle, while there are several admixtures of oxides that give efficient results for a short time, nothing as yet seems able to displace the thoria-cerium combination, if for no other reason, because of the great stability of the latter at the temperatures involved. White and Russell† have

* See "JOURNAL," Vol. CIII., p. 319.

† *Ibid.*, Vol. LXVII., p. 74; Vol. LXV., p. 1310.

‡ *Ibid.*, Vol. LXXX., p. 562.

* See "JOURNAL," Vol. XCV., p. 41.

† *Ibid.*, Vol. LXXIX., p. 892.

position, both by training and personality, able to listen first and then to talk. This sounds improbable, but it has been known. Her first work, perhaps, will be to instruct in the use of the gas-range in homes. She should teach the economy and efficiency of gas, the uses of various burners and how they should be adjusted, the cleanliness and comfort of gas, and the possibilities of the oven as to economy—pointing out the variety of dishes which can be cooked at one time in it, providing there is careful management, and doing away with odours which are noticeable if cooking is done on top of the range. She should explain the use of the simmering burner, as this is not usually very well understood, and teach that the oven door should be left open after roasting or any other cooking where moisture is created, to avoid rust. It is also advisable under some conditions to leave the door open a few moments after lighting. She must explain how to take care of the range and keep it in condition, and do this without offence; teach the reading of the meter by cards, which should be supplied to the customers; and, of course, understand the construction of the range, in order to explain how one burner will do as even baking as two.

Special instruction needs to be given regarding the broiling facilities of gas-stoves, as too many people utilize this space as a receptacle for flat-irons, &c. An inspector should be in the office during discount days, to answer questions about the ranges and other appliances, and exhibit results when feasible. It is best for inspectors to make calls for testing ovens by appointment; thus no time is wasted, and no housewife is surprised and disturbed in an untidy kitchen. It is important that the actual mixing of materials should be done by the cook or the housewife, or advantage would be taken of the inspector's ability in this direction. Instances have been known where women made it a point to call up the inspector when they wished an especially good cake. We cannot afford to be so philanthropic as that.

A woman of middle age will secure confidence more quickly than a young girl. A housewife resents being told how to cook by a person of youth and evident inexperience, however well trained. A stranger is preferable to a local person, first because she will be less liable to criticism; and, secondly, no time will be wasted in local gossip. She must be thoroughly interested in her work, which is, of course, a desirability in any position. She must be pleasing in manner, and not easily ruffled or quick to take offence. She must be neat. This I consider an especial necessity. A young woman who is careless in her dress, or has untidy hair, has no business in a kitchen. She must be tactful and oblivious of kitchen sights; and however able to offer an opinion, she must avoid being officious. The chief objection to this admirable combination is that, other things being equal, she will probably be married by one of the company's men in a short time. But even this might be made advantageous. Work of this kind, if well done, should be well paid. It is nerve-wearing; and for this reason the hours should not be too long. It would be done best if never overdone.

Model kitchens fitted up in gas office buildings are of untold advantage. A woman who has any interest in her home will see something here to attract her attention and make her realize her own needs. A kitchen cabinet and utensils may be secured at almost any cost from manufacturers; and this offers an excellent showing for various gas appliances. A regular hour for consultation at the office will invite the confidence of women; and they will be glad to take advantage of this opportunity to make various inquiries regarding matters pertaining to the kitchen. Gas offices can be used for lessons occasionally in the evenings. As large a building as an opera house is usually unsatisfactory, because the audience is too far removed from the speaker to invite free comment and discussion. If women are allowed to ask the questions desired, many points will be brought out which might otherwise be overlooked. Better have a smaller room well filled than a large room in which people are sparsely scattered about. It is, of course, a great mistake to confine such work to the spring and summer months. This is a point which the gas men are beginning to realize now. Gas as a hot-weather fuel has been over-emphasized.

Special sessions for nurses, with a talk on invalid diet and possible class work in hospitals, can be made valuable. On various occasions certain clubs may be invited, or the lecturer supplied to church organizations, or the Young Women's Christian Association. This is often looked upon as simply a diversion; but results may amount to more than would be imagined. On one occasion, where we co-operated with the Catholic churches, the priest himself told his parishioners that it was vital that they should attend these practical lessons. A special invitation to high-school girls often results in their showing a practical interest in cooking which they might not otherwise do. A brief special talk on economy and the care of the range would prove a help in the practical education of the public at any of these demonstrations.

Free lessons are often followed by paid ones; the salary of the teacher being paid by the company, the church conducting the work and retaining the admission money. The people really appreciate instruction in economical cooking in this day of expensive food stuffs; and the dishes should be neither elaborate nor expensive.

Women in the employ of gas companies can be of very practical assistance in planning the arrangement of kitchen furniture and appliances in new homes. They can also furnish suggestions in the remodelling of kitchens already in use. Such persons, well-qualified, and full of the enthusiasm of their work, become

a power in any community. In no other way can a gas company with certainty secure and maintain the goodwill of the housewife, the real head of the home. See that your employees in this line are furnished with the proper implements for their needs, and then "Let the women do the work."

GAS-ENGINES TO GENERATE ELECTRIC POWER.

At a recent Meeting of the Institution of Electrical Engineers, a paper on "The Use of Large Gas-Engines for Generating Electric Power," the joint production of Messrs. Leonard Andrews and Reginald Porter, was presented. It gave the results of an attempt to compare gas-engines with steam-turbines for central station work.

For the purposes of their comparison, the authors endeavoured to show what would be the respective total cost of generating power by steam-turbines and by gas-driven generators under certain assumed conditions. In the scheme it was assumed that the maximum load to be dealt with was 8000 kilowatts; that the overload and stand-by capacity of the plant would be such as to carry the maximum load of 8000 kilowatts for at least two hours should any portion of the plant break down at the time when one unit was laid off for overhaul; that the power generated was utilized for public and private lighting and for tramway and general industrial motor load; that the load factor was 24 per cent.; and that the efficiency of distribution was 80 per cent. It was further assumed that the cost of good bituminous slack of a calorific value of 13,000 B.Th.U. per pound was 12s. per ton delivered at the generating station. As it was impossible to estimate the cost of obtaining a site with a plentiful water supply, the authors based their comparisons upon the assumption that cooling-towers would be used in conjunction with a public water supply.

A convenient lay-out for the steam plant, as well as a corresponding one for the gas plant, was illustrated. For the former the authors assumed that steam-turbines of the horizontal type would be used, directly coupled to three-phase generators, and that each turbine would exhaust into a separate contra-flow surface condenser placed directly below the turbines. The cooling water would be obtained from a town supply and circulated by electrically driven centrifugal pumps through natural draught cooling towers; a separate pump being used for each unit. For the gas plant the authors supposed the engines to be of the slow-speed four-cycle double-acting tandem type, directly coupled to overhanging fly-wheel three-phase generators. The cooling water for the engines would in this case also be obtained from a town supply, and circulated by means of a small pump driven from the engine crank-shafts; the water being cooled in natural draught cooling-towers.

For a maximum output of 8000 kilowatts, the authors considered that the most economical arrangement of units for the steam plant would be five sets, each having a normal capacity of 2000 kilowatts, with an overload capacity for two hours of 33½ per cent. In the event of two sets being laid off simultaneously, the remaining three would be capable of supplying the maximum demand for two hours. The output of gas-engine units, it was stated, was limited to about 1500 B.H.P. per cylinder; this being the largest size yet made. Four such cylinders, arranged in twin tandem, would give a combined output of 6000 H.P., or (say) 4000 kilowatts. For the gas scheme, the authors did not think it advisable to use even such large units as 2000-kilowatt sets, since the overload capacity of gas-engines is only 10 or 12 per cent.; and consequently three 2000-kilowatt sets would only be able to deal with a maximum demand of 6600 to 6700 kilowatts, and six units of this capacity would therefore be required to deal with the specified maximum demand and provision for stand-by. A more economical installation, it is considered, would be seven generators, having a normal capacity of 1450 kilowatts each and an overload capacity of 1600 kilowatts. With such an installation, if two generators were laid off simultaneously, the remaining generators would be able to deal with the full maximum demand of 8000 kilowatts for two hours, as specified.

In dealing with the question of sulphate of ammonia recovery plants, the authors called attention to the following points, which they said should be taken into consideration before adopting such plants: (1) The first cost of the recovery plant, particularly for small sizes, is much greater than the first cost of non-recovery plants. (2) Considerable extra labour is involved in operating these plants. (3) The purchase of sulphuric acid, of which approximately 1 ton is required for every ton of sulphate of ammonia turned out, is a heavy item. (4) The yield of heat units per ton of coal is slightly less if sulphate of ammonia is recovered than the yield from non-recovery plants. (5) The extra cost of repairs and the cost of handling and packing the bye-product absorb some of the profits effected by the recovery process. Experience up to the present, the authors stated, appeared to indicate that it is not worth while to attempt to recover sulphate of ammonia unless the total output of the plant is greater than 2000 H.P., and then only on an exceedingly good load-factor. For a maximum output of 8000 kilowatts, the authors thought it would probably pay to put down ammonia-recovery plant, even for so poor a load-factor as 24 per cent. For the particular conditions under consideration, it was recommended to use eight producers

of which four would be equipped for the recovery of ammonia and the remaining four for non-recovery.

The total capital cost of the respective steam and gas plants for the specified maximum load of 8000 kilowatts was estimated as follows: Steam plant, £139,525, about £13 19s. per kilowatt installed; gas plant, £176,875, or about £17 13s. 6d. per kilowatt installed.

The authors then passed on to investigate at considerable length the question of the running costs for the two plants. They stated that various tests on gas-engines of outputs ranging from 500 to 5000 B.H.P. showed that the actual consumption of fuel per unit generated, exclusive of no-load losses, was approximately 1 lb. per kilowatt-hour for any output from no-load to full load. The fuel required for banking the producers, it was stated, was only a small fraction of that needed for banking boilers. The heat radiation from the producer was also small, and the producers in the estimate were guaranteed not to exceed 50 lbs. of banking fuel per hour per producer. In the case of the steam plant, as four 10,000 lb. boilers were required for each 2000-kilowatt unit, the coal for banking these boilers would, it was estimated, be at least 448 lbs. per hour per plant unit. For both the steam and the gas plant, the authors added 25 per cent. to the ascertained fuel consumption under test conditions, to cover the contingencies met with in practice, such as variations in the quality of fuel supplied and so forth.

For a maximum demand of 8000 kilowatts, a load-factor of 24 per cent., and a distribution of 80 per cent., the units generated per annum would be 21 million. From curves given in the paper, it was shown that for a 2000-kilowatt turbo alternator the steam consumption per unit generated was 15.5 lbs., or, assuming an evaporation of 8:1, 1.94 lbs. of coal. From the same curves it was shown that the no-load losses—viz., the amount of fuel required to run the generators at full electro-motive force on open circuit, and with all auxiliaries, including exciters, for a plant of this size—amounted to 900 lbs. per hour.

The maximum total engine hours—the hours when the engines are running light and doing no work—would be 35 per day, or (say) 12,800 hours per annum; and the banked boiler hours would be 46 per day, or (say) 16,800 per annum. The total annual coal consumption for the steam-turbines was given as 23,330 tons, or 3.55 lbs. per unit generated; the over-all thermo-dynamic efficiency being 7.4 per cent. For the gas-engine station the total no-load engine hours should be 17,450 per annum, and the banked producer hours 35,000 per annum. The total coal consumption for the gas plant was therefore 20,465 tons, or 2.18 lbs. per unit generated; the over-all thermo-dynamic efficiency being 12 per cent. It was estimated that approximately 71 per cent., or 14.58 tons, of the total coal consumption would be gasified in the ammonia producers, and would yield at least 586 tons of sulphate of ammonia, the sale of which at £11 per ton would bring in £6446 per annum; but the cost of sulphuric acid and bags for packing reduced this figure to £5524.

The total cost for generating 21 million units of electricity, including interest and depreciation at 10 per cent., was given as follows: Gas, £33,523, or 0.383d. per unit; steam, £43,668, or 0.498d. per unit. Allowing 6½ per cent. for interest and depreciation, the total cost was: Gas, £26,900, or 0.306d. per unit; steam, £38,428, or 0.438d. per unit.

The conclusions arrived at by the authors may be briefly summarized as follows: While they believe there is an important field for the use of large gas-engines for driving electric generators, they do not consider there is at present justification for the suggestion that has been made that the internal combustion engine will in the early future be used to the exclusion of the external engine; the former being very much more economical than any external combustion engine yet known. The capital cost of a gas-engine and producer installation is greater than that of a steam-turbine and boiler installation of equivalent overload capacity. There is no material difference in the reliability or in the cost of labour, stores, and repairs of the respective systems. In cases, therefore, where the cost of fuel is low and the load-factor is low, it is generally a mistake to use gas-engines. On the other hand, where the load-factor is high or the cost of fuel high, there can be no doubt whatever that gas-engines will prove by far the cheapest prime mover for driving any form of electric generators.

A Weighty Argument.—For inventive capacity, "Meteor" of the "Electrical Times" may be strongly commended. He refers to the London Fire Brigade returns; and makes an oblique allusion to our editorial article on the subject (p. 13). Then he tries to pad-out the returns of fires occurring in connection with gas through negligence. This is the result of his efforts: "By the way, what of the 135 cases of children playing with matches? We should much like to know how many of these cases occurred in the summer months when in most houses coal-fires are not lighted at all. We believe that at least 100 of them are the result of using gas and gas-stoves, whilst the remainder are perhaps due to using coal-fires. The final conclusion to be drawn from the report is that there were about 450 ordinary fires due to the use of gas, and that 130 fires occurred where electric light was used, most of them in spite of its comparatively greater safety as ingeniously admitted by the managers of gas-works." Cannot "Meteor" put a few of the fires down to "father's bad habit of smoking?"

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Croydon Gas-Works.

On Saturday afternoon last a visit was paid by members of the London and Southern District Junior Gas Association to the Croydon Gas Company's works at Waddon. On arrival, they were met by Mr. J. W. Helps, the Engineer and General Manager, under whose leadership the tour of the works was subsequently made. There was much to be seen, and a great deal to be explained; but the visitors did the one thing thoroughly, while the other was equally thoroughly carried out by Mr. Helps and those of his assistants who also acted the part of guides—namely, his son Mr. Maurice Helps, Mr. F. J. Harrison, Mr. J. A. Brentnall, and Mr. S. Ringham. The full illustrated descriptions of the different sections of the works that have appeared from time to time in the pages of the "JOURNAL," must have prepared those of the members who had studied them for a treat. But however great their expectations may have been, it is quite safe to say they were not disappointed. The Croydon Gas-Works are a model in many respects; but perhaps the point about the section most recently laid down that was chiefly commented upon by the members was its attractive appearance. There is no unnecessary ornamentation about the buildings; and they are arranged so as to allow of grass plots being placed between. The grass here flourishes exceedingly; and when to this feature is added that of scrupulous cleanliness, it becomes easy to understand the enthusiastic remarks of the visitors. This section of the works, it may be pointed out, was described in detail, and illustrated by a large number of photographs, in Vol. C. of the "JOURNAL" (pp. 623, 698).

Before making a start with the inspection, Mr. Helps gave the party a few particulars with regard to the works, indicating some of the features which he considered called most for attention. He said that the works were divided into two sections. The old section was capable of producing about 4 million cubic feet of gas per day; and instead of enlarging this, they decided to build a new section to make another 4 million cubic feet. This new section was now at work; and they hoped at an early date to complete the entire remodelling of the old section, on which work had already been commenced. The visitors would proceed first to the old section, where, however, it would not be necessary to spend much time, except in No. 2 retort-house, which was in process of reconstruction. There had just been put down 15 settings of tens; and it was intended to use West's compressed air machinery for charging and discharging. The whole of the coal breaking and elevating and coke-handling plant would be driven by electrical power. There had been put down two 120 H.P. gas-engines by the National Gas-Engine Company, and two 50 kilowatt dynamos. The coke conveying plant would be on the principle of an electric crane overhead picking up the coke in skips, and putting it into hoppers, after which it would drop on to a conveyor and then be properly screened. The new section now at work comprised one retort-house—No. 3—having 29 settings of eights, with West's compressed air machinery, and conveying plant on the De Brouwer principle which was driven by gas-engines. The coke plant took the coke to the store, to loading hoppers, or to the carburetted water-gas plant, as desired. When made, the gas was first passed into two Colman "Cyclone" tar separators. These took out all the heavy tar; and then the gas, while still on the vacuum side, was passed through a Livesey washer which contained carburetted water-gas tar—the object being to take out some of the naphthalene, but more especially to pass forward in the gas certain light oils which boiled at about the same temperature as naphthalene, so that when the gas went into the water-cooled condensers, and was brought down to about 60° Fahr., the naphthalene and light oils fell down together, and thus trouble was prevented. They had had no difficulty with naphthalene while this system had been in operation; but just lately, when they wanted to clean out the Livesey washer, and had to shut it off for a week, stoppages immediately began to take place. This showed that the system was really a useful one. Afterwards the gas was pulled through the exhausters, and went back to the condenser-house, where it passed through two more Livesey washers, and then through two Kirkham, Hulett, and Chandler "Standard" washers, from which it travelled to the purifiers. They would not, of course, expect him to explain to them all the different processes, but merely to indicate those points in which perhaps their practice at Croydon somewhat varied from that at some other gas-works.

The first party was then led off by Mr. Helps, and passed at once through the old No. 1 retort-house, which was the first one built when the works were removed to Waddon in 1866, and in which direct firing was employed. This, of course, is out of action now. The next house—No. 2—was a similar one; but, to accommodate the new conditions, it has been made 20 feet higher and 12 feet wider. The two engines and dynamos referred to by Mr. Helps will supply all the electricity required about the works. The building which contained the old sulphate plant is also under condemnation; and in its stead there will be erected lavatories, mess-rooms, &c. It was explained by Mr. Helps, when proceeding through the new section, that everything throughout was in two 2 million cubic feet units, rather than one of 4 million feet. This was a plan which had been advocated by other engineers; and he felt convinced that it was the right one. Much interest was excited by the house which contains—after the Continental

practice—the condensers and washer-scrubbers. By this means, it was explained, an equable temperature was secured; and very much better working resulted. Attention was drawn to the fact that there are no seals in this house. Everything drains to seal-pots outside; these being emptied by a simple vacuum arrangement, the idea of which Mr. Helps got from Tottenham. Among other things, the light oils with the naphthalene run down to these seal-pots. The sulphate of ammonia plant is provided with a centrifugal dryer, with the aid of which Mr. Helps produces sulphate containing no more than 1 per cent. of moisture. By means of a push-plate conveyor, the sulphate is taken overhead along the store; and it can be deposited in any spot that may be desired. Passing round the end of the new section, the visitors saw that of the last 10 acres of land purchased a good proportion is still uncovered; and on this the employees are privileged to enjoy cricket, tennis, and bowling.

A visit was paid to the carburetted water-gas house, in which are installed four sets of Humphreys and Glasgow apparatus; and in connection with this plant it was stated that an arrangement of the firm named for purifying the blast gases, which had been found to work successfully in some other places, was being installed. By this device, the gases, in passing up a series of pipes, are brought into contact with a spray of water, which carries down the "flyers"—small particles of coke and ashes, &c.; and the sludge which is the result runs away to a settling tank. Considerable interest was manifested in the Thorp and Marsh "Rotary" meter, having a capacity of about 200,000 cubic feet per hour (which is the station meter for the new section), and in the smaller similar meter which is used when the load falls below a certain figure. These meters, of course, take up a small amount of room. Indeed, the members were able to accurately measure the saving in space which is secured by installing them; for they were shown side by side a 60,000 cubic feet per hour "Rotary" meter and an 80,000 feet square station meter. The two boosting plants—De Laval turbines and Sturtevant blowers—were also minutely examined. By means of these, in winter time, for the evening consumption a pressure is put on equal to about 10 inches at the inlet of the governors. In the case of the supply to Caterham, the gas is sent direct at this pressure through one of the mains, and is governed down when it reaches that district. Passing through the valve-house, where the whole of the gasholders are regulated, the visitors next came to the extensive stove repairing shops. Mr. Helps finds there are objections to simply painting stoves after they have been repaired; and so he has put down an enamelling furnace, by means of which (as he clearly demonstrated by the large number of samples which were on view) he is able to turn old stoves into new. Above are the tin and lamp and brass shops (divided off from each other by clear glass partitions, which are an aid to efficient supervision), offices, &c.

It was here that Mr. Helps invited his guests to take tea with him, after which a few speeches were made.

The PRESIDENT (Mr. W. J. Liberty), in proposing a vote of thanks to Mr. Helps for his kindness in showing them round and for his hospitality, and also to his assistants for the trouble they had taken, remarked on the enormous district covered by the Croydon Gas Company—about 80 square miles. They found, he said, at these works the old and the new standing side by side—the latter giving them the very last word on gas-works construction. There they saw the embodiment of all the knowledge and experience of Mr. Helps, who had been at the helm for 25 years. It was to him that the credit belonged for all the improved and up-to-date methods they had witnessed. The capital charges of the Company, he noticed, were at a low figure per 1000 cubic feet; and this proved that they were visiting a good gas-works. Thirty years ago, when he knew the district intimately, the question of the purchase of the works was discussed by the Local Authority; but they never came to terms—a result for which the consumers must be thankful. Since the Association had last visited the works, the Company had adopted co-partnership; and as a firm believer in this principle, he was delighted that they had done so. They were very grateful to Mr. Helps for having devoted his Saturday afternoon to them. There were many instructive things to be seen; and he had been particularly struck by the vacuum process for emptying the syphons.

The SENIOR VICE-PRESIDENT (Mr. W. A. Barnett), in seconding the vote, remarked that there were very few works they had been to where they had seen the last word in gas manufacture as they had at Croydon. Now that the Company had taken up co-partnership, he thought they had done everything that could be done both on the manufacturing and the commercial side. He had lately looked up a paper read by Mr. Thomas Travers, of Cork, in 1882, before the Gas Institute, on the subject of "Industrial Co-Partnership;" and it was surprising to see how many difficulties were then anticipated. Since that time, however, through the late Sir George Livesey, the idea had been brought to a successful issue in some works; and he believed it was likely to go forward making fresh converts. In fact, it must do so when once the advantages were thoroughly understood.

Mr. F. C. CANNING, in supporting the proposition, said they had all learnt something from the novel processes and new ideas they had seen. They had witnessed how gas manufacture could be carried on side by side with the greatest cleanliness and orderliness. Mr. Helps waged war against two things—against dirt and against naphthalene.

Mr. H. AUSTIN, one of the Workmen Directors of the South Metropolitan Gas Company, who also supported the vote, made

some spirited remarks in favour of co-partnership. He pointed out that in the case of his Company the dividend in a single twelvemonth to the workmen alone amounted to between £12,000 and £13,000; while they had received over £76,000 by way of dividend since the scheme was started.

The PRESIDENT, in putting the proposal (which was carried with acclamation), said that in 25 years the output of gas at Croydon had increased five times, and during the past ten years it had doubled.

Mr. HELPS thanked the members very much for the vote, and said it had been a great pleasure to him to receive them—though there were not many people for whom he would give up his Saturday afternoon. His assistants had also been pleased to do what they had, because they all felt honoured that the Association had selected the works for one of their excursions. Nowadays there was a great deal of competition; but they in the gas profession were not beaten yet. They were going to "keep their end up" for a long time to come. If the members had seen any ideas there which they thought were good, they were quite welcome to them. What was good for one works was good for the industry at large; and if any of them had got a good thing, they should let others benefit by it. Co-partnership had been in the air a good deal at Croydon lately. They were new recruits; but they were not new in looking into the question. Now that he had felt in a position to recommend it, the Directors had given the matter most careful consideration, and had adopted a scheme. At a meeting some time ago, when the resolution was put about co-partnership, every man's hand went up in favour of it, and it was received with acclamation. On the previous night, they held their first Co-Partnership Committee meeting; and a very pleasant episode occurred. A day or two before, he had had a bronze bust of Sir George Livesey sent down to him by the sculptor, who asked if they, as a co-partnership Company, would like to buy it. Well, at the meeting one of the Committee suggested that a photograph should be taken of the bust, and copies sold at (say) 6d. each, which would provide the money to buy the bust, and allow every man to have in his house a picture of the originator of their co-partnership system. The matter had not yet been before the Board; but he mentioned it as an interesting episode. When he joined the Company, the make of gas was 270 millions; he thought this year the output would be between 1300 and 1400 millions. The business had therefore grown; and in spite of the money that had been spent, the capital, which when he came there was over £8 per ton of coal carbonized, was now only just over £5 per ton. When he and his assistants heard the compliments that had been paid to the works, they felt more than repaid for any trouble they had taken in showing the members round. He hoped at some future date—when they had remodelled the old section—to have the pleasure of welcoming the Association there again.

STRESSES AND STRAINS IN GIRDER WORK.

The Association of Engineers-in-Charge, at their meeting last Wednesday, had read to them by the Vice-President, Mr. Henry Adams, a valuable paper, illustrated by numerous lantern slides, on the subject of "Stresses and Strains in Girder Work," in which the author commenced by describing the true use of the words "stresses" and "strains."

He said it was interesting to note that from the time of the Britannia Tubular Bridge, 1845, when the theory of stresses first received general attention, to about the year 1880, it was customary to speak of the stresses in girder work as strains; so that Mr. F. Wentworth Shields' book on "Strains in Ironwork," and his own lectures to the Society of Engineers, with the same title, which dealt solely with stresses, did not at that time seem improperly named, as draughtsmen were in the habit of describing their preliminary work in designing a bridge as "taking out the strains," and as many of the leading "iron-men" in the various railway engineers' offices were old students of his, he was afraid he must be held responsible for helping to keep up the misnomer. However, in the lectures he had referred to, he gave a full description of the true use of the terms; and this he recapitulated as follows: "By a load on any member of a structure is meant the aggregate of all the external forces acting upon it, including the weight of the member itself, and of other parts supported by it; by a strain is meant the change of form produced in a piece by the action of a load; and by a stress is meant the resistance set up in the material, by its molecular forces opposing the action of a load in producing a strain. Thus the strength of a piece in a given position may be such that a load of so many pounds produces a stress of so many pounds per square inch; the result being a strain, or change of form of a certain amount, whether temporary or permanent, and, when large enough, appearing as stretching, shortening, bending, crumpling, or twisting. The term strain is commonly used instead of stress, and is usually meant as such when we speak of the calculation of strains; so that, though we may use this term as an ordinary office phrase, we must bear in mind the distinction when we make a systematic study of the subject." The various kinds of strain that may come upon a structure, he said, are: Tension—stretching, pulling, and tearing. Compression—crushing, pushing, and squeezing. Shearing—cutting and nipping; or when acting along the grain of wood it is called detrusion. Transverse

strain—cross strain, bending, and deflection. This strain may be resolved into tension, compression, and shearing. Torsion—twisting and wrenching. This strain is a form of shear belonging almost exclusively to machinery. Buckling or crumpling is a compound strain made up of crushing and bending.

Referring to the subject of bending moments, the author said that a bending moment is the effect of a load, or its reaction at the supports, multiplied by the leverage with which it acts. In other words, it is the active part of the calculations, or the effort, as distinguished from the resistance due to the nature of the material and the disposition of its parts. The bending moments, however, he added, do not tell us all the action that is taking place. We have also to take account of shear—a matter which does not always receive due consideration. Many of the failures in early ferro-concrete work were due to the neglect of shear; and only recently the question of shear in masonry dams has been subject to investigation by many distinguished men.

GAS AT THE NURSING EXHIBITION.

Where there is a prospect of business resulting either directly or indirectly, there are the Gaslight and Coke Company to be found; and it is, under these circumstances, not surprising to find that they were represented by an excellent show of gas lighting and heating appliances at the Nursing Conference and Exhibition, which was held last week at the Grafton Galleries, Bond Street, W. Such an occasion promised a first-rate opportunity of impressing upon those connected with the medical profession the hygienic and collateral advantages of gas; and full advantage was taken of this by the provision of a plentiful supply of up-to-date, attractively prepared literature. So far as could be seen, the only gas in the exhibition was to be found at this stall; and it is therefore all the more pleasing to record that the display made by the Company was a good one in every respect.

All the lighting was on the inverted system; the fittings being of artistic design, by Messrs. Messenger and Son. The doctor's bracket—which is made to move in any direction, and is provided with an incandescent burner and a powerful reflector—also found an appropriate place upon the stall. As to water-heating appliances, there were to be seen a Wilsons and Mathiesons circulator for attachment to existing hot-water systems, geysers of the Ewart and Maughan type, a Richmond "Avon" heater for a hand-basin, to give a constant supply of hot water, and a neat looking little Ewart lavatory apparatus fitted with an overhead spray. Cookers were represented by Sugg's new pattern "Westminster" stove. There were also a very neat Fletcher enamelled grill, white inside and blue outside, and a Richmond nickel-plated hot-plate for toasting and boiling. There was an excellent show of fires, including Richmond's nursery pattern, with a boiling-burner at the top for a kettle, so as to save labour in going up and down stairs for hot water; the same firm's "Assyrian" drawing-room fire; Wright's new pattern "Thermo" fire-front stove; and a selection of Parkinson's, Davis's, and Main's bedroom fires. An air of completeness was given to the stand by the display of attractive copper culinary utensils.

Midland Association of Gas Managers.—We are asked by the Hon. Secretary (Mr. Harold E. Copp, of West Bromwich) to announce that the spring meeting of the Midland Association will be held at Longton on Thursday, the 20th prox.

The Malam Family.—In the obituary notice of Mr. George Malam, of Dumfries, which appeared in the "JOURNAL" for the 6th inst., it was stated that his father was a native of Yorkshire. Referring to the matter, our Scotch Correspondent writes: The Malams seem to have been early a family of inventors in gas appliances. A friend has just told me that there is an invention known as "the Malam wheel" in connection with gas-meters. I suppose this is the invention which is described as having been brought out in 1817 by "the very ingenious John Malam." It is described as "an instrument for measuring gas, which undoubtedly led to the construction of meters so universally employed and so justly appreciated." The publication from which I am quoting goes on to say: "However, Malam, from some unaccountable cause, never patented his invention; and as early as 1818 Clegg and Crossley abandoned their mode of constructing meters for that invented by the first-named gentleman. On the occasion of his meter being presented by Malam to the notice of the Society of Arts, Clegg asserted that it had been copied from him. This serious charge was investigated by a Committee of the Society, who ultimately, after great deliberation, gave their verdict in favour of Malam, by awarding him their gold medal 'for his invention of a gas-meter, new, ingenious, superior to all others, and likely to be of great benefit to the public.' The extraordinary originality of inventions since displayed by Malam has confirmed the decision of the Society of Arts." I find in the "Mechanic's Magazine," published on Oct. 11, 1823, in the list of new patents, there is the entry: "To John Malam, of Wakefield, Yorkshire, engineer," for his mode of applying certain materials, hitherto unused for that purpose, to the construction of retorts and improvements in other parts of gas apparatus.—18th August." So that, assuming the John Malam mentioned in both publications to be the same, it would appear that the lesson he received in connection with his meter invention was not without effect when he came to bring out another.

VALUATION OF COAL-TAR PITCH.

At the recent Annual Meeting of the Manchester Section of the Society of Chemical Industry, Mr. W. H. Coleman read a short note on this subject. According to an abstract in the "Chemical Trade Journal," he referred to the lack of precision in the methods of testing at present in use, and described a method for determining the "dropping-point" of pitch, which, according to the results arrived at by different experimenters, certainly showed a great improvement with regard to accuracy, and eliminated to a great extent the personal equation.

In the discussion which followed, Mr. Clayton said the present methods of testing tar products were extremely unsatisfactory, considering the large extent of their manufacture. For instance, the average briquette manufacturer bought his pitch as cheaply as possible, and then used 9 per cent. of it, irrespective of its origin, taking no account of the free carbon present. He said he should think it would be to the manufacturers' interests, when buying pitch, to adopt some method of testing it. Dr. Bailey asked if the speaker would detail some of the distillation methods of testing pitch. In replying, Mr. Coleman said one of the problems was to ascertain the amount of solid matter deposited at a definite temperature by creosote. It was possible to find this out by using creosote containing some other body, the amount of which could be easily ascertained; and he instanced tar acids. Dr. Skerrow suggested that the delegates at the Seventh International Congress of Applied Chemistry, to be held next month, should deal with the standardization of the existing methods of testing pitch. Mr. Hermann asked if it did not seem that the pitch had to be made too soft before the result could be arrived at by the new method. For instance, in testing a pitch to be used for road-making, this would, in his opinion, be the only drawback to the test. Dr. Bailey questioned whether it was not possible for someone to invent a method so that the same results from the experiments might be obtained at the ordinary temperature. Replying to Dr. Bailey, Mr. Coleman said his suggestion was a good one; but as pitch when cold was extremely brittle, he was doubtful whether the tensile strength could be properly arrived at. In regard to the pitch test for road-making, he felt he could rely on the results obtained by the method described.

ELEVATED WATER RESERVOIR AT CALCUTTA.

In the "JOURNAL" for the 26th of January last, we recorded that Messrs. Clayton, Son, and Co., Limited, had secured the contract, at a price of £91,367, for a huge steel tank for the supply by gravitation of water for domestic and other purposes to Calcutta. The special feature of the tank is that it will stand at an elevation of 90 feet above the ground level, and be supported on steel trestles. It forms an important constituent of a scheme of improved water supply for the city devised by the Chief Engineer to the Municipality (Mr. W. B. MacCabe, M.Inst.C.E., formerly Chief Water Engineer to the Dublin Corporation) by which provision is made for a present delivery of 30 million gallons per day, and an ultimate addition of 10 million gallons. As the structure above referred to is the largest steel water-tank in the world, it may be of interest to give a few more particulars concerning it, from a report furnished by Mr. MacCabe to the Corporation when he proposed his scheme.

In the first place, Mr. MacCabe explains the necessity for the erection of the tank, and then offers a few remarks on the functions it will discharge. As already mentioned, the scheme provides for an ultimate supply of 40 million gallons per day, and, were it possible to deliver this quantity to the consumer at a uniform rate throughout the 24 hours, there would be but little difficulty in the distribution of the water, as the pumping machinery would be arranged to work at one constant head and speed. As a matter of fact, however, the demand varies within very wide limits; for it fluctuates from a rate of (say) 7½ gallons per head at night time to about 75 gallons per head during the hours of maximum demand in the day. This high degree of fluctuation between the minimum and maximum demand renders it also necessary to provide for an exceedingly elastic method of supply, which must be capable of varying automatically with requirements. The present system of pumping direct into the mains is singularly inelastic, and cannot satisfactorily cope with the maximum demand; and the result has been that the supply fails just at the moment when the need for it is most urgently felt, while it is copious during the night hours when the demand is at a minimum. The high degree of elasticity required can only be secured by the force of gravitation, which, provided that the system is designed to meet the maximum demand, will automatically adjust itself to anything short of the maximum.

From what has been said, it will be clear that both the requirements of an adequate reserve and of elasticity can best be satisfied by creating a reserve at a sufficient elevation to supply the whole city by gravitation. Were there natural hills or high ground within reasonable distance, reservoirs could be constructed at a sufficient height for the purpose, and of sufficient capacity to balance the difference between the average supply and the maximum demand. Unfortunately, the absence of any natural eminence in the neighbourhood of Calcutta rendered it necessary to construct an artificially elevated reservoir.

In considering the dimensions of such a reservoir, it was desirable to provide for future maximum requirements, which during the four hours of maximum demand would amount to 16·5 million gallons. Of this quantity, 6·6 million gallons would flow into the underground reservoir—leaving about 10 millions to be provided as storage. The underground reservoir contains 8 million gallons; but as it is necessary to retain a reserve in case of accidents, not more than 3 million gallons could be counted upon from this source. It was thus necessary to provide storage in the raised tank for at least 7 million gallons. In order to leave a margin of safety, its capacity was fixed at 9 million gallons.

It now remains to describe the construction of the work. Briefly, the reservoir consists of a steel tank 15 feet deep and 321 feet square, supported on steel columns; the height from the top of the tank to the ground level being 110 feet. It is divided into four compartments which can be used independently of each other, so that one or more can at any time be thrown out of use for repairs or cleaning, without any interruption in the supply of water to the town. The bracing is of special design, enabling a considerable saving in weight of material to be effected without any loss of strength. Provision for expansion and contraction is made by leaving the bottom flexible, so that the only effect of changes in temperature will be that the slight sagging of the bottom, which will take place between each pair of the supporting joists, will slightly increase or diminish as the temperature rises or falls. This will eliminate all tendency to "creep;" and it is claimed that this is the cheapest and most effective way in which this could be done. The 60-inch pipe which will act both as an inlet and an outlet pipe, will be fitted with an effective expansion joint, to prevent straining of the pipe or bottom of the tank.

To protect the water from possible contamination and to keep it cool, the tank will be provided with a flat terrace roof, consisting of 2½ inches of fine concrete carried on slates laid between steel rafters, which in their turn are carried on steel joists supported by steel columns from the bottom of the tank. To make the roof water-tight, a sheet of Callender's bitumen will be laid over the whole area between the slates and the concrete; and to prevent birds entering the tank through the ventilating spaces, all means of ingress will be closed by brass wire netting of small mesh. The maximum load on each vertical member of the substructure of the tank will be 200 tons; thus giving a maximum load of 800 tons on each of the sets of four braced verticals. Under each vertical member is a shoe for distributing the load, and reducing the weight per square foot on the surface of the concrete under each vertical member to 6 tons per square foot, which is quite safe for reinforced concrete. The load on the soil under the concrete foundations will only be about 0·6 ton per square foot, which leaves a large margin of safety even in bad ground such as exists in Calcutta.

The important matter of the foundations of the tank naturally received much attention. The site contains a number of old tanks. Those which are beneath the foundations are to be emptied, piled, and filled in; while those on or near the edge of the foundations are to be piled where necessary and filled in, and a retaining wall constructed to prevent any lateral displacement of the soil. The west side of the foundation, next the existing Tallah reservoir, is also to be piled throughout its length. The foundation itself is on the grill reinforced concrete system, and consists of a bed of concrete 2 ft. 6 in. thick, reinforced at its base with a system of flat ties which cross each other at right angles beneath the supporting columns of the tank. Near the surface of the concrete bed, steel joists are to be built in, corresponding exactly to the flat ties below; and upon these joists the bases of the columns will rest. The whole foundation forms a system of which the ties become the lower or tension members, and the joists and concrete take up the compression, and spread the weight over the whole area of the foundation. As an additional precaution, a dwarf wall is to be constructed completely surrounding the tank, extending from the surface of the concrete foundation to a depth of about 4 feet below the level. This wall will be of concrete, reinforced with expanded metal, and will form the outer edge of the foundation, which is a costly one, as the whole of the concrete will be in cement. But, in view of its paramount importance, and the known deficiencies of the soil of Calcutta, the expenditure is considered to be justified.

The Gas-Mantle Industry.—According to a paragraph in the Engineering Supplement to "The Times," the manufacture of incandescent mantles in Germany reached its highest point in 1906-7, and has recently declined, owing to the fact that England, France, the United States, Italy, Austria, Russia, and other countries have established factories. The industry, however, is still to a great extent in German hands, and the majority of the more important factories are established near Berlin. Competition between German manufacturers has brought down the prices of mantles until it now seems impossible to supply a really good article at a lower figure; but the difference between a first-class mantle and one of an inferior quality is very marked. At present the maker who uses only the best material and the most skilled labour, in order to supply a good article, suffers, because the public do not understand the nature of this difference in quality. The annual production of mantles for the whole world is distributed as follows, the figures referring to millions of mantles: Germany, 100; America, 55; Great Britain (including the Colonies), 35; France, 15; Austria, 3; Italy, 2; Belgium, 2; Russia, 1.

REGISTER OF PATENTS.

Gas Cooking-Stoves.

DAVIS, H. N., of Luton.

No. 4656; March 2, 1908.

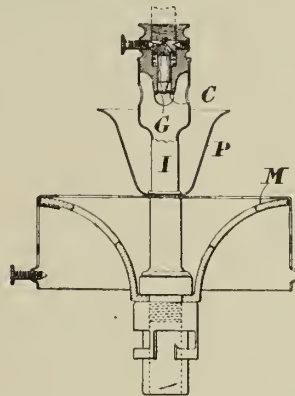
In cooking-stoves as at present in use, the gas and air are supplied to the oven (the patentee points out) either from the outside or inside; but he proposes to fix the gas and air regulator in a recessed position and flush with the outside of the cooker, and fix the pipe of the gas supply, which passes through the regulator, on the inside of the oven-frame—the air being supplied from the outside, and regulated by an air-shutter.

Inverted Incandescent Gas-Burners.

WEBBER, J., of Salford.

No. 7221; April 1, 1908.

Upon the end of the ordinary gas pipe or conduit is attached a valve fitting for controlling the flow of gas to the burner, by a conical needle or pointed part C forming the lower end of the sliding-piece in the valve casing. Into a slot in the head of the sliding-piece there projects a pin on the end of a finger screw or stud which passes through the valve casing. The valve seat is provided by the washer or disc attachment G. The sliding-piece, having the pointed valve part C



Webber's Inverted Gas-Burner.

formed at its lower end, is normally held up to an abutment peg by a spring which is forced down when adjustment is effected by the screw. Grooves are formed along the sliding-piece to permit of the passage of gas. The lower end of the valve fitting has secured to it the bunsen tube I provided with the usual mixing-chamber, with its wire gauze or other screen therein for effecting mixing the gas and air.

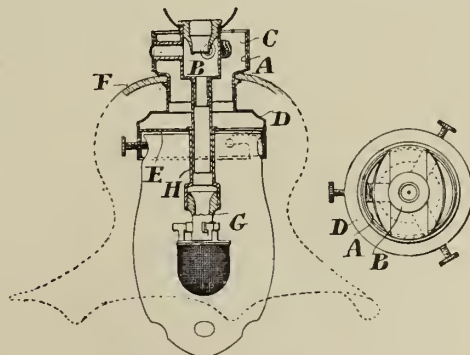
The mantle-carrier, screwed on to the lower end of the bunsen tube, serves also the purpose of supporting the cone M (of china or other material) for the deflection of the light from the mantle. The cone is provided with apertures for allowing the hot gases to pass to and heat the tube I and its contents, and supports an ornamental globe-carrier. An ornamental fitting P on the bunsen tube at or about the position shown shields the air-inlet apertures from the hot rising gases.

Inverted Incandescent Gas-Lamps.

ZECHNALL, L., of Bunhill Row, E.C.

No. 10,321; May 12, 1908.

According to this invention, the lamp consists of an upper member having the usual gas and air mixing-chamber; separate passages being provided for the inlet of fresh air to the mixing-chamber and for the escape of the products of combustion respectively. A bunsen tube projects downwardly from the mixing-chamber, and a carrier is detachably secured to the upper member for supporting the globe surrounding the mantle. Means are also provided for removably attaching a shade or reflector to the upper member. The arrangement is such that the products of combustion pass up in a space formed between the bunsen tube and the shade-carriers, and made of such length as to enhance the draught.



Zechnall's Inverted Gas-Lamp.

In the form shown, the lamp consists of an upper cylindrical member A within which is disposed the air and gas mixing-chamber B so as to form an annular space C between them. The mixing-chamber is supported in a concentric position by tubular arms, through which the air supply to the mixing-chamber is led in the usual way; the fresh air

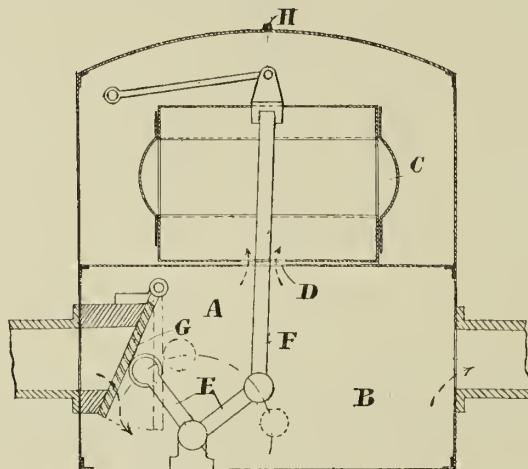
supply being isolated from the annular space C through which the products of combustion escape. An air-regulator is slidably mounted on the outside of the member A; and the lower part of the upper member A is made of reduced diameter and adapted to support a removable gallery D, provided with bayonet slots for receiving and supporting the globe-carrier E. The upper part of the gallery also serves to clamp a shade or reflector F between it and the underside of the upper member. In this form, the globe-carrier is also adapted to carry the burner-nozzle G; being provided with a central downwardly extended tube H, the lower end of which is fitted with the nozzle G, upon which the mantle is hung, and which tube slides over the bunsen tube for a suitable distance when the parts are assembled. By this means the globe-carrier tube, burner-nozzle, and mantle can be readily detached from the gallery or replaced thereon without interfering with the shade. The space between the bunsen tube and the parts A and D provides a flue for directing the products of combustion, so that on being discharged from the top the gas does not discolour the exterior of the fitting. The flue also provides a means for improving the draught and, consequently, the efficiency of the burner.

Gas Pressure-Controllers.

LANTONNOIS, G., of Ypres, Belgium.

No. 11,433; May 26, 1908.

This invention relates to a gas pressure regulator of the kind having a collapsible chamber actuating a regulating hinged door through levers and links; the essential feature consisting of a bell-crank lever arranged to oscillate on its elbow and one arm of which frictionally engages the hinged door, while the other arm is pivotally connected to the top of the collapsible chamber.



Lantonnois' Gas-Pressure Controller.

The chamber A contains gas under high pressure; and chamber B gas under low pressure. The bellows C (of leather) communicates with the chamber B through an opening D. When the pressure is lowered in the chamber B below the desired reduced pressure, the bellows will be flattened to a correspondent extent and cause the lever E to swing through the agency of the connecting rod F, thereby opening the door G to a small extent. The door will be closed again as soon as the pressure of the gas in the chamber B is brought back to the normal degree. A minute opening H provided at the top of the apparatus permits of the circulation of air during the operation of the bellows.

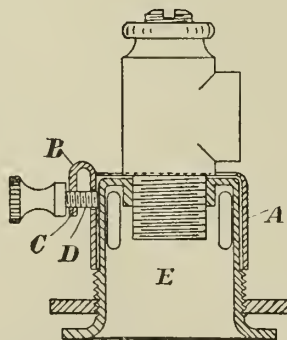
The desired reduced pressure is maintained at a constant degree in spite of the variations of high pressure and supply to the lower pressure conduct. The surface of the bellows and the lever E are calculated so that the door G cannot be opened unless the pressure in the chamber B is lowered below the desired reduced pressure, whatever be the high pressure acting on the door.

Air-Regulators of Bunsen Burners.

MAIN, R. B. & A. P., of Falkirk, N.B.

No. 12,838; June 16, 1908.

This invention relates to air-regulators for bunsen burners of the type in which a slotted or perforated sleeve fits around a slotted or perforated pipe or passage through which the gas supply flows; and it has



Main's Bunsen Burner Regulator.

for its object to provide a device for securing the sleeve regulator in any position in which it may be adjusted, while permitting of readily varying the adjustment.

The perforated or slotted sleeve A is formed with a projecting lug B, bent over to lie parallel with the body of the sleeve and tapped with a screw-thread at C. Through the tapped orifice a thumb-screw or screw-threaded pin D is passed; its point passing through a plain orifice in the sleeve and adapted to bear on the periphery of the inner pipe or tube E. After the sleeve is adjusted relatively to the pipe E to regulate the air supply, the screw is turned so that its end bears on the pipe; and by reason of the threaded engagement of the screw with the bent lug (which has a certain amount of spring), the lug is caused to bear against the head of the screw, and thus acts as a lock-nut. The thumb-screw D and lug B form a lever with which to turn the sleeve A.

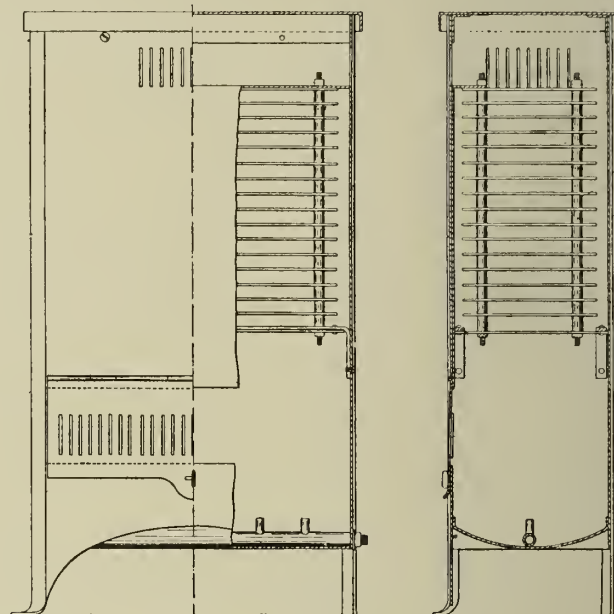
Gas-Radiators.

BERTHOLDT, C. R., of Norfolk Street, Strand, W.C.

No. 12,942; Dec. 9, 1908.

These radiators comprise a casing having a system of perforated baffle-plates in the upper part and gas-burners below.

The radiator casing is fitted inside with a system of flat metal plates or shelves formed with perforations. These plates are of relatively large area, as shown, and are spaced apart from one another and assembled together preferably by means of tubular-distance pieces and rods provided with nuts at the ends. The perforations in adjacent shelves are arranged so as to offer circuitous passages to the ascending heated air. The shelves are supported in the upper half of the casing by brackets or bridge-pieces, bolted to the lowermost plate and to the



Bertholdt's Gas-Radiators.

casing sides. The lowermost plate extends to the front, back, and sides of the casing; but all the other plates are made smaller so that a small space is left between their edges and the front, back, and sides of the casing, to prevent the ascent of the heated air from being too much retarded in the successive chambers formed between the plates by allowing air to escape from the chambers between the edges of the plates and the front, back, and sides of the casing, while also serving to prevent damage by overheating. In the lower half of the casing are arranged the gas-burners, and below the burners is a plate curved as shown, formed with a few perforations for the admission of air.

In operation, the air drawn in through the perforations in the curved lower plate is thoroughly heated in the lower half of the casing by the gas-flames, and the gas is thoroughly burnt in the hot atmosphere. The air then percolates through the perforations in the several plates; being continuously deflected, baffled, and retarded in its course, which ensures a most advantageous heating effect. The heated air finally escapes through apertures in the front and sides of the casing covered by a removable top.

Automatic Gas Regulators or Governors.

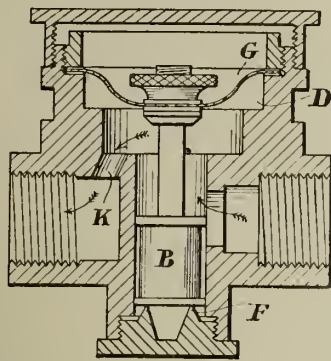
GOODSON, J., of Maze Pond, S.E.

No. 13,558; June 25, 1908.

This automatic gas-governor is of the kind described in patent No. 20,846 of 1906, wherein a piston valve and a controlling piston are connected with the valve. But, according to this invention, the controlling piston is replaced by a diaphragm, so that the friction is reduced.

As shown on p. 165, the barrel portion of the casing (with the inlet and outlet) is provided, as in the earlier patent, with a cylindrical valve-chamber formed transversely to the barrel, and receives the piston-like valve B—a small passage being formed through the valve so that the pressure in the valve-chamber above and below the valve always remains the same. The lower end of the valve-chamber is closed by a screw plug provided with a stop F having a circular knife-edge, which supports the valve when in its lowest position. Above the valve-chamber a co-axial diaphragm chamber D is formed for the reception of a diaphragm G, and communicating, through a separate opening K, with the outlet. The outer edge of the diaphragm is clamped gas-tight against an annular shoulder in the casing D by a ring which screws into the casing. At the centre a suitable strengthening or stiffening piece may be applied to the diaphragm, and likewise at the outer edge, to facilitate removal or insertion. By removing the cover ring and nut,

the diaphragm can be taken out or put in with equal facility; so that a worn-out diaphragm can be renewed.



Goodson's Automatic Gas-Governor.

In order to reduce friction, the middle of the valve B is turned to a smaller diameter than the ends, so that the surfaces in contact are as small as possible.

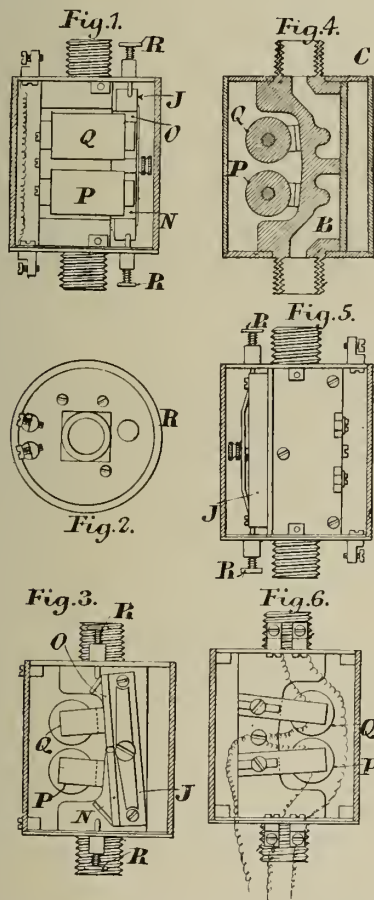
Electrically Controlled Gas-Valves.

BENARD, P., of Reims, France.

No. 13,772; June 29, 1908. Date claimed under International Convention, July 12, 1907.

This invention relates to apparatus for controlling electrically, from a distance or by hand, the opening for the gas-fed to gas-burners.

Fig. 1 is an elevation (the outer casing in section); fig. 2, a plan; fig. 3, an end elevation (the outer casing in section and the gas-check in the open position); fig. 4, a section of fig. 1; fig. 5, a rear view (the outer casing in section); and fig. 6, an end elevation, showing the connection of the wires.



Benard's Electrically Controlled Gas-Burners.

The apparatus comprises a metal chamber bent to horseshoe form, the interior of which forms two compartments B C separated by a partition. The compartments are connected, one to the inlet, the other to the outlet of the gas by threaded joints top and bottom. One side of the chamber is a smooth plate, ground and perforated with two slots corresponding to the two compartments B C. It carries a pivot on which oscillates a rectangular box J, perforated also with two holes registering with those in the chamber A. The two parts are held in contact by a plate spring, which serves to hold the two ground faces one against the other so as to ensure a tight joint. In one of the positions of the oscillator, the slots are superposed and effect communication between the compartments through the intermediary of the box J. In the second position the slots are covered up, and communication between the gas inlet and outlet is interrupted. The oscillations of the gas-check corresponding to these two positions are electrically effected by providing the oscillator on its lateral face with two armatures N O arranged respectively opposite the two poles of two one-legged electro-magnets P and Q placed in the recess formed by the metal block of horseshoe shape. When the electric circuit is closed through one of the two sets of wires, the current passes only through the electro-

magnet P, and the poles of the latter attract the armature N. In this position the feeding of gas to the burner is interrupted. When, on the contrary, the electric circuit is closed through the other set of wires, the current passes only through the electro-magnet Q, and the poles of the latter attract the armature O. In this position the gas may be fed to the burner.

Two spring knobs or plungers R, acting on the inclined planes placed at the two ends of the gas-check, allow of the oscillatory movement being produced by hand in case of insufficiency or failure of the electric current.

The advantages of the apparatus consist essentially in the fact that the inlet and outlet of the gas may be in any direction, and that the gas does not circulate, nor even penetrate, either in the casing or around the opening and closing members. Besides, the apparatus only requires a very weak current for its operation, and ensures a tight joint.

Gas-Fires.

YATES, H. J., of Aston, near Birmingham.

No. 15,783; July 24, 1908.

This invention has for its object to enable gas-fire heating apparatus to be employed in conjunction with an ordinary fire-grate "without the disadvantages hitherto experienced." The patentee proposes to make the grate or frame of the gas-fire of such a shape that it can be placed compactly against an ordinary fire-place. A rectangular frame, formed with a hollow back and adapted to fit over the fire-bars and canopy of the grate, is found most generally convenient; and along the two sides and the top of the gas-fire grate junction strips are secured and arranged to abut against the grate behind. To adapt the strips to any grate of ordinary type, they are made adjustable with respect to the gas-fire grate, or are hinged to it, and when in the required position are fixed by screws. For covering the gaps at the top corners of the strips, cap pieces are secured by screws; the strips being slotted to permit any required adjustment of the caps.

Gas Cooking-Stoves.

PIRRIE, W. H., of Great Winchester Street, E.C.

No. 18,037; Aug. 27, 1908.

This invention relates to gas cooking-stoves of the type in which a water-heater is provided in connection with the hot-plate. In such stoves, as heretofore constructed (the patentee mentions), the gas-burners have been placed as close as practicable to the hot-plate; but "if the burners are near enough to give a rate of heating similar to that obtained over an open burner, as in an ordinary gas-cooker, there is imperfect combustion of the gas, causing both danger to health and loss of heating efficiency." Also the rapid heating of vessels placed upon the hot-plate is seriously impeded by the great amount of heat taken up by the hot-plate by conduction. In addition, in stoves wherein the hot-plate is continuous in surface (spaces being left which are covered by the vessel to be heated or by a plate in the absence of a vessel), "imperfect combustion arises owing to there being insufficient passage for the heated products of combustion from the neighbourhood of the burners."

The claim for the present invention is for a gas cooking-stove in which a water-heater is provided in connection with the hot-plate having the gas-burners placed at such a distance below the hot-plate that the flame is not in contact with it; means being provided whereby the cooking-vessels, on being passed through the aperture in the hot-plate, can be supported over the burner at a suitable distance above the burners, and sufficient space being provided between the cooking-vessels and hot-plate to ensure sufficient natural draught. Flanges extend entirely round the vessel, which is provided with ribs or is perforated for supporting the cooking-vessels, so that conduction of heat from the cooking-vessel to the hot-plate and water-heater is avoided. The cooking-vessels are supported by flanged openwork cylinders; and means are provided for regulating the vertical distance between the gas-burners and hot-plate.

Pyrometers.

NORMA COMPAGNIE, G.M.B.H., of Wurtemberg, and KIRNER, J., of Stuttgart, Germany.

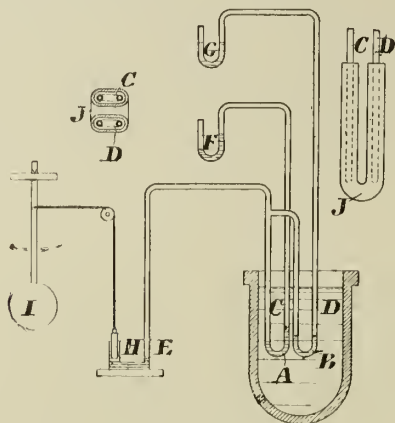
No. 27,245; Dec. 15, 1908.

In a pyrometer according to the present invention, the fusible substance employed does not require to be replaced, and therefore any desired number of measurements may be performed with a single charge, and, in addition, the temperature at any part of a furnace can be measured, it is said, without trouble. The inventors propose to enclose the fusible substance in communicating tubes within the furnace, and the process of fusion takes place in the tubes instead of, as heretofore, in the furnace itself. By this arrangement the saline matter may be repeatedly used over again. Combined with the feature just referred to, there may be provided means to render the change in the condition of the fusible substance more apparent.

In the preferred arrangement of a pyrometer constructed according to this invention, two sets of communicating tubes—i.e., two U tubes—are employed; the tubes or limbs on one side of the fusible substance being in connection with the means for imparting movement to the saline matter when it melts, and the other tubes or limbs on the other side of the saline matter being provided or in connection with separate indicating means on the outside of the furnace. When it is desired to maintain the temperature of a furnace between two given points, each U tube may contain saline matter of a different fusing point corresponding with the highest and lowest limit of temperature required in the furnace; and then, by maintaining the furnace heat so that the fusible substance in one tube is melted while the saline matter in the other tube remains solid, the required heat is ascertained.

The illustration on p. 166 shows a construction of the pyrometer, in which a varying air pressure is exerted on the saline body. A and B are fusible substances, the fusing points of which correspond with the limits of temperature desired in the furnace, in the bottom of U-shaped

tubes C D, one limb of each of which is connected with the pressure chamber E. Each of the other limbs of the tubes is connected with a pressure-gauge—for example, with transparent tubes F G filled with liquid. A varying air pressure is set up in the pressure-chamber by a plunger H arranged to move up and down in a second tube or cylinder in communication with the pressure-chamber and filled with some liquid. The plunger is operated by the pendulum I.



Kirner's Pyrometer.

The pendulum is set in motion, and the indicator tubes watched. When the liquid in communication with the fusible substance begins to move up and down, it necessarily shows that the body has liquefied, and, consequently, that the temperature has risen above the fusing point of the saline matter. When the liquid in one of the tubes ceases to pulsate, then the temperature to be measured has fallen below the melting point of the corresponding saline body. If it be desired to maintain the temperature of a furnace between two given points, the fusing point of the saline matter is made to correspond respectively to the highest and lowest limits of temperature desired, or *vice versé*. After the lowest temperature is exceeded, the liquid in the one tube which corresponds to the saline matter of the lowest fusing point will pulsate and indicate that the minimum temperature has been exceeded. To maintain the furnace at the desired intermediate temperature, the liquid of one tube should pulsate as described, while the other remains stationary to show that the highest temperature is not reached.

The tubes C D may be placed within protective tubes, a special advantage of which is that they do not have to be welded together. For this purpose, in the case of the present pyrometer, the protective tube may be simply formed of a tube J bent U-shaped; the communicating tube, charged with the saline body for the minimum temperature, being inserted in the one limb, and that for the maximum temperature in the other limb of the tube.

Incandescent Gas-Lamps.

STILL, E. H., of Charles Street, Hatton Garden, E.C.

No. 28,560; Dec. 31, 1908.

The objects of this invention are to ensure that the gas-nipple of (say) a railway carriage lamp having an inverted incandescent burner shall remain cool while the lamp is in use, and to enable such lamps to be adapted to be employed with inverted incandescent gas-burners.

The chimney described in patent No. 5031 of 1908 is formed above the reflector body with a lateral opening; and a mixing-tube (secured to the chimney by screws passing through curved lugs or ears) projects into the chimney, where it is downwardly bent, and is adapted to support an inverted incandescent gas-mantle. But according to the present invention, the outer end portion of the mixing-tube is approximately horizontal, and terminates opposite a gas-nipple carried by a tubular bracket fitting rigidly secured upon the upper side of the reflector. The gas supply-pipe that is usually pivoted to the bracket outside the carriage roof is provided with an enlarged or flanged end which, when the pipe is swung down after the reflector and chimney are in place, is secured to the tubular bracket fitting in a gas-tight manner. The air-passage around the gas-nipple is adjusted by means of a sleeve which can be adjusted towards or from the nipple and fixed in position upon the ends of the mixing-tube by a set-screw.

Lighting of South Dublin Union.—The Dublin Board of Guardians have adopted a resolution brought forward by Mr. Shields, to the effect that they accept the tender of the Alliance and Dublin Consumers' Gas Company for the lighting of the South Dublin Union, at a cost of £1142 9s. 7d.; cost for cooking purposes, £390; and cost of installation of new lights, £364 os. 8d. for a period of one year, "inasmuch as it is not advisable to incur thousands of pounds outlay in dealing with electricity, owing to the threatened changes by the Government in the poor law system; and that all orders to the contrary be rescinded." Mr. Shields, in submitting his motion, quoted figures to show that they would not be able to light the Union with electricity on the estimate already accepted. Gas, in his view, was the illuminant to be preferred for the lighting of the house; and he was of opinion that its use would be a saving of expense, particularly when they had regard to the heavy cost of putting down an electric installation. At the end of twelve months they could reconsider the merits of the two illuminants. His opinion was that on the security of any wiring or plant they might introduce for electric lighting, they could not get a loan for more than ten years. This decision was come to in spite of a statement by the Lighting Committee of the Corporation that they had started arrangements for laying cables on the strength of the agreement previously come to between the Board and the Corporation for the lighting of the premises by electricity.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Cooking by Gas and Electricity.

SIR,—As we venture to think that anything dealing with the comparative merits of gas and electric cooking apparatus is of great interest to your readers, we submit hereunder some figures which are the result of the most careful scientific tests carried out in our laboratories during a period of some weeks past.

According to the returns which were published in the "JOURNAL" for March 9, the average calorific value of the gas supplied during 1908 by one of the large London Companies was 626 B.Th.U. per cubic foot. This, at 2s. 3d. per 1000 cubic feet, gives 37 cubic feet per rd., which is equal to 23,162 B.Th.U. per rd., against 3437 B.Th.U. from one unit of electricity at rd. Thus it will be seen that the user of gas can lose five-and-a-half times as much heat as the user of electricity has available and still have more left; the heating values always being: Electricity, 1; gas, 6·7.

To check these figures as applied to cooking-ovens, tests were made by us with (1) an up-to-date electrical cooking-oven, (2) an up-to-date single-cased gas-cooker, and (3) an up-to-date double-cased gas-cooker, with the following results:—

Electrical-Cooker.

Oven dimensions, 14 in. by 12½ in. by 10½ in. = 1837 cubic inches. Heat raised in ten minutes from 61° to 390° Fahr., giving a rise of 329°.

Current used in ten minutes, 0·249 unit, giving an hourly rate of 1·494 units, which at rd. per unit is equal to 59·75 cubic feet per hour at a local price of 2s. rd. per 1000 cubic feet.

To maintain this cooker at a temperature of 420° (a rise of 359°), the hourly consumption was 0·532 unit; being equivalent to 21·3 cubic feet at 2s. rd. per 1000 feet.

Single-Cased Gas-Cooker.

Oven dimensions, 14 in. by 12 in. by 12 in. = 2016 cubic inches.

Heat raised in ten minutes from 46° to 460° Fahr., giving a rise of 414° with 2·66 cubic feet of gas, which is equal to 16 cubic feet per hour.

The temperature was maintained at 440° Fahr., a rise of 396°, with an hourly consumption of 11 cubic feet.

Double-Cased Gas-Cooker.

Oven dimensions, 14½ in. by 15½ in. by 25 in. = 5618 cubic inches.

Heat raised from 56° to 600° Fahr., and maintained at a rise of 544° with an hourly consumption of 18·5 cubic feet of gas.

After making these three tests of cookers for heat maintenance, we treated each set of figures by multiplying the cubic capacity by the rise of temperature maintained, and divided the result by the hourly consumption, thus obtaining the following comparative factors:—

Electrical-cooker	30·960	equivalent to 100
Single-cased gas-cooker	72·570	" 234
Double-cased gas-cooker	165·190	" 533

We think the figures furnished by our tests are sufficient to prove that cooking by electricity is still far and away more costly than cooking by gas, in spite of the claims which have recently been made by those interested in electrical apparatus. This is abundantly apparent even when the gas apparatus used is the simplest form manufactured—namely, the single-cased cooker.

Were it not for the fear of trespassing upon your space to too great an extent, we could furnish further figures in relation to water-heating by gas as compared with electricity, which would show even more astonishing results in favour of gas.

DAVIS GAS-STOVE COMPANY, LIMITED,

CYRIL G. DAVIS, Managing-Director.

Luton, April 17, 1909.

Position of the Cromer Gas Company.

SIR,—Although I hesitate to ask for any of your valuable space to deal with a personal matter, I think that a slight error which occurred in your report of the annual meeting of the above Company may give a false impression as to the attitude of the shareholders towards the Directors. In the paragraph (p. 40) you say the Directors' report was adopted except in regard to a recommendation as to a payment to myself. This point was certainly discussed at some length; but when subsequently put to the vote the recommendation of my co-Directors was carried *nem. con.* Moreover, many flattering remarks were made in regard to my services on the Board, which, though naturally gratifying to myself, were more important in that they showed the shareholders' confidence in the new policy adopted by the Directors during the past year.

Owing to the competition of the electricity undertaking (which is still trading at a loss, and therefore competing on unfair terms), the advancement of the Gas Company's business is slow. On the other hand, it is sure; and when our competitors are tired of losing money, and either raise their price to a paying level or give up what, in a small holiday resort like Cromer, is a hopeless struggle, there will be a chance for both shareholders and consumers to secure better results as regards dividends and price of gas respectively. It is not necessary to explain to your readers the fact that competition such as exists in Cromer means a higher price of gas, and not, as is popularly supposed, a lower one.

54, Parliament Street, S.W., April 6, 1909.

PERCY GRIFFITH.

Informal Meeting of Scottish Gas Managers.

SIR,—At the above meeting, you report me to have said (during the discussion): "When I went to Montrose, I started gas-fires, but after two years' experience I had to discard them." What I did say was: "When I went to Montrose I started hiring gas-fires; but after two

years' experience I had to discard the hiring system." You will see that, according to your report, I am supposed to have discarded the use of gas-fires altogether, which is not the case, as we sell these at cost price to our consumers and fix them free.

There is also an error in the number of new consumers I am credited with having obtained as a result of my new lighting scheme. You report: "I had, up to this time, only managed to get about six streets done; and I fancied that I had got ten to fifteen new consumers in that area." What I said was: "I had, up to this time, only managed to get about six streets done; and I fancied that I had got ten to fifteen new consumers in each street."

Montrose, April 14, 1909.

A. MACKAY.

Iron Carbonyl in Coal Gas.

SIR,—In my communication about iron carbonyl in coal gas, in the last number of the "JOURNAL," is a mistake—made by myself.

In the following sentence: "On this being examined, no iron was discovered in the solution," the word "no" must be removed, because I have found iron in the solution.

Will you be so kind to make the needful correction?

Laboratory, Eastern Gas-Works,

J. N. E. TEUNE, JUN.

Amsterdam, April 15, 1909.

LEGAL INTELLIGENCE.

Disputed Gas Consumption at Forfar.

Last Thursday, Sheriff-Substitute Lee gave his decision in an action which has been before him for some time, in which the Town Council of Forfar sued Mr. James Nicoll for £2 2s. 4d. for gas consumed in the quarter ending April 6, 1908. Evidence was given by Mr. J. Baxter, the Gas Manager, to the effect that when the account was rendered, the defender complained of the amount being too large. He sent a man to examine the meter, and he reported that the reading was right. Subsequently the meter was taken to the gas-works, and was tested and found to be correct. In the witness-box, the defender said his normal gas account was less than 10s. per quarter. He was sure that during the period in dispute gas was not extravagantly used. He had offered to pay half of the account; but this was not accepted. The Sheriff gave decree for the sum sued for. He said he thought an examination of the figures might result in the discovery of some mistake which would furnish a reason for the really extraordinary account which the defender had been called upon to pay; but it had not thrown any light on the matter. It was certainly a hard case on the defender, because nobody who heard the evidence could have any doubt that something had gone wrong, and that there must be something other than the defender's ordinary consumption of gas to account for the progress of the meter during the quarter in question. The pursuers were entitled to make out their accounts by the indices of the meters. If the defender had been watching, he must have seen how the meter was going, and he could then have had it tested if he found it wrong, and he would have had an absolutely good defence. But he did not do this, and trusted his meter, with which the pursuers said they found nothing wrong. He was sure the defender had been the victim of a mistake somewhere; but he would have to pay for it, as it was a mistake he had the opportunity of finding out.

Private Supply of Water from the Thames.

At the Tower Bridge Police Court, last Thursday, Messrs. Van Lessen, Son, and Barker, wharfingers, &c., of Rotherhithe Street, S.E., were summoned by the Bermondsey Borough Council for not having a proper and sufficient water supply. It appeared that originally the defendants paid a water-rate of £2 2s.; but under the new law the Metropolitan Water Board charged them 5 per cent. on their rateable value of £165. They had three men only in their employ; and they considered the charge so excessive that they decided to dispense with the Board's supply. They utilized the tank and pipes, and flushed the lavatories with a regular supply of water taken direct from the Thames. Having cut off their supply, the Board sent the usual notice to the Bermondsey Borough Council, and the premises were visited by a sanitary inspector. It was not disputed that the lavatories had sufficient water for flushing them; but the Council contended that the defendants should have a proper supply for drinking purposes. They thereupon installed a filter to purify the water; but the Council urged that this was not sufficient. Mr. Ashby, the Manager, said he did not think he had seen any of the men drink water. The foreman was an abstainer, and went home to his meals; and the other two drank beer. Pure water was supplied through the filter if it was required. Mr. Rose said that, under the circumstances, he would be straining the Act of Parliament if he were to hold that there was not a "proper and sufficient water supply;" and the summons would therefore be dismissed.

Illuminating Power of Hornsey Gas.—At the last meeting of the Hornsey Borough Council, it was reported that a recent test of the gas supplied by the Hornsey Gas Company showed that the mean illuminating power (corrected) was 17.26 candles; the statutory power being 15 candles. Referring to the matter, the "Hornsey Journal" said: "This, we believe, is unequalled in the history of the Company. The minimum permitted to them is a 15-candle illuminating power, and hitherto they have conscientiously and rigorously adhered to this figure. They are to be congratulated on the improvement; and the consumers will hope that it may continue. Adequate illumination is one of the material comforts of the home; and, therefore, small as such a detail may at first sight appear, it is of considerable importance in the economy of the household and of the community."

MISCELLANEOUS NEWS.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Second Day.—Tuesday, March 23.

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The first day's proceedings were reported last week, p. 105.

The following were the Counsel engaged: For the Corporation: Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASPINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

Mr. G. Hampton Barber's Evidence.

Mr. G. Hampton Barber, examined by Mr. FOOTE, said he was Secretary of the Birmingham Corporation Gas Department, who had carried on the works since 1875. The average tonnage of coal delivered to the four gas-works in question was about 550,000 tons per annum. The total quantity of coal purchased on the average of the last three years was 588,000 tons, which included Adderley Street, with which the present case was not concerned. There would be an average of about 1800 tons per working day for the four works. There was also an inward traffic of lime and chemicals and other material used at the four works of some 50,000 tons a year. With regard to the outward traffic, which was mainly coke, from the works in question, this was approximately 100,000 tons a year, or 300 tons a day. He first brought the matter of the rates charged by the Railway Companies to the notice of his Committee in November, 1905; and the following month he gave the Companies notice that the rates were paid from that date under protest, and without prejudice to any claim that might be made for the recovery of excessive charges or for damages for undue preference in freights given by the Companies to firms or undertakings who had thereby been enabled to compete unduly with, and to the detriment of, the Corporation. He had at that time no actual knowledge, but merely suspected that the charges were excessive. The rule with regard to coal was to take 60 per cent. of the purchased quantities for delivery during the six winter months, and 40 per cent. during the six summer months. Subject to these proportions, the contracts were for equal weekly deliveries.

THE MIDLAND RAILWAY CASE.

Mr. FOOTE: The Saltley works are served only by the Midland Railway, I think?

Witness: That is so. Continuing, he said Lawley Street, the nearest Midland goods station, was a mile further from the collieries; and the rates from the different collieries were identical, whether they were to the gas-works siding at Saltley or to Lawley Street Station. The works covered 18 acres; and last year 216,000 tons of coal were taken there. There were 2 miles of sidings within the works.

Mr. FOOTE said an agreement was in operation between the Company and the Corporation, by which the Company were to keep in repair the sidings connecting the railway system with the works, and the Corporation were to maintain the sidings in their own line. The Corporation were to pay the Company for the work they did in maintaining the sidings. Another clause provided that all waggons loaded or placed upon the Corporation sidings for transit over the lines of the Company should be marshalled in accordance with the directions of the Company.

Examination continued: The Corporation had four locomotives to take the trucks in and out of the gas-works. The Company's locomotives came just to the boundary of the works. The Corporation had never experienced any difficulty in dealing with the amount of coal which was ready to be delivered; and he had never received any complaint from the Company as to delay in the reception of trucks. There were large sidings at Washwood Heath; and coal was sometimes detained there before being sent on. This, however, was neither for the convenience nor at the request of the Corporation. So far as he knew, all traffic going to Birmingham and district was received at Washwood Heath sidings and dealt with in a similar manner. As a rule their coal arrived at Washwood Heath sidings in full train-loads. It did not always come in full train-loads from the colliery; but in that case the trains were made up at certain centres by the Company. As a rule, the Corporation did not want the coal in a different order from that in which it arrived at the sidings. About once a month, however, they asked the Company to divert half-a-dozen trucks to the experimental plant at Nechells.

Justice LAWRENCE: The train is all for you when it arrives at Washwood Heath sidings?

Witness: I should say so, as a rule.

Then why does it not come straight on to you?—Because their goods line is frequently blocked, and they cannot get the traffic through.

Mr. FOOTE drew attention to a number of tables to show that there was no delay by the Corporation in taking the coal, and that the Company took longer to deliver to other traders than to them; to show that the capacity of the Corporation sidings was amply sufficient to accommodate the daily requirements of coal; and to show that the station charge at Lawley Street for coke was 3d., from which he argued inferentially that the charge for coal was the same.

Sir ALFRED CRIPPS pointed out that on most of these matters the witness could only speak as to what he had learnt from hearsay. The sole question was whether, as regarded particular sidings or a particular trader, the Company had to perform services and provide accommodation for which they could properly make a charge outside the charge in the conveyance rate.

In further examination, witness said that the services rendered at Nechells were different from those at Saltley. The Company did not deliver the coal to them there; nor did they take delivery of the traffic outwards. The Company put the coal first into Duddleston Mill sidings, which were not devoted solely to the Corporation. Then they drew from twelve to fifteen trucks at a time and backed them on to another short siding, which was not reserved wholly to the Corporation, though in practice it was not used for other traffic. The Corporation locomotive crossed to this siding and drew the waggons into the gas-works. These were the services, at any rate, for what they were worth. As to spent lime, he had had it carted from Adderley Street to Lawley Street Station and loaded up there; and the Company charged the same rate from Saltley or Nechells as they did from Lawley Street.

Mr. FOOTE: I think it is common ground between us now that the Company purport to make a charge of 1d. per ton for whatever they do at the siding in picking up coke?

Sir ALFRED CRIPPS: That is right.

Mr. FOOTE: And our contention will be that this is too much—that they do not do anything. (To witness:) I want to take you now to a separate matter, which is the charge made by the Midland Railway and the Great Western Railway jointly for coke from Saltley to Small Heath. Prior to 1907, were they charging you 1s. 6d. per ton for that conveyance?

Witness: Yes.

Sir ALFRED CRIPPS: There is no difference between us that we charged 1s. 6d.; and when the matter was brought to our notice, we put it down to 1s. 4d. We cannot justify the 1s. 6d. Whether or not that means damages here, is a legal point which we shall have to discuss; but we admit the matter.

Mr. FOOTE: Since then they have reduced the charge to 1s. 3d. That 1s. 3d. must also include 1d. beyond conveyance for services rendered at Saltley.

Witness: Yes.

Mr. FOOTE: That 1d. we are fighting about. Your Lordship will find that this 1d. applies to all the Companies; and speaking without the figures before me, I think all the three Companies have reduced it in the same way. They all leave this 1d. to be fought about.

THE LONDON AND NORTH-WESTERN RAILWAY CASE.

Mr. FOOTE: The London and North-Western run into Windsor Street and Nechells?

Witness replied that they did. The Company allowed them a rebate of 3d. per ton off the Windsor Street Station rate for coal into both these gas-works; but they did not make this allowance for other traffic that came in—lime, for instance. The rates in certain cases contained a "carted and delivered charge," upon traffic sent over the private sidings to the works—which was not carted or delivered, and which did not use the station. In these instances, they would claim a larger rebate than the mere station charge. In Class C there was a station terminal charge of 1s. 6d. included; and there was probably a cartage charge of 1s. to 1s. 2d. per ton—that was, about 2s. 6d. or 2s. 8d. per ton overcharge.

Mr. FOOTE: The question of coke really comes to the same thing with the North-Western as it did with the other Company, which results in a charge of 1d. for doing what they do to the coke at the gas-works sidings. I do not say "collecting," because I do not consider they collect it, but for taking it and accepting it. Your Lordship notices it has come down to 1d. These Companies were obviously overcharging us in various degrees; and the result of this litigation is that they have all come to the conclusion to charge 1d. for services on coke traffic rendered at the Corporation's sidings. Then there is a complaint about the charge for the use of trucks.

Sir ALFRED CRIPPS: It is a pure point of construction. There is no dispute between us as regards the facts.

THE GREAT WESTERN RAILWAY CASE.

Mr. FOOTE: The Great Western is the only Company that has access to Swan Village. There is a Swan Village goods station, is there not?

Witness replied that there was, and it adjoined the gas-works. They paid the same rates as to the station. For station terminal only there was a charge of 6d. per ton on Class B, 1s. per ton on Class C, and 1s. 6d. per ton on Classes 1 and 2. These were the maximum charges.

Mr. FOOTE: It may be the Companies will say they are charging less than the maximum for these distances.

Witness: It may be in the case of the Midland that they say they are charging 1d. on a 66 per cent. rate.

Justice LAWRENCE: I do not know what you mean by a 66 per cent. rate.

Witness: Our coal rates from Derbyshire to Saltley and Nechells are 66 per cent. of their maximum powers. Under the Pidcock rule, we should be allowed 66 per cent. of the maximum station terminal charge at Lawley Street Station. That is 66 per cent. of the 3d., or, in other words, the allowance to us for station terminal on coal traffic to

Saltley and to Nechells in respect that no station is provided, should be 2d. per ton, and not 1d. per ton, as they assess.

Mr. FOOTE: 66 per cent. meant that, in fact, the average charge for coal from the Derbyshire Collieries to these sidings is 66 per cent. of the maximum. Therefore, if you apply Pidcock's rule to find what they are charging, you ought to take 66 per cent. of the maximum of each individual charge. If I may say so, without arguing it now, our position is that, with regard to "Coal in," we have given evidence to show that, in fact, they charge for the station terminal 3d. Therefore it is not a question of 66 per cent. upon that, but upon the whole of it. If they actually charge 3d., it is not a question of taking 66 per cent. If you show that they have charged 3d., as we have attempted to do by showing that they charge it for coal, and for Class A, then we say we are entitled to the whole of it. In other words, 66 per cent. is an alternative against us. If we prove that any Company make a station terminal charge of 3d. a ton on traffic taken to their station, then the rebate we have to get upon it is the whole of the 3d.; and really there is no necessity for applying Pidcock's rule at all, nor could it be applied. (To Witness:) Do you remember sending a truck of coal from King's Heath to the Midland Company at Lawley Street?

Witness: Yes; I bought a truck of coal at King's Heath from a merchant of Birmingham, and I had it consigned to Lawley Street Station in that merchant's name. I was charged 1s. a ton for the conveyance of the coal. Dissecting this charge, and allowing the maximum for conveyance, they charge 3d. per ton station terminal at King's Heath, and 3d. per ton station terminal at Lawley Street.

Examination continued: The Great Western Company brought the coal to the boundary of the Swan Village works; and Corporation locomotives dealt with it from that point. There was no siding belonging to the Railway Company at Swan Village (as there was said to be in some of the other cases) which was devoted in any sense to the Corporation's sole use. Certain of the traffic was taken a considerable distance to the canal basin before it was run either into the Swan Village Station or the gas-works sidings. This was on account of the large passenger service; and, of course, it was common to all the traffic, not only that to the gas-works. The gas-works sidings were laid down under an agreement with the Company, who did the work at the cost of the Corporation. The Company had a right to call on the Corporation to lay down additional sidings, should the traffic necessitate it; and they had done so, as a matter of fact. There was a table showing the charge for coal conveyed to Wolverhampton Station and to the Wolverhampton gas-works siding.

Sir ALFRED CRIPPS: What have we to do with the charge we make at Wolverhampton? I do not see how it can be relevant.

Mr. FOOTE: In this way. We want to get at how much is included in the charge made by the Great Western at Swan Village Station for the use of the station. We are entitled to that amount as rebate, whatever it may be, inasmuch as they charge the same with regard to Wolverhampton. What we want to show is that they make a charge for the station there; and when they have the same goods carried to the siding close by, they make a deduction of 3d. In other words, the charge for the use of Wolverhampton Station for coal is 3d. a ton. It is the nearest thing we can get to show what is the proper charge for the use of Swan Village. The coal is the same; and though the stations are not identically the same, they are of the same class.

Justice LAWRENCE: You could only do that in cross-examination; it is not evidence-in-chief.

Mr. FOOTE: If your Lordship says that, I will go no further. There is only one other matter on the Great Western; and that is coke outwards. The Company put in an amended answer on Dec. 18, in which they said: "Since the application was filed, the defendants have revised certain of the rates for coke from the applicants' Swan Village gas-works siding, and have reduced the rates in the manner and to the extent shown in the schedule. The defendants are willing that the applicants' accounts should be adjusted as from the date of the application." The schedule is a long one. Your Lordship will see they are material reductions—from 1d. to 3d., and in one remarkable case—Stroud—11d. We have not touched on what is a very important point in this matter, which must not be lost sight of. The Company say they are willing to consent to an account as from the date of the application; but, of course, we shall claim an account as from the date of six years, on the ground that we commenced our proceedings within a year after we discovered these facts. On the back of the schedule there are some revised rates. Those are the stations on the London and North-Western where the transit commences at Swan Village, and is therefore on the Great Western. There are similar reductions of 4d., 3d., and 6d. There are three instances on the Midland. I was under the impression that in this amended answer it was claimed that they were entitled to charge 1d. per ton for taking coke out of Swan Village siding.

Sir ALFRED CRIPPS: For services in connection with it. You are right.

Examination resumed: In taking coke from Saltley to Small Heath, they started over the Midland; and at Bordsley Junction they got on to the Great Western. Prior to May, 1907, they were charged 1s. 6d. a ton; and this was reduced to 1s. 4d. after the application, and subsequently to 1s. 3d.

Mr. FOOTE: That includes 1d. for services at the sidings. The maximum is 1s. 2d.

Sir ALFRED CRIPPS: In all these cases my friend may take it we claim to make a charge in connection with services at the siding. In most cases 1d., but not in all cases.

Mr. FOOTE: Now as to Congreave Sidings. In order to get from Congreave to Saltley you pass through Bordsley Junction. The Great Western made a rate which was 3s. 3d.—3s. 2d., plus 1d. That is the rate which we know has been reduced to 2s. 6d. What are the maximum charges according to distance?

Witness: The distance from Congreave sidings to Bordsley Junction is 11½ miles. The maximum conveyance charge according to the Act is 1s. 5d. The distance from Bordsley to Saltley on the Midland is 1½ miles. The maximum charge is 1s. 2½d. per mile; but they can charge for 6 miles, as there is no station terminal in it. Thus the maximum charge is 7½d.

Mr. FOOTE: I will add these two together—1s. 5d. and 7½d. make 2s. 0½d., as against 2s. 6d.

Cross-Examination of Mr. Hampton Barber.

Sir ALFRED CRIPPS, in cross-examination: Just this little outstanding point before I go back to the Midland case. The Congreave sidings traffic is carried, is it not, in the opposite direction to what you are, down to Stourbridge Junction? Do not you know that what the Railway Company originally claimed to do was to charge in respect of the distance that they were bound to carry this traffic, first of all to Stourbridge, then back to Bordsley Junction, and from Bordsley Junction to Salltley?

Witness: No. It was mentioned to me very incidentally by a representative of the Company within the past fortnight.

THE MIDLAND RAILWAY CASE.

Witness, in cross-examination by Sir ALFRED CRIPPS, said it was only when they were short of coal at Salltley that they whistled from the gas-works for a Midland engine to bring trucks from the special siding to the works. At other times the Company did it at their convenience. The service was performed with an engine that was kept at Duddleston Mill sidings for shunting purposes. As to the Nechells works, none of the Duddleston Mill group of sidings were reserved solely for the gas-works traffic. So far from the Midland Company having gone to large additional expenditure since 1896, in connection with the working of the Corporation and other traffic, he should think they had saved money by the new arrangements—the Washwood Heath sidings. The services rendered by the Company to the Corporation now must be much less costly than they were in 1896.

Sir ALFRED CRIPPS: It has not been any part of your duty, nor have you sought, to ascertain the cost other than in connection with conveyance which the Company are incurring in connection with your Nechells goods sidings or your Salltley station?

Witness: No; I do not know the actual expense that is incurred in giving delivery of our traffic. But I know from the manner in which the Companies deliver it that it must really be very expensive and very extravagant.

Sir ALFRED CRIPPS: From my point of view, we only have to see on the evidence, when it is all before the Court, whether we justify the charge we are making as regards services and accommodation—I mean the cost of services and accommodation which would not be included in the conveyance charge.

Further cross-examined: A fortnight ago they had over 300 trucks on the Nechells sidings, without interfering with the running lines. At Salltley, without counting the reception sidings, they could on their branch lines accommodate 100 trucks without interfering with their running lines. He had no knowledge that special portions of the Washwood Heath sidings were set apart exclusively for the Corporation; but he understood it was so. Certainly such provision had not been made at the Corporation's request. Outward traffic from Nechells and Salltley found its way to the Duddleston Mill sidings. The Corporation owned several hundred waggons; and about one-third of the traffic came in these. He had written to the Midland Company to complain of the coke rate to Nottingham. The Company were bringing coke from Nottingham to Birmingham at a charge of 3s. 1d. per ton. This coke was interfering with the Birmingham trade. He then asked the Company to quote him a rate for coke from Birmingham to Nottingham; and they quoted him a rate of 4s. 10d. Before the present application was filed, he had never complained to the Company that they were overcharging the Corporation as regarded coke rates generally. He only entered into service with the Corporation in 1901; and it took him several years to get hold of the business. In turn he took up this question of railway rates; and as soon as he did so, he dealt with it. No specific written complaint had, he thought, been made in the matter to the other two Companies concerned; but he had mentioned it to their representative.

THE LONDON AND NORTH-WESTERN RAILWAY CASE.

Sir ALFRED CRIPPS: As regards the traffic going into the Windsor Street gas-works sidings, is it, in fact, put first of all into the Windsor Street Station sidings? I am asking as regards miscellaneous inwards traffic other than coal?

Witness: It would be mixed, in all probability, with the traffic of other traders in a train; and when it arrives at the station, you would have to divide the train up. You would have to do that on your siding; and when you have the train divided up, you would draw it out and put it on to our works.

Sir ALFRED CRIPPS: Do you know that this was one of the terms of the agreement when the sidings were put in at the Nechells gas-works; the date being 1899: "The Company shall charge in respect of all traffic to or from the said gas-works and premises rates calculated on the same principle as the rates from time to time charged and paid by the Corporation in respect of traffic to and from the gas-works of the Corporation situated at Windsor Street, Birmingham." At the present time, they are charging you, are they not, at Nechells the same rates for traffic of every kind as they do at the Windsor Street gas-works sidings?

Mr. BALFOUR BROWNE: That is not the meaning of what you just read. It is "calculated on the same principle as the rates," not to be the same rates.

Witness: Yes; but on many of the journeys the distance to Nechells is 40 chains less than to Windsor Street works, so that, in fact, you may in certain cases be charging over the maximum under the agreement; and that would be illegal.

Sir ALFRED CRIPPS: Whether the traffic is dealt with at one or the other, the same charges have, in fact, been made?

Witness: Yes; on traffic outwards, and on traffic inwards other than coal. Now you are giving us a further reduction of 3d. per ton on coal into Nechells. You are bringing it into line with the charge of the Midland Company to Salltley.

Sir ALFRED CRIPPS: You are not complaining of that?

Mr. BALFOUR BROWNE: We had not got it at the time of the application.

Sir ALFRED CRIPPS: Is it any the worse for that?

Mr. BALFOUR BROWNE: No; but we were cheated all that time.

Third Day.—Wednesday, March 24.

Mr. G. Hampton Barber Further Cross-Examined.

THE GREAT WESTERN COMPANY'S CASE.

Mr. SIMON: The Swan Village siding was arranged for and made as long ago as 1874? Then there was an extension, I think, in 1892?

Witness said it was just about doubled. The connection between the siding at the gas-works and the running line was a connection with the up-line. It was laid down by the Great Western Company at the expense of the Gas Company of those days.

Mr. SIMON: If a truck of gas coal is consigned to be delivered at the Corporation gas-works sidings from the south—coming from the direction of London—it would come along on the down-line, and therefore cannot run directly into the gas-works. That is the reason why it, in fact, is run along the branch as far as the Swan Village Basin Station, and there it is shunted back.

Justice LAWRENCE: Does the coal spoken of in the application—Yorkshire, Nottinghamshire, and Derbyshire coal—come from that direction?

Witness: At the time the Company made their answer, it was not so. The whole of it came in the other direction from Wednesday.

Does the Yorkshire, Nottinghamshire, and Derbyshire coal come from that direction?—Yes; from Birmingham.

Now what do you want to say about some other coal?—At the time the answer of the Company was filed, the whole of the coal, I think, coming into the works was from the contrary direction, so that it came on to the line where it could have been easily backed into our works. It came at that time from North Wales and from the Aldridge Colliery Company.

Re-examination by Mr. Balfour Browne.

Witness, in re-examination by Mr. BALFOUR BROWNE, said the station terminal charge on high-class articles was very much higher than the 3d. terminal on coals. Class B was 6d., class C 1s., and classes 1, 2, 3, 4, and 5 were 1s. 6d. a ton for station terminal. Their complaint had always been that, where services were performed for the station rate, and were not performed for the Corporation, they should have a rebate. In cases where the charge made was a "carted and delivered" rate, they claimed to have a rebate in respect of cartage (which was not done for them), as well as in regard to station terminal.

Mr. SIMON: Let it be taken that, there being a cartage charge, this has got to come out. Whatever the cartage rebate is, without any kind of refinement, we subtract; and there is an end to it. We do not want to waste any time over it. There are, of course, cartage rebates which are agreed. It is the commonest thing in the world to give a cartage rebate off a "carted and delivered" rate. We will give the Corporation that ordinary conventional cartage rebate which we give to everybody; and we would have given it before, if we had only known.

Mr. BALFOUR BROWNE: Of course, with regard to that, it will have to be for six years, because it has only been discovered since the application.

Witness, answering further questions, said, with reference to Swan Village, that the traffic of the public was dealt with in precisely the same way as that of the Corporation. The siding was the Railway Company's own planning, and their own work. As to the Salltley works, the Corporation had never requested the Company to reserve two of the Washwood Heath sidings for them. It did not matter at all to them on which of the sidings their traffic stood. In fact, they did not want the traffic to stand there at all. They wanted it at the works.

Justice LAWRENCE: That is a very broad way of putting it. It is, if the works can take it in at the moment.

Mr. BALFOUR BROWNE: As I understand, your idea in ordering coals is not to glut their sidings, but merely to keep your works going? You would be very silly to order coals that you could not take in; and as a rule you can take in everything that comes.

Witness: Yes; and our consumption is regular day by day throughout the year.

Justice LAWRENCE: He does not order coal forward as and when he has got room in his works. He gives a general order, and it comes away from the collieries.

Mr. BALFOUR BROWNE: Of course, he knows how many tons are being used per year; and he has a very large surplus of stored coal in case he should be short. (To Witness:) In case of a block occurring, instead of taking two days upon the journey, I suppose the coal might take a much longer period; and this coal, being upon the line, would be standing somewhere?

Witness: Somewhere between the collieries and Birmingham. I have known coal to be delayed for a week by fog.

It would not be standing there for your convenience at all. It would be merely because it was blocked on the railway?—Yes; that is so.

Is it any convenience to you to have this coal standing on the Washwood Heath sidings?—It is a very great inconvenience; it frequently imposes cost upon us. Having the trucks standing at Washwood Heath may mean our having to pick up coal from stock; and every ton of coal we pick up from stock means a cost of from 6d. to 10d., according to the position in which the coal is.

Is it a fact that the Railway Company never inform the customer where the coal is on the line?—They never advise us when the coal reaches Washwood Heath. They only give us the number of trucks that are standing there; not the total number of trucks they have received for us.

Justice LAWRENCE: Have you ever asked them to advise you?

Witness: I asked them to advise me the number of trucks they had standing at Washwood Heath, so that I could see that the siding was kept clear.

That is what they do advise you?—They only advise me what is standing; not the number that is received there for us. I asked for the number received day by day, so that we could make arrangements for disposing of the traffic. We got returns from them showing the quantity of coal at Washwood Heath; but these failed to tell me the number of trucks that came in there day by day.

Mr. MACASSEY: There must be some mistake, because I have in my

hand copies of the advice notes which have been sent from time to time to the Corporation, showing the number of trucks standing, not merely at Washwood Heath, but at other sidings along the line, all waiting to be delivered at the Corporation works. Witness must be in error in saying that we only told him what trucks were standing.

Witness: Those are not advice notes.

Mr. BALFOUR BROWNE: I am told these are sent to us and delivered about 9 o'clock in the morning, to say how much is on hand.

Justice LAWRENCE: It does not matter when, so long as you get the notice.

Mr. BALFOUR BROWNE: It merely tells us what is in the sidings.

Justice LAWRENCE: What more do you want to know?

Mr. BALFOUR BROWNE: We want to know when it arrives.

Justice LAWRENCE: If you have it daily, how in the world does it matter at what part of the day it arrives?

Mr. BALFOUR BROWNE: We only get that information in the morning as to what is standing on the siding. We never hear of its arrival at all.

Justice LAWRENCE: If you get that in the morning, and you have not taken the coal away, and get another the next morning, you must know that the difference between what you have taken away and those two notices is what arrived on the previous day.

Mr. MACASSEY: Have you ever asked for any other return?

Witness: No.

Mr. BALFOUR BROWNE: How long has this system been in vogue?

Witness: Six to nine months.

After the application?—Yes.

They did not even advise you as to the number of trucks that were upon the sidings at the time the application was filed?—No, I think not; but I cannot say definitely without reference to the papers.

You have submitted a table with the object of showing that you get notice of what the Railway Company have, and clear the trucks out almost immediately?—And not only that, while we received 2218 trucks from them in November, they only advised us of 1401. The same thing was true with regard to December, when they only advised us of 952 trucks out of 2529. There are always three train-loads of coal or more on the road between the collieries and Birmingham. In November, the average number of trucks, for twenty-five working days, despatched from the collieries was 90; and the average taken into our works 88. In December, the figures were 101 per day from the colliery, and 101 received at our works. In January, 93 per day were despatched, and 86 taken in.

Mr. MACASSEY: Do you suggest that this position of things is typical of other periods of the year?

Witness: I took it at the portion of the year when our traffic is heaviest, and when the weather is worst.

Have you not, at our request, given instructions that the coal should be held back at the collieries, owing to your being unable to take it?—In summer time, possibly; not in winter.

Further Evidence for the Corporation.

Mr. William Massey, examined by Mr. FOOTE, said he was Accountant to the Birmingham Gas Department, whose service he entered in January, 1906. He had been engaged checking the accounts rendered by the Railway Companies; and he was instructed to visit the depôts of the Companies, and make extracts from their books, so as to ascertain whether suspected overcharges in fact existed. The first extracts he made were dated Feb. 1, 1906. It was by comparing these extracts with the Acts of the several Companies that he found the alleged overcharges which were complained of in the application. He was responsible for two tables. The first was to show what the charge for the use of the Lawley Street Station was in the case of class A traffic. This only affected the Midland Company; and after crediting the Company with the maximum statutory charge for conveyance, it showed approximately 6d. balance for the two terminals. The second table was a disintegration of the Midland Company's rates on coal to Lawley Street Station from several collieries. It was the Company's own disintegration. It showed that they charged for conveyance something like 66 per cent. of the maximum, on the average.

Justice LAWRENCE: What is this on?

Mr. FOOTE: I am endeavouring to show what the Midland Railway Company charge for the use of the Lawley Street Station on coal, because if I raise the presumption that there is a charge, that is an amount which should be cut off. This makes it rather less than 3d.

Mr. BALFOUR BROWNE: The total rate that they charge for coal from Pinxton Colliery to Lawley Street Station is 3s. The Company themselves disintegrated it in this way. They say that for special service on colliery siding they charge 1d., for conveyance 2s. 10d., and for the station terminal at Lawley Street 1d.

Mr. FOOTE: The Company seek to show that they only charge 1d. for the service at Lawley Street Station. The object of the witness's table is to show that this is wrong. It is 2d. at least, if not 3d.

Witness was only briefly cross-examined by Mr. MACASSEY and Mr. SIMON.

Mr. Frederick J. Bywater, questioned by Mr. FOOTE, said he was Engineer of the Saltley Gas-Works, where he had been for the last ten years. There had been a tendency to increase the amount of traffic at Saltley during the past few years. The average number of waggons of coal received there was about 77 per day in the winter and about 57 in the summer. The average of the empty coke-waggons coming in was 50 in winter and 33 in summer. As a very general practice the coal went on to the independent siding which was kept for the waggons of the Corporation. He had at times seen other waggons on this siding; but as a rule it was retained for the purposes of the Corporation. This independent siding held about 40 waggons; and from there the coal was backed to the works to two sidings which held some 24 waggons each. On the latter sidings the trucks remained on an average three to four hours. He could not remember it ever happening that the independent siding was full and could not be discharged because the works sidings were full also. There was a third siding used for empties for coal, and loading trucks of coke. Some 50,000 tons of coke per annum went away over the railway lines; but, of course, a lot also went away

by boat. It was entirely on the Railway Company's initiative that the coal was placed on the independent siding. The Corporation had a definite quantity of coal coming forward from the collieries every day; and they wanted this coal delivered to them. All that was desired was that the Company should put the coal along the Corporation reception line. Until the last six months, they had had no official knowledge of any kind of the Washwood Heath sidings; and they had no cognizance at all of what was going on up there. He had never received any complaint from the Midland Company as to the glut of traffic at the Washwood Heath sidings; but, on the other hand, often when the coal was at these sidings it was impossible to get it down into the works. Several times the Company had asked him to take coal to accommodate them; and he had invariably done so. He had never made an application for coal to be delivered in any particular order—in fact, it was not in any way necessary to do so; and he had never had to apply to the Company to hold coal back.

Cross-examined by Mr. MACASSEY, witness said he would be able to take a full train-load of coal, if offered by the Railway Company, every three or four hours; but not every hour, or every few minutes. It was only when they were absolutely wanting coal—when there was none whatever on their reception siding—that they whistled to the Company to bring them a supply from the independent siding. He had not given orders about the placing of the coal specially on one of the two reception sidings. They consumed coal regularly day by day. They wanted it regularly, and tried to arrange for it; but the Railway Company did not by any means supply it.

Justice LAWRENCE: The Railway Company would reply that they run engines and trucks day by day; but something or other interferes with them.

Witness: That is what they put Washwood Heath and other sidings down for. They do not put them down for our convenience.

Cross-examination continued: It was in August last, he believed, that the Company began to advise them of the number of trucks standing at Washwood Heath. His foreman shunter had advised him at odd times, when they had been short of coal, of the number of trucks standing at the sidings. There had been no application whatever to him, as the Engineer of the works, to remove coal from Washwood Heath. He had never given instructions to the colliery companies to hold back the coal, on representations by the Midland Company that their sidings were too congested to receive it.

Justice LAWRENCE: Do you seriously say your works are so laid out that you could take all your coal in full train-loads?

Witness: We can take it.

We know something about this matter, you know. Do you suggest that you could in these works take all your coal in full train-loads?—As a general thing we could not conveniently take in forty trucks at a time. What I say, most assuredly, is this—that whenever the Railway Company have asked us to take any quantity up to a full train-load, we have always taken it. If they put in twenty trucks, they say that suits our convenience. It may be that it does; but it also suits theirs, and they have never asked us to do anything different.

Very likely not. They have not treated you so foolishly as to ask you to take it all in in full trains?—If they have, we can do so.

Am I right in taking you to say you could take all your coal in full train-loads provided they did not contain more than twenty-five trucks?—That is so.

Justice LAWRENCE: All I can tell you is you will have to go into this very thoroughly if you are going to satisfy me that you could conduct your works by taking it in in full train-loads. It seems to me impossible. The mere look of your works makes it appear to be so.

Mr. BALFOUR BROWNE: If the train is twenty-five trucks, we certainly could do it.

Justice LAWRENCE: You must have some elasticity in dealing with the interior of works. You cannot do it by having full trains coming. You would have the trains standing outside for half-an-hour while you cleared the place. It is ridiculous to ask the Court to believe such stuff as that.

Mr. BALFOUR BROWNE (to witness): I think, in order that his Lordship may see what our capacity of receiving is, you ought to give the length of your sidings, apart from what we call running lines.

Witness: The total capacity is 3600 yards; and the capacity for storage is about 1400 yards. One hundred waggons available for storage and the seventy-three waggons for the three sidings would occupy 1024 yards out of the total of 3600 yards. That is to say, it will be seen it is only about one-third, or less than one-third, of the total capacity of the sidings.

Mr. Walter Chaney, examined by Mr. BALFOUR BROWNE, said he was Engineer-in-Charge at Nechells, which works he had superintended since 1902, prior to which date he was Superintendent at Saltley. The Nechells works, which were built in 1900, were the last constructed by the Corporation. They were connected by sidings with both the Midland and the London and North-Western Railway systems. The coal carbonized at these works (which were capable of development to double their present capacity) had so far never exceeded 141,000 tons per annum. In consequence of the connection with the two railways, the coal was delivered over that on which the lowest rate obtained. They had at times different contracts with North Staffordshire collieries; and as the rate to the Nechells London and North-Western sidings was 2s. 11d., as against 3s. 7d. *via* the Midland, the former route was naturally chosen. In addition to coal, the inwards traffic per annum included 8000 tons of oil, 5500 tons of lime, 1800 tons of bricks and fire-clay, and 1000 tons miscellaneous. Then Messrs. Brotherton were contractors for ammoniacal liquor, and leased their works from the Corporation. These works adjoined the gas-works; and they used the Corporation siding. Waggons for Messrs. Brotherton equalled 20,700 tons a year. The total in traffic was thus 178,000 tons per annum, 80 per cent. of which was coal. The works sidings had been laid out in modern times, and were arranged to give a very large amount of accommodation. More than the maximum daily requirement in waggons could be accommodated. The whole of the sidings were capable of holding nearly 350 waggons. The method of delivering by the Midland was as a rule to store some traffic in their Duddleston Mill sidings, and then bring it back and push fourteen or fifteen waggons

into a short connecting siding. The Corporation locomotive went over this siding and hauled the traffic in. The Duddleston Mill sidings were general sidings for a great deal of other traffic besides that of the Corporation. It was not a fact that two of these sidings were reserved specially for the Corporation traffic. The average time that waggons were allowed to stand on the small connecting siding was about thirty minutes; and frequently they had cleared it in the space of two or three minutes. This siding was, on the other hand, also used for outgoing traffic; and at times they experienced difficulty in getting the Railway Company to clear it in order to put on incoming traffic. The connecting siding was too limited to allow the Company to put in large quantities of traffic—the capacity being only fifteen trucks. This, of course, meant that a considerable standage must take place upon the Duddleston Mill sidings, and that a considerable amount of extra shunting had to be done. If the Company had a siding that would contain (say) a full train-load, it would be more favourable to them in shunting, and also more favourable to the Corporation in taking the coal. In fact, the shortness of the siding caused additional cost of working and considerable inconvenience resulted to the Corporation and the Company.

Justice LAWRENCE: What point does this bear upon?

Mr. BALFOUR BROWNE: It bears upon the point that the stuff has to stand upon the Duddleston Mill sidings.

The Court then adjourned.

FAREWELL TO A WORKMAN-DIRECTOR.

An interesting retirement and presentation have taken place at the South Suburban Gas Company's works. Mr. R. Wyllie, who with Mr. W. G. Waller enjoyed the distinction of being the first Workmen-Directors of the concern under Sir George Livesey's co-partnership scheme, has—being now 66 years of age—decided to take a well-earned rest. Mr. Wyllie has been in the service of the Company as carpenter and joiner more than half his life, or nearly 36 years; and for three years, in addition to his work as foreman carpenter, he has taken his part in the administrative work in the Board room. It will be a great satisfaction to him in his retirement to know that he filled such a conspicuous position in the co-partnership system of the Company, and enjoyed the honour of working on the same Board as the great founder of the system.

A few days since, officers and men assembled at the works to take their farewell of Mr. Wyllie, and to present him with a tribute and memento of their regard. This took the form of a beautiful gold Albert chain and seal. Mr. Waller—Mr. Wyllie's colleague on the Board—presided. He was supported by Mr. G. Ross who has been elected to fill the vacancy caused by Mr. Wyllie's retirement, and Mr. S. Y. Shoubridge (the Company's Engineer and Manager), Mr. John Whimster, Mr. Maltster, Mr. B. P. Bezant, and others.

Mr. WALLER, in making the presentation, remarked that they had met there that afternoon to ask Mr. Wyllie to accept a small present, as a mark of their personal esteem and of appreciation of his services, and as a memento of his long and faithful connection with the Company. It was a painful thing to have to say "Good-bye" to one who had worked with them for so many years. But Mr. Wyllie had a right, after so busy a life, to rest for the remainder of his days; and they all hoped he would enjoy many years of health and happiness. It was absolutely impossible for him (Mr. Waller) to find words to express his admiration for the splendid example of energy, perseverance, and faithfulness to duty as a workman that Mr. Wyllie had set them all, and for the many good qualities he had shown in the various positions he had occupied in the affairs and interests of the Company and the workers. As a Director, he had held the novel position with credit to the workmen he represented, and to the satisfaction of his colleagues, who had parted with him with much regret. Personally, he deeply regretted the parting from one with whom he had had such intimate association, particularly during the past three years; and he was sure that feeling was shared by all present. He sincerely hoped that Mr. Wyllie would enjoy good health and happiness in the years of his retirement. It was with great pleasure he handed the chain and seal to Mr. Wyllie, and hoped the gift would always remind him of the goodwill of those whom he was leaving behind.

Mr. SHOUBRIDGE supplemented Mr. Waller's remarks, testifying to the high esteem in which Mr. Wyllie was ever held by Directors and employees alike.

Mr. WYLLIE, in his acknowledgment, said that an occasion of parting such as this was a difficult one upon which to find adequate words to express one's feelings. He could not do more than thank those with whom he had worked for their gift, which would always represent to him a mind a great deal associated with the past and those with whom he had mingled in various capacities. He was glad to have this memento of his connection with the works to take away with him; but, without it, he could not but always cherish the pleasant recollections of his long association with the Company and his fellow-workers. To him, however, the occasion was naturally one that caused his heart to be full. Beyond this he could not say more, excepting that he felt sure Mr. Ross, his successor as a Workman-Director, would well fill his place on the Board of the Company. It would be one of the most pleasant remembrances that he himself had enjoyed the confidence of his comrades, and had been elected one of their first Directors.

Mr. ROSS (the newly-elected Workman-Director) took the opportunity of thanking his brother co-partners for having elected him to the place rendered vacant on the Board by the retirement of Mr. Wyllie. He rather fancied his fellow workers had shown more confidence in him than he had in himself. However, he would try his utmost to merit their confidence in the position of honour by doing to the best of his ability the work of the office that had been so ably filled by Mr. Wyllie.

The Directors of the Tarapaca Water-Works Company, Limited, announce a final dividend of 4 per cent., less tax; making, with the interim dividend, 7½ per cent. for the year 1908.

TRANSFERENCE OF MATERIAL TO DUBLIN GAS-WORKS.

Objections by the Dublin Port and Docks Board.

Readers of the "JOURNAL" are aware that the Alliance and Dublin Consumers' Gas Company have in Parliament a Bill to confer further powers upon them. They require, among other things, authority to construct certain specified works with the view of further facilitating the transference of coal and materials from vessels alongside Sir John Rogerson's Quay to the gas-works; and the proposal has been under the consideration of the Port and Docks Board. At a meeting of the Board held last Thursday, under the presidency of Alderman W. F. Cotton, J.P., the Chairman of the Company, the Law and Parliamentary Committee reported that, as the result of conferences which had taken place in London, the Council had sent to the Company a letter from the Port and Docks Board stating that their Engineer could not approve of the plans which had been forwarded to them, as the works shown would form a serious obstruction to the general trade of the port. He was fully satisfied that works giving the facilities required by the Company could be designed which would not be open to this objection. It was added that the Port Act of 1902 gave the Board full power to carry out such works, and they were prepared to exercise it in the present instance. The letter had been approved by the Board; and the Committee submitted for their consideration a resolution on the matter which they suggested should be forwarded to the Company. It was to the effect that if the Company would withdraw from their Bill the paragraph in the preamble with reference to the acquisition of lands and the erection of works and all clauses relating thereto, and would insert a saving clause for the protection of the Board similar to that contained in section 5 of the Alliance and Dublin Gas Act, 1879, the Board would undertake to construct across Sir John Rogerson's Quay such overhead communications and appliances, and under such terms and conditions, as might be agreed upon between the Board and the Company. The resolution was adopted.

GAS-COAL CONTRACTS AT SALFORD.

The Publication of Tenders.

At the last Meeting of the Salford Town Council, the proposal to confirm the contracts for the coal required for the gas-works gave rise to some rather strong remarks. A Special Committee was appointed some months ago to consider the question of the publication in the agenda of the amounts of all contracts and the terms of all special trading agreements entered into by the Corporation; and Mr. Royle moved, as an amendment, that the contracts now submitted should be referred back to the Gas Committee until the report of the Special Committee had been received. Mr. Boscohy, in seconding the motion, characterized the Special Committee as a "farcical" one, and said he had been told that one of the firms whose tender had been accepted for the supply of 80,000 tons of coal had quoted prices which were among the highest; and he had heard further that one or two members of the Gas Committee had described the coal as being "rubbish." Alderman Phillips, the Chairman of the Gas Committee, pointed out that, as usual, all information about the contracts was at the command of members of the Council, but not for publication. Referring to the remarks made by certain speakers on this subject, he said he had been a member of the Council for 24 years, and had never before been so disgusted with men who came, presumably as representing the public, and suggesting that his methods were "subterranean," and made a lot of innuendoes which it was difficult—indeed, almost impossible—to disprove. Unless they wished to have the borough in physical as well as intellectual darkness, the purchase of this coal should not be deferred. He did not often recede in the face of the enemy; but he was certainly not going to stand much longer these constant innuendoes. He would not do it even for the ratepayers of Salford. On being put to the vote, the amendment was defeated by 31 votes to 8, and the contracts were confirmed.

Just previously, when the minutes of the Gas Committee were submitted, Mr. Boscohy moved that certain minutes be read *in extenso*. A heated discussion followed; and finally the Mayor ruled the motion out of order, and the minutes were confirmed.

DEVONPORT CORPORATION GAS-WORKS.

New Governors—Contracts for Stores.

At the last Meeting of the Devonport Town Council, the Gas Committee reported that they had considered a recommendation by the Gas Engineer (Mr. W. P. Tervet) that new governors be provided at a cost, including buildings, mains, &c., of £1900, and had come to the conclusion that the governors should be provided at a cost of £850, and that the erection of the buildings be deferred for the present. The Committee also presented a long list of tenders for stores of various kinds, recommending that some should be accepted, and that where no tender was accepted the firms at present supplying the goods should be authorized to continue to do so at present prices, failing which the Gas Engineer should obtain goods from the lowest on the list of tenderers.

Alderman TOZER, in moving the adoption of the report, said the expenditure on new governors was necessary. Two of those at present in use had been in service for 40 years, two for 23 years, and two for 21 years; and the Gas Engineer had said that unless an improvement was made he could not be responsible for the consequences. The Engineer suggested the erection of a new governor-house; but the Committee thought it advisable to keep the expenditure down to the lowest possible amount, and to provide for the governors only. These were absolutely necessary. Unfortunately, their borrowing powers were exhausted, and the cost would have to come out of revenue. There was, however, some compensation for this abnormal expenditure in the list of tenders which

the Committee had accepted. They found that there had been no contracts for the supply of any of these goods. In the past the practice had been for them to be ordered, and when the accounts came in monthly or quarterly they were paid. Under the head of "Sundries," there were no fewer than 79 different articles; and he found that, on a comparison of the new and old prices, they would save no less than 29 per cent. In oils they would save 28 per cent., in burners 21 per cent., and in mantles 29 per cent. The Committee had not accepted the lowest tender in every case, but had been guided by the advice of the Engineer as to the suitability of the article. Generally speaking, on about 90 per cent. of the articles they were buying they were effecting a saving of from 5 to 50 per cent. in the cost as compared with former prices. The saving of expenditure on these items would more than pay the cost of the new governors.

Mr. DAYMOND asked what would be the saving in money through these contracts, and whether the oils contracted for included oil for the carburetted water gas plant.

Alderman TOZER said the oil for gas making was a separate contract, but there was a saving also on that.

Mr. COOMBS thought it strange that none of the sixteen members of the Gas Committee had thought of the necessity of having tenders until now. The present Committee were to be congratulated on having taken this action; but those who were on the previous Committee could not escape responsibility. He asked what was to be done in regard to the goods for which no tenders were accepted.

Alderman TOZER replied that he should have preferred to say nothing about these for the present. Messrs. Willey and Co. had been supplying certain of these goods; but, as the Council knew, negotiations had been going on between the Committee and the firm as to another matter, and until these negotiations were concluded it was thought better to leave the other tenders over. There was no reason why the relations between the Committee and Messrs. Willey and Co. should not be as satisfactory as they had been in the past.

Alderman HORN BROOK remarked that, in regard to tenders for many things, the Council must remember that the prices of iron and steel had now been falling gradually for two or three years. This had been a matter of conversation between himself and the former Engineer; and they thought it wiser to wait until the market found its level. There was another consideration. Though they obtained some of these small things cheaper, they would have to pay more heavily for articles the cost of which ran into hundreds of pounds.

The minutes were passed.

CHEAP GAS FOR HEATING AND POWER AT BURSLEM.

At the last Meeting of the Burslem Town Council, a new scale of charges for gas to be used for heating pottery kilns and for motive power was adopted; and it will come into operation in June. Up to 20,000 cubic feet per quarter, the price will be 2s. 6d. per 1000 feet, decreasing by 2d. for larger quantities (1s. 6d. being the figure when the consumption is more than 1½ millions); all subject to 6d. per 1000 cubic feet discount if accounts are paid within a month. At the same meeting, the Gas Committee reported that Messrs. Oliver and Son, of Longport, had applied for a supply of gas for power purposes to a new flint-mill which they intend to erect, and that the Chairman, the Vice-Chairman, and the Gas Manager (Mr. E. Jones) had fully considered the application, and recommended that an agreement be entered into with the firm for the supply of gas for a period of ten years in quantities of not less than 1½ million cubic feet per quarter at the price of 1s. per 1000 cubic feet, subject to an adjustment of the price at the end of the first five years, or at the end of any succeeding year of the term, in case the cost of fuel should exceed 11s. per ton delivered at the gas-works. In the course of the discussion on the matter, it was pointed out, with reference to the new scale, that those taking a million cubic feet of gas would get the whole of it at the cheap rate, though the Staffordshire Potteries Water Company did not supply water on this basis, but charged the earlier part of the supply at the higher rate. Some of the members seemed to think the same principle might be applied to the new scale for gas sold in bulk; but the report was adopted. With respect to the supply to Messrs. Oliver, it was asked if it would pay at the price. In reply, it was admitted that the gas could not be supplied at a profit at the figure named, if the capital charges had to be included; but it was stated that since the Gas Committee had lost the Wolstanton district, the works were greatly in excess of the consumption, and that this circumstance warranted what was being done.

Gas Profits at Southport.—The gross profits of the gas undertaking of the Southport Corporation for the past financial year amounted to £29,277; the income being £88,552, and the expenditure £59,275—the latter including £3000 spent on reconstruction work. After payment of interest on loans and sinking fund charges, there is a net profit of £14,840, compared with £13,417 for the previous year. A sum of £13,000 is to be handed over in relief of the rates, and £520 of the balance is to be expended on fixing Humphrey lamps; leaving £1320 to be carried forward. Coke realized £11,785 last year, compared with £6407 in the preceding twelve months.

Gas and Water Supply in the Dewsbury District.—The Local Government Board have issued a Draft Provisional Order, under which Thornhill, Ravensthorpe, and Soothill Nether are to be included in the borough of Dewsbury, while Soothill Upper is to be divided between Dewsbury and Batley. The Order provides that from and after March 25, 1910, the Dewsbury Corporation are to supply gas to that portion of Soothill Upper which is now added to Dewsbury; the terms of the transfer to be settled by section 62 of the Act of 1888. Protection is given to the Mirfield Gas Company, whose rights and powers are not interfered with. Nothing in the Order is to extend the area within which the Dewsbury Corporation, the Dewsbury and Heckmondwike Water-Works Board, or the Heckmondwike District Council may supply water.

GAS SUPPLY IN SHANGHAI.

We have received the report and accounts of the Shanghai Gas Company, Limited, for the past year, which were presented at the annual general meeting on the 26th ult. We learn from the report that the progress of the Company continues satisfactory. The revenue amounted to 666,719 taels, and the expenditure to 425,526 taels; the profit on the working account amounting to 241,193 taels, which was transferred to the profit and loss account. The net profit for the year was 219,162 taels—a decrease of 29,788 taels as compared with 1907. This result was almost entirely occasioned by the interest incurred on the cost of the recent extensive additions to the Company's plant. The Directors have considered it advisable to write-down considerably the stocks of materials held in certain departments; and to enable them to do this, they have appropriated from renewals and depreciation account the sum of 30,000 taels. The balance at the credit of the profit and loss account, after crediting the account with 6603 taels carried forward and with the 30,000 taels just alluded to, and deducting the interim dividend, at the rate of 7 per cent., paid in July, was 171,766 taels, which the Directors recommended should be appropriated as follows: Final dividend of 6 per cent. (making 13 per cent. for the year), 72,000 taels; amount written off for depreciation of land and buildings, plant, and furniture, 95,459 taels; carried forward, 4306 taels. The private consumption of gas increased 25,999,900 cubic feet, or at the rate of 5·77 per cent.; the increase in the gas consumed for public lighting being 658,238 cubic feet, or 4·17 per cent. The number of gas-engines in use is now 113; while the augmentation in the quantity of gas employed for power last year was 3,127,400 cubic feet, or 6·22 per cent. There were 2829 tons more coal carbonized and 36,387,900 cubic feet more gas made last year than in 1907. The market for the Company's residuals was satisfactory; and, apart from coke, of which a largely increased quantity was used for manufacturing purposes, there was a considerable increase in profit on all products. Early in the year, the Directors decided to provide the funds necessary for the payment of the balance of cost of the new plant, by the issue of further loan capital in preference to increasing the share capital. To enable this to be done, it was necessary to consolidate the whole of the debenture issues of the Company; and steps to effect this were taken. It was decided to create a new issue of 6 per cent. debentures of not more than 1,250,000 taels, of which, in the meantime, 400,000 taels should be applied to the redemption of existing issues, and a further amount, not exceeding 400,000 taels, should be issued as required. Practically all the holders of existing debentures have agreed to accept the new debentures in place of those now held by them; and of the residue a considerable portion has already been placed.

Appended to the Directors' report is a summary of that of the Engineer (Mr. H. King Hiller). He states that the condensers, washers, and scrubbers of the new section of the works were completed during the year, and are now in use, thus finishing the scheme of extensions entered upon three years ago, and bringing up the Company's possible output to 3,700,000 cubic feet per day. Filters, storage-tank, and overhead service-tank have been constructed from disused plant to supply the works with filtered water from the Soochow Creek. The following are the figures relating to the working: Coal, &c., carbonized, 44,735 tons; gas made, 531,877,400 cubic feet; yield per ton, 11,870 cubic feet of gas, of an average illuminating power of 15½ candles. With regard to distribution, Mr. Hiller reports that 13,944 yards, or about 8 miles, of new and enlarged mains were laid during the year, and a pressure-raising plant, consisting of a steam-turbine driven fan, was installed to increase the supply to the central and French districts. The quantity of gas sold last year was 488,008,100 cubic feet (an increase of 5·77 per cent.); and used at the works, unaccounted for, and in stock, 43,869,300 cubic feet.

LINCOLN GAS AND WATER SUPPLY.

Gas-Works Profits—Position of the Water Undertaking.

At the last Meeting of the Lincoln City Council, the Gas Committee reported that the existing purifiers at the Bracebridge works had been inspected, and it was resolved that the Manager (Mr. John Carter) should invite tenders for four new purifiers, 30 feet square, each with centre-valve and all necessary connections and fittings. It was also resolved that a sum of £3000 be contributed out of the gas-works revenue in aid of the general district rate for the year commencing April 1, 1909. Alderman Wallis moved the adoption of these recommendations. He said the Committee had taken a forecast of their accounts for the year, and they were quite satisfied that they were able to recommend that £3000 be granted to the rates. With regard to the purifiers, they had been down since 1876, and though they were enlarged in 1885, they were now much too small for requirements, and were also in an unsatisfactory state. The Committee wanted to spend about £4000 during the coming year, on various things, and they thought they would be able to provide for it during the next year or two out of their profits, and also be able to hand over an amount for the rates. The minutes were confirmed.

At the same meeting, the Chairman of the Finance Committee (Mr. C. W. Pennell) presented the estimates of the income and expenditure for the year ended March 31, 1910. Referring to the water undertaking, he said matters were not very satisfactory. A statement had been prepared, but it was only an approximate estimate of expenditure. During the past year, the sum spent on the water-works was £18,030, and their income was £17,204; leaving a deficiency of £826. During the coming year, the expenditure was estimated to be £22,560, and the income, other than by rate, from the supply of water by meter, &c., £7405. There was thus a balance of £15,155 to be provided by rate, or £4530 more than last year. The increase was due to interest and repayment of the costs of the Water Act, £1670; and new works, interest, and sinking fund, £2710. They hoped to spend something like £100,000 during the coming year, and the interest and sinking-fund charges would have to be paid. The rate required to raise the £15,155 was

rs. 11½d. in the pound, which was practically 2s. for the city and 3s. for those residing outside. As, however, the Corporation had to levy a differential rate for these, it was only fair that this amount should be charged, as the city had to pay off an enormous deficiency. It was suggested that the Corporation should wait until the new water supply was in the mains before they levied an unearned rate; but this was out of the question, as funds were required for proceeding with the work. They proposed to spend on the new scheme £200,000, which was a very large amount. He trembled to think what would have been the fate of anyone who had happened to suggest such an outlay before the typhoid epidemic; but Lincoln people had demanded a new supply at whatever cost, and he expected they were prepared to pay for it. Next year the sinking-fund charges would be increased by something like £3000; so they had not yet reached the limit of what the water-rate would be. In all probability it would be 2s. 6d. next year, and not until they got the new supply in the mains would there be any possible chance of a reduction. It must necessarily be more costly to run two businesses than one; and when they were able to cut off the old works, the rate would begin to go down. A few years more would see the repayment of the cost of the Boultham bore. The amount was borrowed for ten years only; and the interest and sinking fund amounted to £1670 per annum.

GAS-WORKS EXTENSIONS AT BURTON-ON-TRENT.

At their Monthly Meeting last Wednesday, the Burton-on-Trent Town Council adopted various recommendations of the Gas Committee in respect to the carrying out of new works in connection with the gas undertaking.

The scheme embraces the diversion of the railway sidings and the raising of the boundary wall of the works. Messrs. Clayton, Son, and Co., of Hunslet (whose tender amounted to £8077), are to erect a four-lift gasholder and steel tank, with external guide-framing consisting of fourteen latticed standards, three tiers of latticed girders, and three tiers of bracing-rods or wind-ties. The tank is to be 125 feet diameter by 26 feet deep; and the four lifts are to be 122 ft. 6 in., 120 ft. 3 in., 118 feet, and 115 ft. 9 in. diameter respectively, by 25 feet deep—the inner lift rising above the guide-framing. The total capacity will be 1,038,000 cubic feet. About 7 feet of the tank will be underground; and the tank will be placed on a concrete foundation, to be prepared by Mr. George Hodges, a local contractor. The Council also accepted the tender of Messrs. Vale and Sons, of Stourport, for the erection of nine Klöane regenerator settings in the No. 5 retort-house.

A local paper commenting on the matter says: "The tenders accepted yesterday represent a sum equal to 9d. or 10d. in the pound on the rates; but the ratepayers need not quake. The money is already provided through the wise policy of building up a substantial gas reserve account in the past few years. Indeed, it is hoped that the whole of the improvements will be met out of the reserve, and then leave a balance in hand."

GAS SUPPLY IN ROTHERHAM OUT-DISTRICTS.

Proposed Inclusion of Thrybergh.

At the Town Hall, Rotherham, last Thursday, Mr. F. J. Willis held an inquiry, on behalf of the Local Government Board, into an application made by the Corporation for a Provisional Order to sanction the extension of their limits of gas supply by the inclusion of the township of Thrybergh, in the rural district of Rotherham. Mr. J. F. Lloyd Mortimer (the Recorder of Rotherham) and Mr. W. J. Board (Town Clerk) represented the Corporation; Mr. T. E. Ellison appeared on behalf of the Dalton Main Collieries, Limited, the largest ratepayers, the Rotherham Rural District Council, and the Lord of the Manor (Mr. J. S. H. Fullerton).

In opening the case, Mr. Mortimer explained that the Corporation had power to include the hamlet of Dalton within their area for the supply of gas, and last year the mains were taken there. Dalton had grown from quite a village to a populous place, and at the present time 350 houses were being supplied with gas by the Corporation. They had laid an 8-inch main; and in the event of the present application being granted, no alteration would be necessary. Thrybergh was not in the Corporation area, but it had a large population, and there was no gas supply. So far as the public authorities were concerned, a clause for their protection had been agreed upon, chiefly in regard to the roads. Correspondence had taken place between the Corporation and the Rural District Council; but there was nothing to throw any light upon the Council's actions, and the opposition had come as a surprise. The action of the Thrybergh Parish Council until the previous Tuesday had been uncertain; but on that day they had decided to support the application. With regard to the inhabitants, 313 out of 350 householders had signed applications in favour of gas being supplied by the Corporation. Thrybergh was at present lighted with oil-lamps and candles. There was no doubt that, owing to the energies of the Colliery Company, the place had grown. The Company had built most of the houses, and had entered into an arrangement to light the streets with electricity; and for this purpose some poles had already been put up. He was not aware whether the Company were proposing to light the houses by electricity or by gas if the present application failed. If they purposed doing it by gas, there was no doubt it could be procured from the coke-ovens at the colliery; but, on the other hand, the Corporation were in a far better position, having their mains laid right up to the borders of the parish, and were therefore better able to deal with the matter than the Company.

Evidence was then given by Alderman Gummer, the Chairman of the Gas Committee of the Corporation, in support of the application. In the course of it, he stated that the rate charged for gas at Thrybergh would be the same as at Rotherham. In cross-examination, he acknowledged that the application of the Corporation was made as a mere commercial speculation. After paying expenses, the revenue of the gas

undertaking was available, and had been used, for the relief of the borough rates.

Among the other witnesses called was Mr. J. E. Knight, the architect of the new church at Whinney Hill, who said the Colliery Company had been approached with regard to the lighting of the church, and the information received was to the effect that they would not do it. Rev. G. H. C. Bowen (the Rector of Thrybergh) made an independent statement in favour of the application. In doing so, he asserted that Mr. Fullerton really supported it; his objection being confined to any proposal the Corporation might make for the inclusion of the parish of Thrybergh within the area of the borough. This statement was borne out by Mr. T. Beeden, Mr. Fullerton's agent.

The Town Clerk read a letter from Mr. Vickers Edwards, an architect, in support of the application, and emphasizing the necessity of bringing the gas-mains to the Whinney Hill Schools. He said he considered the lighting of the schools by paraffin lamps dangerous for children. It was not only essential from the point of view of safety, but also in the interests of education, that gas should be provided.

Mr. Ellison, in opposing the application, dealt mainly with the legal aspect of the matter. He argued that the Local Government Board had no power to make the Provisional Order where the question was merely a commercial one. Any profits of the gas undertaking would go to the ratepayers of Rotherham, and not to the consumers of Thrybergh. The Colliery Company, who owned nine-tenths of the houses of Thrybergh, were willing to put down proper gas plant to supply the district, and had prepared the plans and estimates for the purpose.

Mr. James Elce, the Manager of the colliery, said the Company started to get out the plans for the gas-works two months ago; but he had not seen them, and could not give details as to the capacity of the works. They were on the lines of what was done in similar villages in other parts of the country.

Mr. Mortimer submitted that it was clear the inhabitants of Thrybergh wanted gas, and that the Corporation were in the best position to supply it. Even if the Colliery Company had the power to furnish gas under their Articles of Association, they might any day be prevented from doing so by an injunction obtained by a shareholder. The Corporation were willing to supply gas at a cost which would satisfy the parish.

MERCANTILE CORPORATIONS AND THE FRANCHISE.

The Bill to confer the municipal franchise upon mercantile corporations and companies which was introduced last session and dropped, has been brought in again by Sir William Holland, supported by Sir Clifford Cory, Sir Henry Kimber, Mr. Robert Balfour, and Mr. Holden. It provides that where any corporation aggregate or joint-stock or other company is in occupation, as owner or tenant, of any land or tenement of the clear yearly value of not less than £10 in any district or place having a local government register of electors, and is rated in respect of the same, a duly authorized officer shall be entitled to be entered in the register, and to vote at any election excepting for a Member of Parliament, and shall also be qualified to be elected as if he were in all respects fully qualified to be entered and vote and be elected. An officer of a corporation or company authorized to vote is to make his claim on the prescribed form, and forward it to the overseers or the assessors of the parish in which the vote is claimed. The overseers or assessors are to make out a list of all persons so claiming; and, subject to any objection sustained before or revision by a revising barrister, the list is to be incorporated in the next printed burgess roll, and the power to vote is to come into operation on the 1st of November in that year, and continue for twelve months. It is provided that His Majesty the King may, by Order in Council, alter the instructions, precepts, notices, and forms under the Registration of Electors Acts in such manner as appears necessary for carrying into effect the proposed Act, the County Electors Act, 1888, and any other Act for the time being in force amending or affecting these Acts; and the instructions, precepts, notices, and forms specified in any such Order in Council are to be observed and be valid in law, and clerks of the peace and town clerks and other officers are to act accordingly. The words "corporation aggregate" are not to include any municipal corporation, council of a county or metropolitan borough, county council, urban or rural district council, parish council, or board of guardians.

Kimberley Water-Works Company, Limited.—The report of the Directors for the year ended Dec. 31 sets forth that the working account shows a balance of £23,270. After providing for debenture interest and £956 for depreciation, the net profit, including £1772 interest on investments, is £22,486. The Directors propose to write off £6736 from construction, and to pay a dividend of 2½ per cent. for the six months to Dec. 31; making, with the interim dividend, a total of 5 per cent. for the year, absorbing £15,750. The consumption of water for the year was 172,566,600 gallons, compared with 215,972,700 gallons during 1907.

Lighting the St. Leonards Pier.—According to a statement in the "Hastings Observer," the local Manager of the Rinkeries Syndicate (Mr. H. F. Blackwell) is not favourably impressed with the business methods of the Hastings Corporation as suppliers of electric current. He told a representative of the paper that he was going to have about 4000 lamps on the St. Leonards Pier, with large arcs and electric signs, and he had reckoned to pay 2½d. per unit for the current. But the Corporation offered him terms that worked out at a good deal more than this; and, as the result of his negotiations with them, he came to the conclusion that they did not want to meet him in the matter. Consequently, he went to the Gas Company and asked them what they could do for him. He saw Mr. Botley, and the next day received a quotation, with a plain and businesslike statement for lighting the pier—very different from the Corporation, who kept him waiting a week. "The Gas Company seem," he said, "to be able to meet me on every point, and all at the ordinary price of gas, with a certain charge for maintenance, which works out at considerably less than that asked by the Corporation."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The illuminating power of the gas supplied in Edinburgh and Leith is again a subject of interest, consequent, I presume, upon the Gas Commissioners having exercised the power conferred upon them in their recent Provisional Order, and reduced the candle power. They are authorized to go down as low as 14 candles. Before obtaining the Order they had been supplying over 20 candles. The first indications of a change having been made was the publication of letters to the editors of more than one newspaper—anonymous, of course—in which complaint was made of the poor quality of the gas. One of the editors has, so far, confined the exercise of his public spirit to the publication of only one letter; but he added under it that he had received a number of others complaining of Edinburgh gas. In the letter he published, the writer stated that he had begun to think it was time to call upon an oculist, but that when spending a night in a friend's house in Arbroath he found that there he could read small print with perfect ease, and without the strain he felt in Edinburgh. I need not go further into the statements in the letters, which, as usual, are not of the most enlightened nature. The same remark may almost be made regarding a discussion which took place in the Edinburgh Town Council on Wednesday. Under the new Order, the Municipal Buildings in both Edinburgh and Leith are made official testing-stations. The Corporation of Edinburgh have fitted up a photometer in their City Chambers, and appointed Mr. W. Gordon, the Inspector of Gas-Meters, as Examiner. In Mr. Gordon's report regarding the gas on the 6th inst., the illuminating power was given as 17·18 candles. Mr. W. W. Macfarlane drew attention to the subject, and said he had received numerous complaints as to the low illuminating power. Mr. Balfour thought it was a pity that the Gas Commissioners had been given authority to reduce the illuminating power to 14 candles. Mr. Thomson stated that in some of the houses of the poorer class there was practically no light at all—candles would be better. Lord Provost Gibson explained that the reason given for the change in the standard of the gas was the immense advantage which would be derived from the introduction of incandescent lighting. Mr. Thomson remarked that the fittings in working-class houses were not suitable for the incandescent light. Mr. M'Michael said there were tens of thousands of houses in Edinburgh where they would never have incandescent light fittings. The Council had nobody to blame but themselves in giving power to reduce the standard. The subject was then departed from. In this short discussion, not any of the speakers, with the exception of the Lord Provost, are members of the Gas Commission. Were there no Gas Commissioners present, who could have given the Council some information upon a subject of so much importance to the community?

Six months ago, the Town Council of Kirkcaldy appointed a Committee to consider the advisability of the Council supplying the community with gaslight—the reason given for taking up the subject being that the present supply is insufficient in quantity and inferior in quality, the Gas Company having failed to keep up to the needs of the community. On Monday the Committee reported to the Council unani-

mously recommending the purchase of the gas undertaking and the appointment of a Committee to consider under which Act the Council should proceed. Mr. Mackinnon moved disapproval. He was not, he said, opposed to the purchase of the gas undertaking, if it could be shown that it would be profitable to the community; but, so far as he could make out, it could not be bought under £140,000, which he considered far too large a sum for the Council to take on. He had arrived at this figure by taking the profits for the past five years, multiplying them by 28, and adding 10 per cent. for compulsory purchase. Interest upon the sum he had mentioned, at 3½ per cent., would exceed by a few pounds the present profits of the Company. Then they would have to provide £3500 a year for the sinking fund; and as they could not interfere with the present conditions of gas supply in the town, they would have to fall back on the rates, which, in the first year, would mean quite 5d. in the pound. It might be seven or eight years before they could get down to 4d. It would, he believed, take 25, or it might be 30, years before the undertaking would be of any benefit to the town. There was no seconder to this motion. Provost R. C. Munro Ferguson, M.P., said the Committee had very fully considered the question, and he did not think that if they put the matter off for another six months they would be any wiser than they were at present. They had no information which would lead them to assume that they would have to pay £140,000 or any other sum for the undertaking. The really important thing was to see that good arbiters should be appointed. The precedent of Dunfermline had had a certain influence with the Committee, because the purchase of the gas-works there had turned out remarkably well; and there was no reason why it should not turn out equally well in Kirkcaldy. Mr. Wright, who originally raised the subject in the Council, formally moved adoption of the Burghs Gas Supply Act. Mr. Mackinnon asked if the motion was legal. [Notice had apparently not been given.] The Town Clerk was of opinion that the motion was not competent, and the subject was delayed. So was the adoption of the recommendation of the Committee.

The proposal of the inhabitants of Crossgates, Fifeshire, to adopt gas lighting, and the question of whether they are to purchase gas from the Corporation of Dunfermline or from the Cowdenbeath Gas Company, though a small matter, has developed locally into a centre of great heat and activity. It was brought up in the Dunfermline Town Council on Monday by Bailie Husband, who complained that the minutes of the Gas Committee did not contain any reference to the negotiations regarding the lighting of Crossgates. Mr. Stewart, the Convener, replied that the question could not be discussed in public, and the matter dropped. Then, on Wednesday evening, a crowded meeting of ratepayers was held at Crossgates, at which Mr. Stewart made a long speech in support of the view that the supply of gas should be taken from Dunfermline; and he was hotly criticized by several speakers who support the Cowdenbeath supply. So far as could be gathered from the proceedings, the purpose in holding the meeting was to obtain an expression of opinion which might influence the District Committee of the County Council who are considering the question of the creation of a special lighting district at Crossgates. There was no motion proposed; so that expression of opinion will not be found in that direction, though it may be in the enthusiasm of the proceedings.

The Hamilton Town Council discussed the subject for a year or two

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 144.

Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 6	10	Alliance & Dublin 10 p.c.	17½-18*	..	5 11 1	56,000	Stk.	Feb. 25	10	Liverpool United A	222½-224½	..	4 9 1
258,955	10	"	7	Do. 7 p.c.	12½-12½*	..	5 9 10	718,100	"	"	7	Do. B	69½-171½	..	4 1 7
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	9½-100	..	4 0 0	306,083	"	Dec. 30	4	Do. B. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd.	52-6	..	5 8 4	75,000	5	Dec. 11	6	Malta & Mediterranean	4½-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	44-4½	..	5 15 6	560,000	100	"	5	Met of 5 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne 0 p.c.	25½-29½	..	4 14 11	250,000	100	"	4½	Melbourne ½ p.c. Deb.	100-102	..	4 8 3
51,810	10	"	7	mouth Gas B 7 p.c.	16½-17	..	4 2 4	541,920	20	Nov. 13	3½	Monte Vid. Ltd.	12½-12½*	..	5 9 10
53,200	10	"	6	and Water Pref. 6 p.c.	15½-16	..	3 15 0	1,775,292	Stk.	Feb. 25	3½	Newcastle & G't. S. & D. Con	107-108	..	4 3 4
380,000	Stk.	"	12½	Brentford Consolidated	247-250	..	5 0 0	516,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	5½	Do. New	187-190	..	5 0 0	151,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½-20	..	5 0 0
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	55,940	10	"	7	Do. 7 p.c.	13-13½	..	5 3 8
206,250	"	Dec. 11	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140-142	..	5 12 8
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	210-213	..	5 1 0	60,000	5	Mar. 31	8	Ottoman, Ltd.	6-6½	..	6 8 0
246,320	"	"	2½	Do. A Ord. Stk.	152-155	..	5 0 0	3,830	53	Feb. 25	13	Portsea Island A	135-137	..	5 0 7
460,000	2½	Apl. 16	10	British	4½-4½*	..	4 14 1	60,000	50	"	13	Do. B	119-121	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	114-117	..	5 2 7	100,000	50	"	12	Do. C	119-121	..	4 19 2
165,700	"	"	4½	Do. do. 3½ p.c.	85-87	..	5 3 6	114,800	50	"	10	Do. D and E	101-103	..	4 17 1
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	12½-13½	..	5 5 8	398,490	5	Oct. 29	7	Primitiva Ord.	6½-6½*	..	5 7 8
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	796,181	5	Jan. 28	5	Do. 5 p.c. Pref.	5-5½	..	4 15 3
100,000	10	"	—	Cape Town & Dis., Ltd.	4½-5½	..	—	483,000	100	Dec. 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
50,000	50	Nov. 3	6	Do. 4½ p.c. Pref.	4½-5½	..	—	1,000,000	10	Oct. 15	8	River Plate Ord.	13½-14½	..	5 12 3
100,000	Stk.	Dec. 30	4½	Do. 6 p.c. 1st Mort.	48-50	..	6 0 0	312,050	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
157,150	Stk.	Feb. 25	5	Do. 4½ p.c. Deb. Stk.	77-79	..	5 13 11	250,000	10	Mar. 31	8	San Paulo, Ltd.	13½-14	..	5 14 4
1,491,280	Stk.	Mar. 12	5½	Chester 5 p.c. Ord.	109-111	..	4 10 1	62,500	10	"	—	Do. 6 p.c. Pref.	11½-12	..	5 0 0
560,000	"	"	5	Commercial 4 p.c. Stk.	106-109	..	4 15 5	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49½-50½	..	4 19 0
475,000	"	Dec. 11	5	Do. 3½ p.c. do.	10-10½	..	4 17 1	135,000	Stk.	Mar. 12	10	Sheffield A	236-238	..	4 4 0
800,000	Stk.	"	6½	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	209,98	"	"	10	Do. B	236-237	..	4 4 0
200,000	"	"	7	Continental Union, Ltd.	101-103	..	6 6 3	523,500	"	"	10	Do. C	234-236	..	4 4 9
49,200	Stk.	"	4	Do. 7 p.c. Pref.	138-141	..	4 19 3	70,000	10	Oct. 29	10	South African	14-14½	..	6 17 11
55,000	"	"	4	Derby Con. Stk.	121-123	..	4 1 4	6,429,895	Stk.	Feb. 11	5/6/3	South Met., 4 p.c. Ord.	12-12½	..	4 6 0
143,095	"	Mar. 31	5	Do. Deb. Stk.	103-105	..	3 16 2	1,895,445	Stk.	Jan. 14	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
486,000	10	Jan. 28	12	East Hull 5 p.c. Ord.	96-98	..	5 2 0	209,82	S.K.	Mar. 12	8	South Shields Co., Stk.	152-154	..	5 3 11
351,000	10	"	12	European, Ltd.	23½-24½	..	4 19 0	605,000	Stk.	Feb. 25	5½	Stu Suburban Ord. 5 p.c.	120-122	..	4 10 2
15,101,515	Stk.	Feb. 11	4/10/8	Do. £ 1cs. paid.	17½-18½	..	4 18 5	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
2,600,000	"	"	3½	Gas 4 p.c. Ord.	103-104	..	4 7 0	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
3,799,735	"	"	4	light 3½ p.c. max.	88-89	..	3 18 8	502,310	Stk.	Nov. 13	5	Southampton Orj.	109-111	..	4 10 1
4,193,975	"	Dec. 11	4	and 4 p.c. Con. Pref.	105-107	..	4 14 9	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c.	132-134	..	5 0 9
258,740	Stk.	"	3½	Coke 3 p.c. Con. Deb.	83-86	..	3 9 9	423,940	"	"	5½	and B 3½ p.c.	109-111	..	4 14 7
82,500	"	"	6½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	149,070	"	Dec. 30	4	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
70,000	10	Oct. 15	11	Do. do. 5 p.c.	117-120	..	5 4 2	162,300	10	"	8	Tuscan, Ltd.	8½-9½	..	8 13 0
123,500	Stk.	Mar. 12	6½	Hongkong & China, Ltd.	18-18½	..	5 18 11	149,900	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	100-102	..	4 18 0
65,781	"	"	5	Ilford "A" and "C"	134-136	..	4 15 7	236,476	Stk.	Feb. 25	5	Tynmouth, 5 p.c. max.	105-107	..	4 13 0
51,000	"	Dec. 30	4	Do. "B"	103-105	..	4 15 3	255,600	Stk.	Feb. 25	6½	Wands B 3½ p.c.	131-133	..	4 17 9
4,940,000	Stk.	Nov. 13	8	Do. 4 p.c. Deb.	102-104	..	3 16 11	79,416	"	Dec. 30	3	worth 3 p.c. Deb. Stk.	72-74	..	4 1 1
473,600	Stk.	Feb. 11	3½	Imperial Continental	183-185	..	4 6 6	835,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	118-121	..	4 6 9
195,242	Stk.	Mar. 12	6	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	..	3 18 9
				Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5

Prices marked * are "Ex div."

before they could make up their minds to have a railway siding constructed into the gas-works. They at last agreed to it, and the siding has been carried out. The troubles of the Corporation over the matter are not, however, at an end. The working of the siding is now the difficulty. The Caledonian Railway Company are willing to deliver loaded and to lift empty waggons at a certain point; but if they are asked to go beyond this point, they claim payment at the rate of 7s. per hour as the charge for shunting. The Gas Committee conducted all their negotiations on the footing that the Railway Company would deliver all goods at the gas-works without extra charge; and they recommended that a further meeting with the General Manager of the Railway Company be sought. This was agreed to. It was intimated that Messrs. Archd. Russell, Limited, had declined to put gas-fittings into houses at Portland Square belonging to them. The Committee agreed unanimously that the Council should not put in the fittings. Bailie Smellie considered this was a case of the community suffering between two conflicting interests. Mr. Gilmour moved that the matter be sent back to the Gas Committee for further consideration; and after further discussion, the Council agreed to adopt this course. Mr. F. Cassells moved that, in the opinion of the Council, the appropriation of gas-works profits for the erection of a new town hall or municipal buildings—a scheme not yet agreed upon—was illegal, unfair, and unjust to the present ratepayers, and should be discontinued; and that a Committee should be appointed to consider and report as to the best manner of distributing the sums already accumulated. These sums, he mentioned, amounted to £6760—made up of five yearly payments of £1250 from the gas-works profits, with the interest accrued. They had the opinions of the then Dean of the Faculty of Advocates (now Lord Skerrington), and of Mr. Fraser, that the procedure of the Council in regard to the new town hall was entirely illegal; and even the eminent Counsel consulted by the Town Council had distinctly informed them that there were grave doubts as to the legality of their procedure. Ex-Provost Keith moved that the Assessment Committee, when framing their next annual budget, consider whether the sums already accumulated from the gas profits might be utilized for the redemption of municipal debt and the reduction of rates. Mr. Moffat seconded. Mr. Cassells then withdrew his motion, and accepted that of ex-Provost Keith, which became the unanimous finding of the Council.

In the Dysart Town Council last week, reference was made to a complaint by the Gas Company to the effect that the governors on several of the street-lamps had been tampered with by burgh servants. The Town Clerk read a further letter from the Secretary to the Gas Company, in which it was stated that the Town Clerk's reply had been submitted to a meeting of the Directors. In his reply, the Town Clerk had stated that the Council had been unable to find the town's servants at fault; but the Secretary wrote that the information was not given which enabled the Council to come to this finding. He asked that if the town's servants who were responsible had made some statement, the Council should communicate that information to the Directors. The Council, the Secretary's letter went on to state, were of opinion that there would be no advantage in prosecuting the matter further;

but the Directors took an altogether different view, and could not allow the matter to rest. This letter having been read, the Town Clerk said they would give the Company all the information they had, if the Company would consent to do likewise. The subject was thereupon allowed to drop.

A meeting of the Gas Committee of the Dumfries Town Council was held on Thursday of last week to consider as to the gas managership, which is vacant through the death of Mr. G. Malam. The meeting, it is reported, lasted an hour-and-a-half, and was at times of a lively character. A motion by Provost Lennox to bar canvassing was carried. A good deal of discussion took place as to the salary to be offered—£300 and £350 being suggested. It was, however, agreed to obtain information as to the salaries paid to gas managers in towns of similar size before coming to a finding. Mr. Smith, the foreman in the gas-works, and Mr. Dickie, another employee—cashier, I think—who are both candidates for the post, were appointed to take charge of their respective departments in the meantime. It was decided to recommend the Council to advertise the situation.

Suicides by Coal Gas.

At Paddington, a few days ago, Dr. Danford Thomas inquired into the death of Rebecca Whur, aged 55, widow of a shop manager, who committed suicide at her home in the Harrow Road by inhaling gas. Mrs. Clemens, wife of the Rev. Arthur Clemens, Vicar of St. Paul's Church, Paddington, said she went to visit deceased on the previous Monday evening, and found her room full of gas. After having all the windows opened and the lights put out, she went into the room and found two gas-jets turned on, and the deceased lying on the floor with a sheet covering her face and also a gas-ring, the tap of which was turned on. A medical man deposed that death was due to coal gas poisoning, and said he had no doubt it was due to deceased's deliberate act. The jury returned a verdict of "Suicide while of unsound mind." William Piercy Brocklehurst, aged 73, whose death was investigated by the Hornsey Coroner on the 10th inst., committed suicide at his house on Station Parade, Muswell Hill. He was a retired ironmonger, and for some time had been depressed; but on the morning of his death he appeared to be in good spirits. Shortly afterwards, however, he was found sitting dead in an arm-chair, with the rubber pipe from a gas-stove passed under his waistcoat to his mouth. The verdict was "Suicide while of unsound mind." An inquest was held in Dublin on Monday last week on James Parker, aged 32, a native of Manchester, who was found dead in a boarding-house at Fairview. Mr. Isaac Whittaker, of Salford, identified the body as that of his son-in-law. The landlady said that on the previous Saturday deceased seemed depressed. On Sunday morning she detected a strong smell of gas, and found Parker lying with his head near the gas-meter pipe, which had been cut, while the keyhole of the door and other openings had been blocked up. A verdict of "Suicide during temporary insanity" was returned.

The "New Davis" Screwless Cooker

has many claims on the favourable consideration of every Gas Undertaking. Here are a very few of them:—

It has proved itself **Unique from a Maintenance Point of View.**

It has an Improved Grill Burner and Grill Pan—virtually a small oven—giving **25% increase in efficiency.**

A new method of Gas and Air supply to the Oven, with Patent Adjusters **securing perfect combustion and simplicity in operation.**

An Enamelled Tray of **Unique and Novel Construction.**

It **looks** so attractive—the first impression created is always favourable!

The DAVIS GAS STOVE CO., Ltd.,
Diamond Foundry, LUTON.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 17.

Holidays have rather interfered with business; but, on the whole, the market has been fairly well sustained. Prices have, however, been somewhat irregular, partly owing to special demand at some ports, and partly to a certain amount of reselling at others. Home demand has again been good. The closing quotations are £11 8s. 9d. per ton f.o.b. Hull, £11 10s. to £11 11s. 3d. per ton f.o.b. Liverpool, and £11 12s. 6d. to £11 15s. per ton f.o.b. Leith. There continues to be inquiry for forward delivery; but the attitude of makers does not encourage much business. £11 12s. 6d. to £11 15s. per ton, according to port, is still required, but so far not reported paid, for July-December delivery; while for January-April, 1910, £12 is being quoted f.o.b. best ports.

Nitrate of Soda.

The spot market has been fairly well occupied, and the quotations remain 10s. 4½d. and 10s. 7½d. per cwt, for 95 per cent. and refined qualities respectively.

Tar Products.

LONDON, April 19.

The majority of tar products are quiet, with the exception of pitch and creosote. There is a slight improvement in the price of the former at all points. With regard to creosote, there have been several sales made during the last few days, which, however, has not strengthened the price. But there are still a good many inquiries in the market; and, with the busy season approaching, we may possibly see an improvement. No fresh sales of material importance are reported in 90 per cent. and 50-90 per cent. benzol, which are very weak. Crude carbolic dealers are still paying better prices than those being offered by consumers.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d., ex works. Pitch, London, 24s. to 24s. 6d.; east coast, 23s. 6d. to 24s.; west coast, 23s. to 24s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 6d.; North, 5½d.; 50-90 per cent., casks included, London, 6½d.; North, 6d. Toluol, casks included, London, 8½d.; North, 7½d. to 8d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3d. to 3¾d.; solvent naphtha, casks included, London, 10½d. to 11d.; North, 9d. to 9½d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2¾d. to 2¾d.; North, 2¾d. to 2¾d. Heavy oils, casks included, 3d. Carbolic acid, 60 per cent., east coast, 1s. 0½d. to 1s. 0¾d.; west coast, 1s. to 1s. 0¾d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article is steady, but the demand is quiet, though, with the better weather setting in, it is considered that in some cases the price may improve a little. To-day for Beckton prompt, the

price is £11 17s. 6d.; and on Beckton terms, £11 7s. 6d. to £11 10s. In Hull, £11 7s. 6d. to £11 10s. is quoted; and in Liverpool, £11 10s. to £11 12s. 6d. In Leith, £11 12s. 6d. to £11 15s. is the price asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now an active coal market, and for some classes of fuel the demand seems to be brisker, with a tendency towards higher prices. In steam coal, the output is again normal; and, with good shipments, it is well taken up. The prices range for best Northumbrians from about 11s. 9d. to 12s. 6d. per ton f.o.b. For second-class coals, from 9s. 6d. to 10s. 6d. is quoted; and the demand for steam smalls appears to be stronger—from about 5s. to 6s. In the gas coal trade, there is rather more briskness than is usual at this season of the year; and the prices are firm. Durham gas coal varies from about 9s. to 10s. 3d. per ton f.o.b. for the usual classes, according to quality, with "Wear specials" from about 3d. to 6d. per ton higher. Contracts reported are few; but it is said that some sales for the Mediterranean have been made, though there are also rumours of some competition in these markets with fuel from competing coalfields. As it is, however, there is still a strong inquiry for Durham gas coal for the Italian markets. Coke is steadier, and gas coke is in fair demand. The lessening output helps to give firmness to the price—at from about 12s. 9d. to 13s. 3d. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Trade is not healthy; the home request being slack. There is a slight improvement in foreign demand, due to the expectation of the opening of the Baltic trade, and also on account of the circumstance that during Easter week English vessels catered for Scotch traffic. The prices quoted are: Ell 8s. 9d. to 10s. 3d., splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d., per ton f.o.b. Glasgow. The shipments for the week amounted to 303,671 tons—an increase of 26,946 tons upon the preceding week, and of 29,288 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,584,532 tons—an increase of 280,183 tons upon the corresponding period.

We have received from John Wright and Eagle Range, Limited, their latest summer booklet, furnishing illustrated particulars of their "Eureka" gas-cooker and "Sun" boiler. The former appliance is well known. The unique feature of the latter is its automatic valve, which turns the gas down as soon as the water is raised to the right temperature, and restores the full supply when the heat is lowered, by the admission of cold water. The booklet contains a view showing how the boiler may be used in conjunction with the coal-range boiler.

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GLASGOW.

New Joint-Stock Companies.

The Hella Busblight and Methane Gas Company, Limited, was registered on the 7th inst., with a capital of £170,000, in £1 shares, to acquire certain inventions for the manufacture of pure methane, or a mixture of gas rich in methane; for the manufacture of radiant, refractory, and indestructible filaments for the manufacture of incandescent mantles or bushes; and for all kinds of lighting and heating by gas, alcohol, acetylene, petrol, oil, and other modes; also for certain machinery for improvements in the manufacture of incandescent filaments, together with the patents granted, or to be granted, in respect thereof for the United Kingdom and all British colonies and dependencies (except Canada), together with the business of the Universal Gas Methane and Buisson Hella Company, Limited, in those countries (except Canada); to adopt agreements (1) with the Company and R. Laigle and (2) with G. Auger, &c. Under the title of Machine Gas, Limited, a Company has lately been registered with a nominal capital of £25,000, divided into 19,700 ordinary and 5300 deferred shares of £1 each, to manufacture, buy, sell, let on hire, and deal in machinery, pipes, fittings, &c., for the manufacture, distribution, and utilization of gas and light; to manufacture, sell, and deal in all kinds of gas and light; and to prosecute enterprises of any description having the objects of the Company. There are two subscribers—one being Mr. A. C. Ionides, who holds 500 ordinary shares, and the other Mr. A. J. M. Duncan, who has one share. The public generally are not invited to subscribe. The number of members of the Company (exclusive of employees) is limited to 50. The Wedmore Gas Company, Limited, has been formed with a capital of £3000, in £5 shares, to adopt an agreement with Mr. G. C. Swayne, and to manufacture and supply light and fuel in Wedmore and elsewhere, in Somerset. The Novalux Syndicate, Limited, has been registered with a capital of £25,000, in 24,725 ordinary shares of £1 each and 5500 founders' shares of 1s. each, to adopt an agreement and to acquire a licence conferring the right to sell in Great Britain and the Colonies certain appliances for lighting and extinguishing gas-lamps. The Water Circulating Gas-Cooker, Limited, has been registered with a capital of £60,000, in £1 shares.

Walsall and a Gas Supply for Pelsall.—With reference to a proposal to extend the Walsall gas-mains to Pelsall, the Gas Committee have instructed the Town Clerk to inform the Clerk to the Pelsall Parish Council that as 48 persons only had agreed to take the gas in case the mains were extended, they do not consider that they would be justified in recommending the extension; but that if about three times that number would agree to do so, the Committee would favourably reconsider the matter. The consideration of the question of extending the gas-mains to Shelfield has been ordered to stand over until the Brownhills Urban District Council have reported the result of their canvass of the inhabitants to ascertain the number of persons who will take gas.

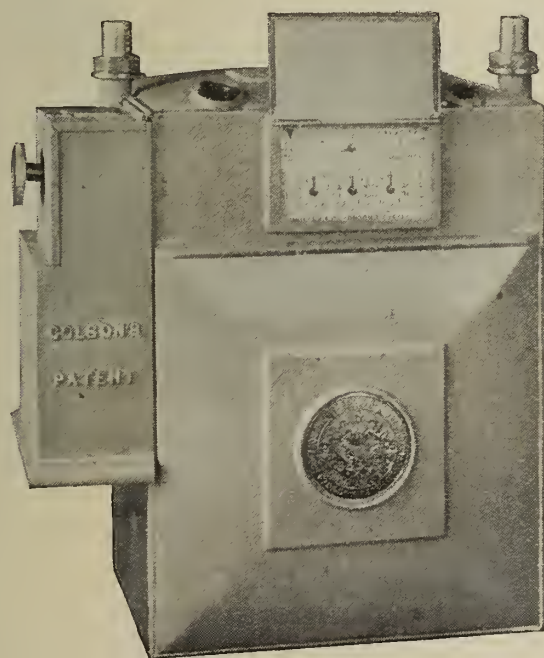
Cookery Competition for Girls at Port Elizabeth.

Mr. William Arnott, the ever-active Manager of the South African Lighting Association, recently arranged some cookery competitions for girls which were attended by highly successful results. He offered two prizes for the best set of four scones, and a like number for the best set of four queen cakes, made by girls of sixteen and under with the aid of a gas cooking stove. The offer was well advertised, and no fewer than 70 sets were sent in. The awards were made by a Committee of ladies, who found it very difficult to place them owing to the general high merit of the articles submitted. The winner of the first prize for scones was a girl of fourteen who had been successful on a previous occasion; the second prize being carried off by a girl of the same age. Another girl of this age gained the first prize for queen cakes; and one a year younger secured the second prize. The scones and cakes were exhibited in the Company's show-rooms, and afterwards sent to the Children's and Nazareth Homes. Mr. Arnott invited people to come to the rooms and see what gas cookery could do, even when children were the cooks; and then recommended them to have gas-stoves fixed for themselves, and make use of them, as many of their fellow townspeople had done. On a subsequent occasion, he gave a demonstration in toast-making by means of a gas-ring and a "Sala" toaster costing 1s. 6d. Cookery is taught in many of the schools in Port Elizabeth; and Mr. Arnott is determined that the value of the gas-stove as an auxiliary shall not be lost sight of.

Gas Profits at Stafford.—The Stafford Corporation Gas Committee estimate that out of the profits of the Gas Department for the year ended the 31st ult., the sum of £3000 will be available in aid of the district funds.

Fires in the City of London.—A report recently issued shows that during the past year there were 134 outbreaks of fire in the City of London. Of this number, 16 were caused through the agency of gas, and 11 by electric current. The outbreaks caused by gas are tabulated as follows: Ceiling fired by gas-jet, 1; curtains or blinds fired by gas-light, 3; escapes of gas, 3; seeking gas escapes with naked light, 2; defective gas-meter, 1; gas-stoves, 9. The fires caused by electric current were all due to defective circuits.

Lecture on the Divining-Rod.—"Water Divining at Home and Abroad, or the History of the Divining-Rod," was the subject of a lantern lecture given in the St. Lawrence Hall, Ipswich, by Mr. S. T. Child, on Monday evening last week. Many instances were given of work done in the immediate neighbourhood; also on the King's estate at Sandringham. The main part of the lecture consisted of instances of water finding during the visit of Mr. Child to Portugal. In cases where villages had been entirely without water for some time, and large numbers of the villagers had died from thirst, the lecturer related how he had been able to locate where water could be found. He said it was quite by accident he found he possessed this gift.



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Failure of the Electric Light in Belfast.—Just before 3 o'clock last Tuesday morning, the whole of the public departments in Belfast were thrown into complete darkness by the sudden total failure of the electric light supply at the Post Office, the Fire Station, the Central Police Office, and the Telephone Exchange. The collapse momentarily created a feeling of consternation; but, fortunately, in nearly every instance recourse was had to emergency gas installations. There was no accident at the electric light station; the cause of the failure being the breaking of one of the main cables.

Gas Prices and Profits.—The current number of the "Municipal Journal" contains a leaderette dealing with the portion of the Inaugural Address of Mr. W. Langford at the recent meeting of the Midland Association of Gas Managers, in which he commented upon the unfairness of reducing rates out of profits. "The figures quoted by Mr. Langford," says our contemporary, "show that an extra, and quite unjustifiable, tax is imposed upon gas consumers by the Longton Corporation. If the Council supplied gas at practically cost price, the demand would be increased, and the supply might be developed in many directions. We are glad to think that, after many years' agitation in regard to this matter, the principle of selling at cost price has been incorporated in the Act of Parliament federating the Potteries towns. There is also a notable change of public opinion in the country on the subject; and we confidently expect that even Manchester, with its £50,000 and £60,000 yearly rate relief from gas profits, will shortly repent, and tread the path that leads to sound municipal economy."

Poisoning by Coal Gas.—A remarkable death from poisoning by coal gas was inquired into last Friday by the Portsmouth Coroner. On the previous Tuesday evening, the open door of an empty house at Copnor attracted notice; and on the premises being entered it was found that a considerable escape of gas was taking place from a small cupboard at the rear, and a man was lying at full length at the entrance. He was quite insensible; and though efforts were made to restore animation by artificial respiration, he died on the spot. The escape of gas was so great that it could only be stopped by opening the ground in front of the house and capping the supply-pipe. The deceased was Ernest Fairhurst, 34 years of age, a fitter in the employ of the Portsea Island Gas Company, and in the course of reinstating a service-pipe to the meter, it was conjectured that the rush of gas was so great when the old cap was removed that he was overpowered and suffocated in the darkness in which he was working. A verdict of "Accidental death" was returned; the Jury adding a rider to the effect that in all future work of such a kind two men should be employed.

Gas v. Electricity for Park Lighting at Bath.—At the last meeting of the Bath Town Council, a discussion took place on the subject of the lighting of the Victoria Park on the three nights weekly during thirteen summer weeks when a band plays. It appears that the Electric Light Committee submitted to the Park Committee an offer to supply and light 38 100-candle power lamps for 2s. per hour, if the latter Committee would pay a sum of upwards of £600 to meet the initial outlay for mains, lamps, &c. The Bath Gas Company offered an inclusive charge of £40 per annum to light 35 250-candle power lamps for two hours per night three nights weekly for the season, with an additional charge of 6s. for each extra night. When the Park Committee met to consider the tenders, the Electric Light Committee sent in a revised offer of an inclusive charge of £60; but at the same time the Corporate Property Committee offered them, on behalf of the Corporation, a grant of £60 a year if electricity was used. After some consideration, the Park Committee decided in favour of lighting by gas, and asked for a grant of £40 only, instead of the £60 offered; being a saving to the ratepayers of £20 per annum.

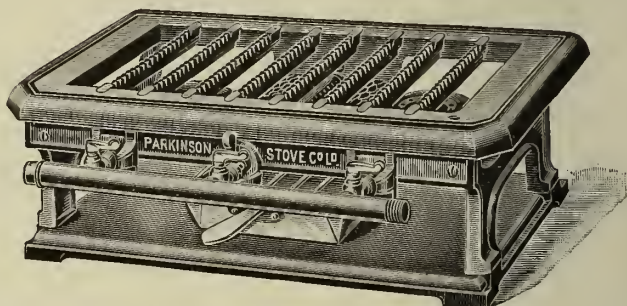
APPLICATIONS FOR LETTERS PATENT.

- 8075.—SOUTHEY, A. W., and the DUDBRIDGE IRON-WORKS, LTD., "Lamps and stoves." April 5.
 8149.—GRAETZ, M., "Regulating device for gas-nozzles." April 5.
 8165.—SPENCER, A., "Controlling the supply of gas to railway carriages." April 5.
 8201.—BEDFORD, C. S., and ATKINS, F., "Producing liquid or gas tight joints upon cylinders." April 6.
 8229.—DEMPSTER, R., and SONS, LTD., BROADHEAD, J. W., and TOOGOOD, H. J., "Manufacture of gas." April 6.
 8243.—HETHERINGTON, R., and TAYLOR, J., "Governing the flow of gas from meters." April 6.
 8269.—PEACOCK, J. H., and TOPLIFF, F., "Gas-turbine." April 6.
 8309.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires." April 6.
 8318.—GREENER, T. Y., THOMPSON, W., and MORGAN, J., "Reciprocating trough conveyors for coal." April 6.
 8332.—VANDERLIP, L. C., "Gas-engines." April 6.
 8396.—STORRER, H., "Measuring the difference in gas pressures." April 7.
 8445.—KIESSELBACH, C., "Controlling gas-engines." April 7.
 8449.—CHIPPERFIELD LAMP SYNDICATE, LTD., and BROWNING, E. M., "Suspension of street and other lamps." April 7.
 8450.—CHIPPERFIELD LAMP SYNDICATE, LTD., and BROWNING, E. M., "High-pressure gas-lamps." April 7.
 8476.—DEMPSTER, R., and SONS, LTD., and TOOGOOD, H. J., "Gas-retorts." April 8.
 8481.—BLAKELEY, W., "Washing, cooling, and heating of gases and liquids." April 8.
 8499.—LEE, J. G. S., "Gas-bag for use when testing mains." April 8.
 8504.—NEWMAN, F. L., "Full-bore valves." April 8.
 8551.—RORKE, T. J. & E., "Controlling the supply of gas." April 8.
 8558.—PARKER, T., "Destructive distillation of coal." April 8.
 8572.—WEST, J., and GLOVER, S., "Vertical retort discharging apparatus." April 8.
 8575.—HANWELL, H. W., "Gas-pendants." April 8.
 8632.—BREEDEN, J., and CO., LTD., and BREEDEN, F., "Joints of gas-brackets." April 10.
 8653.—HELPS, G., "Gas lamps and burners." April 10.

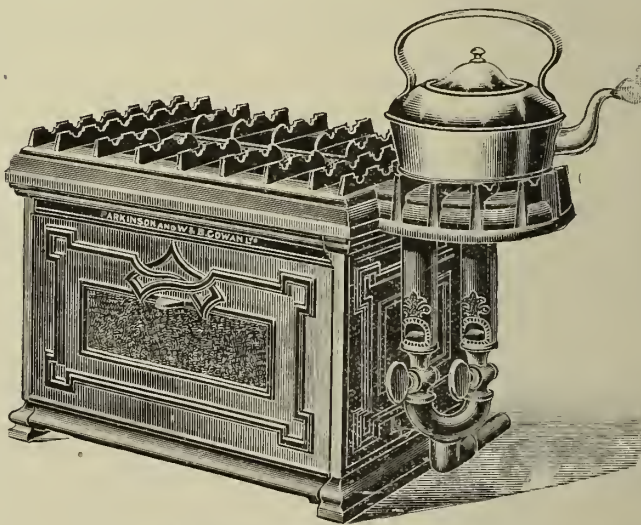
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MADE IN 2 SIZES.

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129, HIGH HOLBORN, W.C.

Extended Gas Powers for the Coventry Corporation.—The Local Government Board have directed an inquiry to be held by Mr. F. J. Willis into an application by the Coventry Corporation for a Provisional Order to partially repeal, alter, or amend several of their Gas Acts, so as to enable them to inspect fittings in new buildings, require consumers to use effective anti-fluctuators or other apparatus for controlling and regulating the supply of gas to engines, and provide that gas-fittings, stoves, and cookers let on hire by the Corporation shall not be subject to distraint. It is further proposed to substitute improved methods of testing the illuminating power of the gas.

Increased Storage at the Arbroath Gas-Works.—After considerable negotiation, the Corporation of Arbroath have secured ground adjoining the gas-works upon which to erect a new gasholder, the contracts for which were let some time ago; and the work of erection will now be proceeded with. Provost Alexander, at a recent meeting of the Gas Committee, said they had had some difficulty in arriving at an agreement, and eventually they had to acquire a good deal more ground than they wished. Although it entailed a considerable feuduty, it was very much cheaper than buying property, and they could sell or sub-ven what they did not require. On the whole, he thought, they had made a favourable bargain. The price was a good deal less than the Manager at one time thought they would have to pay.

The Directors of the Oriental Gas Company, Limited, have resolved to pay an interim dividend at the rate of $\frac{3}{4}$ per cent., free of income-tax, on account of the year ending the 30th of June next.

A Local Government Board Inquiry has been held at Dorrington, near Sleaford, with regard to an application by the Sleaford Rural District Council for sanction to borrow £1000 for water-works at Dorrington.

For the purpose of centralization, Messrs. Thomas Glover and Co., Limited, have decided to move their head office staff from their City address to their works at Edmonton. In future, all communications should be addressed to Gothic Works, Angel Road, Edmonton, N. Messrs. Glover intimate, however, that their City office and show-rooms are still being retained.

At the last meeting of the Coleraine Town Council, tenders were considered for the supply of a supplementary cargo of coal, to complete the season's requirements; and it was decided to order 150 tons of Wrexham coal from the G. J. Eveson Coal and Coke Company, Limited, of Birmingham.

The Manchester Water Committee have decided to obtain tenders for the laying of a third line of pipes from Thirlmere, in the district between Windermere and Carnforth, a distance of 14 miles. They have also resolved to invite tenders for 40-inch pipes for use in the southern district between Walkden and Denton.

Last Friday an explosion took place in an Oldham street, through an accumulation of gas in an electric cable conduit. The footpath was greatly disturbed; and one man who happened to be passing at the time was slightly injured. The escaping gas was allowed to burn out, in order to obviate the risk of further explosions.

The Manchester police some days ago arrested a man named Moorhouse, who until recently was an employee of the Belfast Gas Department, on a charge of having misappropriated money belonging to the Council of the County Borough of Belfast. The accused, who was employed in the capacity of a timekeeper at the works in Ormeau Road, disappeared some months ago; and though immediately on the alleged defalcations being discovered steps were taken to ascertain his whereabouts and to execute the warrant which was duly issued, these had hitherto proved unsuccessful. It is understood that the amount involved is about £160.

The Directors of Messrs. Newton, Chambers, and Co., Limited, state in the annual report that, after allowing for depreciations, there is a profit of £39,130, making, with £11,459 brought forward, £50,590. Out of this there has been paid to the holders of debenture bonds and the mortgagees, for interest, £3501; and further sums have been set aside of £5000 towards the outlay on the new coke-ovens and £10,000 in respect of expenditure on the iron-works—leaving an available balance of £32,089. This the Directors recommend to be applied as follows: Payment of 6 per cent. on 7348 preference shares of £20 each, and 6 per cent. on 7975 ordinary shares of like nominal value; carrying forward a balance of £13,701.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DISTRIBUTION SUPERINTENDENT. Hythe and Sandgate Gas Company.
METER, &c. INSPECTOR. Grantham Gas Company.
MOND GAS PLANT ATTENDANT. The Power Gas Corporation.
SHOW-ROOM SALESMAN. Sutton Gas Company. Applications by April 24.
TRAVELLER (GEYSERS). No. 5383, c/o Willing's.

Situations Wanted.

GAS-FITTER. No. 5086.
REPRESENTATIVE (GAS PLANT, &c.). No. 5084.
SECRETARY, MANAGER OR ACCOUNTANT. Mimmac, St. Paul's Cray, Kent.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTER. J. Hawksley, Great Yarmouth.
PURIFIERS, &c. Uxbridge Gas-Works.
RETORT FITTINGS, CONDENSER, SCRUBBERS, EXHAUSTERS, PURIFIERS. Cardiff Gas Company. Tenders by May 1.

Patent Licences.

MANTLE MANUFACTURING MACHINES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Capital to Invest (Gas or Water Company). No. 5085.

Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. April 27.
BROMLEY AND CRAYS GAS COMPANY. May 11.
CROMER GAS COMPANY. May 11.
EASTBOURNE GAS COMPANY. May 11.
GRAYS AND TILBURY GAS COMPANY. April 27.
GUILDFORD GAS COMPANY. May 11.
HORNSEY GAS COMPANY. May 11.
ILFORD GAS COMPANY. May 11.
KIRKHAM, HULETT, AND CHANDLER. April 27.
LEA BRIDGE GAS COMPANY. May 11.
MAIDSTONE GAS COMPANY. May 11.
PINNER GAS COMPANY. May 11.
ROMFORD GAS COMPANY. May 11.
SOUTHEND GAS COMPANY. May 11.
SOUTHEND WATER COMPANY. April 27.
SOUTHGATE GAS COMPANY. May 11.
WANDSWORTH AND PUTNEY GAS COMPANY. May 11.

TENDERS FOR

Benzol (Crude).
BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by April 26.
Coal and Cannel.
BANGOR (N.W.) GAS DEPARTMENT. Tenders by April 30.
BLACKPOOL GAS DEPARTMENT. Tenders by April 25.
CARLISLE GAS DEPARTMENT. Tenders by April 30.
EAST RETFORD GAS DEPARTMENT. Tenders by April 30.
EDINBURGH AND LITH CORPORATIONS' GAS COMMISSIONERS. Tenders by April 26.
HEREFORD GAS DEPARTMENT. Tenders by May 2.
HEYWOOD GAS DEPARTMENT. Tenders by May 11.
MOSSLEY GAS DEPARTMENT. Tenders by April 28.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by April 24.

Governors.

DEVONPORT GAS DEPARTMENT. Tenders by May 8.

Oxide of Iron.

BLACKBURN GAS DEPARTMENT.

Pipes, Pipe-Laying, &c.

TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

Reservoir Construction.

TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

Sulphuric Acid.

BROADSTAIRS GAS COMPANY. Tenders by May 4.

Tar.

BANGOR GAS DEPARTMENT. Tenders by April 30.
MITCHAM AND WIMLEEDON GAS COMPANY. Tenders by April 30.
SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES. Tenders by April 24.
ULVERSTON URBAN DISTRICT COUNCIL. Tenders by April 29.

Valves and Hydrants, &c.

DEVONPORT GAS DEPARTMENT. Tenders by May 8.
TAUNTON RURAL DISTRICT COUNCIL. Tenders by April 30.

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O'NEILL'S OXIDE
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LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.
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NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants. We guarantee promptness, with efficiency for Repairs.
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AMMONIACAL Liquor wanted.
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Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

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GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

UNNERWOOD HOUSE, PAISLEY.

TO Gas Managers, &c., Wanted, Old
Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

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BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.
FOR Particulars of Annual Generating
Capacity of Plants built or in course of construction, see Advertisement in the "JOURNAL" for April 6, p. 5.
The DELLWIK-FLEISCHER WATER GAS SYNNICATE, 25, Victoria Street, Westminster, LONDON, S.W. Telegraphic Address "Dellwik, London."

FRASER'S FIRE CEMENT.
FOR Gas-Works, Retort Settings, &c.
Supplied to the Largest Works in the Kingdom.
A. C. FRASER'S FIRE CEMENT CO., Corbett Street Bradford, MANCHESTER.

MESSRS. WATT, GILCHRIST, AND
CO. inform all Applicants that the position of ASSISTANT WORKS MANAGER for an Australian Gas Company HAS BEEN FILLED, and Thank Them for Trouble taken in the Matter.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

GAS-FITTER requires Situation. Good in Iron and Compo., Slot Installations, Meter Inspection, Incandescent Lighting, and all class of Companies' Work. Gas Company's Apprenticeship. Ten Years' Experience. Age 24. Excellent References.
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TO CONTRACTORS FOR GAS PLANT AND
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PRACTICAL Engineer, Fifteen Years'
Experience in Shops, Drawing Office, Erection of Gas Works, and all kinds of Plant, also Travelling and Interviewing Engineers, is Open to REPRESENT a Firm of good standing. Can Command Fair Amount of Business. Good Connection in Great Britain and Continent.
Address No. 5084, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MOND GAS PLANT.
CAPABLE Man required to Take Charge
of 150-Ton Mond Gas Plant in the Midlands.
Apply, by letter, stating Age, Experience, and Salary required, to THE POWER-GAS CORPORATION, LIMITED, 39, Victoria Street, LONDON, S.W.

HYTHE AND SANDGATE GAS COMPANY.
DISTRIBUTION Superintendent required. Experienced Man. Salary, £100. Apply, with Testimonials (not more than Three), to H. STAINER, Secretary, 29, High Street, HYTHE.

TRAVELLER Wanted—Energetic Man, with good Connections, to work up Geyser Business and introduce various Specialities connected with the Gas Industry. Only those with a good entrée to Gas Companies and Surveyors need Apply. Address Box 5383, care of Willings, 125, Strand, W.C.

SHOW-ROOM SALESMAN.
REQUIRED by the Sutton Gas Company an Experienced **SHOW-ROOM SALESMAN.** Applicants must be Qualified to give Advice to Consumers in connection with Gas-Fittings, Burners, Cookers, Stoves, &c. Previous Experience with Gas essential. Salary, 30s. per Week, with House, Rates, Taxes, Water, and Gas free. Applications, endorsed "Show-Room Salesman," stating Age and Qualifications, with copies of Two recent Testimonials, in own hand-writing, to be sent on or before Saturday, April 24, to the SECRETARY, Gas Offices, Sutton, SURREY.

METER, &c., INSPECTOR.
THE Grantham Gas Company require the Services of a **METER, &c., INSPECTOR.** Preference given to Young Energetic Man with a little Gas-Fitting knowledge, and accustomed to Meter Waterting and Stating, Maintaining Consumers' Incandescent Burners, &c. Wages commencing at 24s. per Week. Apply, in own hand-writing, stating Age, Experience, and References, to R. G. SHADBOLT, Secretary, &c. Gas Offices, Grantham, April 14, 1909.

ADVERTISER has a Large Fund to INVEST in any Genuine Water or Gas Company. Address No. 5085, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Four 12-foot Square PURIFIERS, complete with Centre Valve, Connections, and Traveller; also another 12-foot Square BOX and One 18-foot by 12-foot BOX, with Valves and Connections. Offers to the **MANAGER, Gas-Works, UXBRIDGE.**

FOR SALE, Cheap, the undermentioned GAS PLANT:—Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem. GASHOLDER, 3-Lift, 50 ft. dia., cap. 123,000 c.f. EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour. 4-inch Cast-Iron Vertical CONDENSER. Wrought-Iron SCRUBBER, 9 ft. high by 3 ft. Donkin's VALVES, 12-inch, 10-inch, 6-inch. Apply to SAMUEL WHITE and Son, 60, Queen Victoria Street, LONDON, E.C.

GAS-EXHAUSTER FOR SALE.
FOR SALE—A Gas-Exhauster with Steam-Engine Complete, made by Messrs. Gwynne and Co., of Essex Street, Strand, in 1874, designed to pass 21,000 Cubic Feet per Hour at a speed of 100 Revolutions per Minute. The Exhauster has recently been overhauled and is in good order. It may be seen working at the Lowestoft Gas-Works by appointment with Mr. Joseph Hawksley, of 2, York Road, Great Yarmouth, to whom offers should be addressed. April, 1909.

MANUFACTURING PLANT FOR SALE.
THE Directors of the Cardiff Gaslight and Coke Company invite OFFERS for the Purchase of PLANT, in good Working Condition, at their Bute Terrace Works, comprising: RETORT FITTINGS, CONDENSER, AMMONIACAL LIQUOR SCRUBBER, TOWER SCRUBBER, ONE PAIR OF EXHAUSTERS, ONE SET OF FOUR PURIFIERS. The whole suitable for Gas-Works producing Half-a-Million Cubic Feet per Day. Schedule, containing detailed Measurements and all Particulars, may be obtained on Application to Mr. H. Morley, C.E., Gas-Works, Cardiff. Tenders to be received not later than the first post Saturday, May 1, next.

COUNTY BOROUGH OF BLACKBURN. (GAS DEPARTMENT.)
TENDERS wanted for the Purchase of about 400 Tons of SPENT OXIDE OF IRON containing not less than 50 per cent. of Sulphur. Offers to state a price per unit of Sulphur per ton for the Material put into Trucks at Blackburn. SAMUEL R. ODGEN, Engineer and Manager. Municipal Offices, Blackburn, April 19, 1909.

BOROUGH OF HEYWOOD.
THE Gas Committee invite Tenders for the Supply of COAL and CANNEL. Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager. Sealed Tenders, endorsed "Coal," to be sent to me not later than Tuesday, May 11, 1909. By order, GEO. G. BOUCHIER, Town Clerk. Municipal Buildings, Heywood, April 15, 1909.

ULVERSTON URBAN DISTRICT COUNCIL.
TO TAR DISTILLERS.
THE Gas and Water Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works during the Year commencing July 1 next. Further Information and Forms of Tender may be had on Application to the undersigned. Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas and Water Committee, to be sent in not later than Thursday, the 23rd inst. The Committee do not bind themselves to accept the highest or any Tender. JNO. SWAN, Engineer and Manager.

CITY OF CARLISLE.
THE Carlisle Gas Committee are prepared to receive TENDERS for the COAL and CANNEL required at their Works during One Year from the 1st of May next. Tenders, endorsed "Coal," and addressed to the Chairman of the Gas Committee, to be delivered at the Gas-Works Offices, Victoria Viaduct, Carlisle, not later than Friday, April 30, 1909. Form of Tender and other Particulars may be had on Application to the undersigned. W. J. SMITH, Engineer and Manager. Gas-Works, Carlisle, April 14, 1909.

BROADSTAIRS GAS COMPANY.
THE Directors of the above Company invite TENDERS for the Supply of about 65 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia during the period of One Year from June 1, 1909. Sealed Tenders, addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than May 4, 1909. The Directors do not bind themselves to accept the lowest or any Tender. Further Particulars may be obtained from F. HIGGINSON, Engineer, Manager, and Secretary. Gas Offices, Alexandra Road, Broadstairs, April 17, 1909.

HEREFORD CORPORATION. (GAS DEPARTMENT.)
THE Gas Committee are prepared to receive TENDERS for the Supply of about 12,000 Tons of Screened GAS COAL or NUTS, to be delivered at the Gas-Works Siding as required during the Year ending June 30, 1910. Sealed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, not later than the 2nd prox. Forms of Tender may be obtained from the undersigned. The lowest or any Tender not necessarily accepted. W. W. TOWNSEND, Engineer and Manager. Gas-Works, Hereford, April 15, 1909.

COUNTY BOROUGH OF DEVONPORT. (GAS DEPARTMENT.)
TENDERS are invited for the Supply of:—Five 15-inch STATION GOVERNORS. Two 10-inch Fifteen 15-inch RACK and PINION VALVES. Six 10-inch The Governors to be of the Water-Loading Type; and Parties tendering must submit with their Tender a fully-dimensioned Drawing or Print illustrating the Governor which they propose to Supply, and also to state the make of Valve. Governors and Valves to be quoted for separately, and the Price to include Delivery to the Gas-Works, Devonport. Sealed Tenders, endorsed "Tender for Governors, &c.," and addressed to the Town Clerk, Municipal Offices, Devonport, must be delivered on or before the 8th of May, 1909. W. P. TERVET, Engineer and Manager.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.
GAS COAL AND CANNEL.
THE Commissioners are prepared to receive TENDERS for the Supply of GAS COAL and CANNEL for Delivery at their Granton Works over a period of about Twelve Months from June 30, next. The Monthly requirements during the period approximate the following ratio per cent. of Coal Contracted for.

July 4 per cent.	Jan. 15 per cent.
Aug. 5 "	Feb. 10 "
Sept. 6 "	March 8 "
Oct. 10 "	April 6 "
Nov. 12 "	May 5 "
Dec. 15 "	June 4 "

The Contractors must Guarantee that in the execution of their Contracts they pay the Standard Rates of Wages, or such Rate as is generally recognized in their Localities. Further Particulars, with Schedule and Form of Tender, may be obtained on Application to Mr. W. R. Herring, the Engineer and General Manager of the Commissioners, at his Office, New Street, Edinburgh. The Tenders to be lodged not later than Ten o'clock on Monday forenoon, the 26th day of April, 1909, in sealed envelope addressed to the undersigned, and marked "Tender for Coal." The Commissioners are not to be bound to accept the lowest or any Tender. JAMES M'G. JACK, Clerk. 25, Waterloo Place, Edinburgh, March 30, 1909.

BOROUGH OF MOSSLEY.
THE Gas Committee of the Borough of Mossley invite TENDERS for the Supply of Screened GAS COAL. Specifications and Forms of Tender may be obtained from the undersigned. Sealed Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Mossley, must be delivered not later than Wednesday morning, April 28, 1909. JAMES TAYLOR, Engineer and Manager. Gas-Works, Mossley, April 7, 1909.

BANGOR CORPORATION.
THE Gas Committee invite Tenders for the Supply of 4500 Tons of Best Screened GAS COAL, delivered free on rail Bangor Station (L. and N. W. Railway), between July 1, 1909, and June 30, 1910, in such quantities, monthly, as required. The Gas Committee reserve the right to divide the quantity between two or more Contractors, for a period of One or more Years. The lowest or any Tender not necessarily accepted. Forms of Tender may be had from the undersigned. Tenders must be on the prescribed Forms and accompanied by Analysis, and addressed to the Chairman of the Gas Committee, Gas Office, Bangor, N. Wales, on or before April 30, 1909. PRICE F. WHITE, Manager. Gas-Works, Bangor, N.W., April 17, 1909.

TO TAR DISTILLERS AND ACID MANUFACTURERS.
THE Gas Committee of the Corporation of Bangor are prepared to receive TENDERS for the Surplus TAR produced at their Gas-Works for a period of One or more Years. The Tar will be loaded at the Bangor Station, (L. and N. W. Railway). The Contractor to provide portable Tanks to hold about One Ton. Security to be given for the due performance of the Contract. Quantity of Tar, about 250 Tons. Payments to be made Monthly. Further Particulars may be had on Application to the undersigned. Tenders to be sent in on or before the 30th day of April, 1909. The Committee do not pledge themselves to accept any Tender. PRICE F. WHITE, Manager. Gas-Works, Bangor, N. Wales, April 17, 1909.

SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES.
THE Directors of the above are prepared to consider TENDERS for the Supply of 31,000 Tons (or thereabouts) of GAS COAL suitable for the Manufacture of Gas without Enrichment, or added Water Gas, over a period of Twelve Months as from the 30th of June next. The approximate Quantities are as follows: Sutton, 22,000 Tons to be delivered at Sutton Station on the London, Brighton, and South Coast Railway. Reigate, 6500 Tons to be delivered at Reigate Station on the South Eastern and Chatham Railway. Newhaven, 2200 Tons to be delivered at Newhaven Town Station on the London, Brighton, and South Coast Railway. Tenders to be sent in by the 24th of April next, marked "Tenders for Coal," and addressed to the SECRETARY, Gas Office, SUTTON. The Directors do not bind themselves to accept the lowest or any Tender.

SUTTON, REIGATE, AND NEWHAVEN GAS COMPANIES.
THE Directors of the above Companies are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at the above Works, estimated at 300,000 Gallons, for a period of Twelve Months from June 30, 1909. Particulars may be obtained on Application to the Secretary, Gas Office, Sutton, Surrey. Tenders to be delivered on or before the 24th of April inst., and addressed to the SECRETARY, Gas Office, Sutton, SURREY. Gas Office, Sutton, Surrey, April 15, 1909.

TAUNTON RURAL DISTRICT COUNCIL WATER SUPPLY.
TO CONTRACTORS AND OTHERS.
TENDERS are invited by the above Council for the following, in connection with the Carrying of Water to, and its Distribution over, the Parish of Stoke St. Gregory within the district.

- The Supply of about 16 Miles of CAST-IRON PIPING.
- The Supply of SLUICE VALVES, HYDRANTS, &c.
- The LAYING and FIXING of the above Pipes and Fittings.
- The Construction of a 50,000 Gallon BRICK RESERVOIR.

Specifications and Forms of Tender may be obtained of the Engineers, Messrs. Merryweather and Sons, Greenwich Road, London, S.E., on payment by Cheque of Two Guineas for each Section, which will be returned on receipt of a *bona-fide* Tender. Tenders to be delivered to the undersigned on or before Friday, the 30th of April inst., at whose Office, Plans may be inspected, as well as at the Offices of the Engineers. (Signed) W. F. B. DAWE, Clerk to the said Council, Taunton. Union Offices, Taunton.

COUNTY BOROUGH OF BLACKPOOL.
THE Gas Committee are prepared to receive TENDERS for the Supply of GAS COAL, NUTS, or COBBLES to June 1, 1910. Tenders to be endorsed outside, and addressed to the Chairman, by the 25th day of April, 1909. Forms of Tender may be had from the undersigned.
JOHN CHURCH,
 Gas Engineer.

Gas Offices, Princess Street,
 April, 1909.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above are open to receive TENDERS for the Supply of 7000 Tons of Freshly-Worked Screened GAS COAL or NUTS to be delivered during the Twelve Months ending June 30, 1910, as may be required. Forms of Tender and any further Particulars may be had on Application to the undersigned. Tenders to be sent, addressed to the Chairman of the Gas Committee, endorsed "Tender for Gas Coal," on or before April 30, 1909.

J. B. FENWICK,
 Engineer and Manager.

Gas and Water Offices,
 East Retford, April 6, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 500 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.

NEW ISSUE OF 400 £10 "B" SHARES
 AND
 £2000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, as above.

By order of the Directors of the
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

NEW ISSUE OF £4000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK,
 AND
 200 £10 NEW ORDINARY SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots. Particulars of the AUCTIONEERS, as above.

Estate of Thos. Hersey, Esq., decd.

MESSRS. A. & W. RICHARDS will SELL BY AUCTION, at the Mart, E.C., on Tuesday, April 27, at Two o'clock, in Lots.
 480 £20 FULLY-PAID SHARES
 IN

KIRKHAM, HULETT, and CHANDLER,
 LIMITED.

Particulars of the AUCTIONEERS, as above.

By order of the Executors of the late Chas. Edwin Layton, Esq.

GAS STOCKS AND SHARES

OF THE TOTAL
 CAPITAL VALUE OF ABOUT £18,000
 IN THE

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY,
 HORNSEY GAS COMPANY,
 LEA BRIDGE DISTRICT GAS COMPANY,
 ILFORD GAS COMPANY,
 ROMFORD GAS AND COKE COMPANY, LIMITED,
 SOUTHEND GAS COMPANY,
 BROMLEY AND CRAYS GAS COMPANY,
 MAIDSTONE GAS COMPANY,
 SOUTHGATE AND DISTRICT GAS COMPANY,
 PINNER GAS COMPANY, LIMITED,
 GUILDFORD GASLIGHT AND COKE COMPANY,
 CROMER GAS COMPANY,
 EASTBOURNE GAS COMPANY.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 11, at Two o'clock, in Lots.

Particulars of Messrs. GOLDING, HARGROVE, AND GOLDING, Solicitors, 99, CANNON STREET, E.C., and of the AUCTIONEERS, as above.

BRIDGEWATER COLLIERIES COKE WORKS.

(THE EARL OF ELLESMERE.)

TENDERS are invited for the Crude BENZOL produced at the above Works (estimated at 450 Gallons per day) testing 80 per cent. at 120° C., during the next Three, Six, Nine, or Twelve Months, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway, or at the Brackley Siding on the Little Hulton Mineral Branch of the London and North Western Railway.

Tenders, endorsed "Tender for Crude Benzol," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 26th inst.

Manchester, April 6, 1909.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Gas-Works for a Period of Twelve Months from May 1, 1909.

Probable quantity, 400,000 Gallons. Further Particulars and Forms of Tender may be obtained on Application to the undersigned. Sealed and endorsed Tenders, addressed to the Chairman and Directors, must be delivered at the Gas-Works not later than April 30, 1909.

The Directors do not bind themselves to accept the highest or any Tender.

B. R. GREEN,
 Engineer and Manager.

Gas-Works, Mitcham,
 April 8, 1909.

THE Proprietors of the Patents No. 24,218 of 1901, and No. 83 of 1901, for "IMPROVEMENTS RELATING TO MACHINES FOR THE MANUFACTURE OF MANTLES EMPLOYED IN INCANDESCENT LIGHTING," and "IMPROVEMENTS RELATING TO MACHINES FOR THE MANUFACTURE OF INCANDESCENT GAS-MANTLES," are desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

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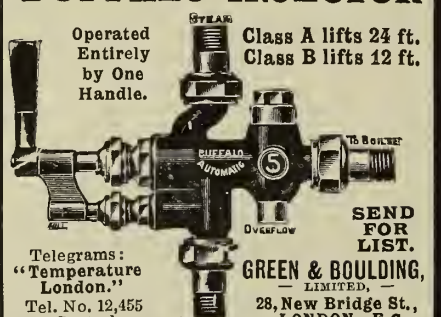
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Rich in Illuminating Power and Yield of Gas.

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Class A lifts 24 ft.
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Highest Results in Gas, & Excellent Coke.

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OF SOME OF THE

Principal Water Undertakings

OF THE

UNITED KINGDOM,

NAMELY:

The Undertakings of the Metropolitan Water Board, and 24 Provincial Water Undertakings

FOR THE YEAR 1907-1908.

Compiled by

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 Chartered Accountants.

LONDON:

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UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

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RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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ALFRETON IRON-WORKS, DERBYSHIRE,
AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
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These are cast in one piece, without Chap-
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Gas Purifying Material

Sole Agent for Scotland:

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Greatly increases Sale of Gas.

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ARROL-FOULIS
Stoking Machinery
HYDRAULIC COKE PUSHERS
(HUNTER and BARNETT'S PATENT).
WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, April 13, p. 124.]

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HARRIS & PEARSON,
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MANUFACTURERS OF

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GLAZED BRICKS AND PORCELAIN BATHS.



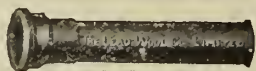
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28, EAST PARADE, LEEDS.

20% GREATER YIELD PER MOUTHPIECE.
DECREASED FUEL CONSUMPTION.
ABSOLUTELY EVEN HEATS.
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NO STOPPED PIPES.

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USE
LEAD WOOL
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Excellent results obtained on HIGH-PRESSURE MAINS.

33 $\frac{1}{3}$ % Cheaper than Run Lead.

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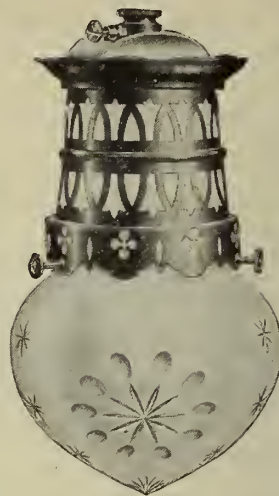
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"OMAR"

Self-Intensive Inverted Burners.



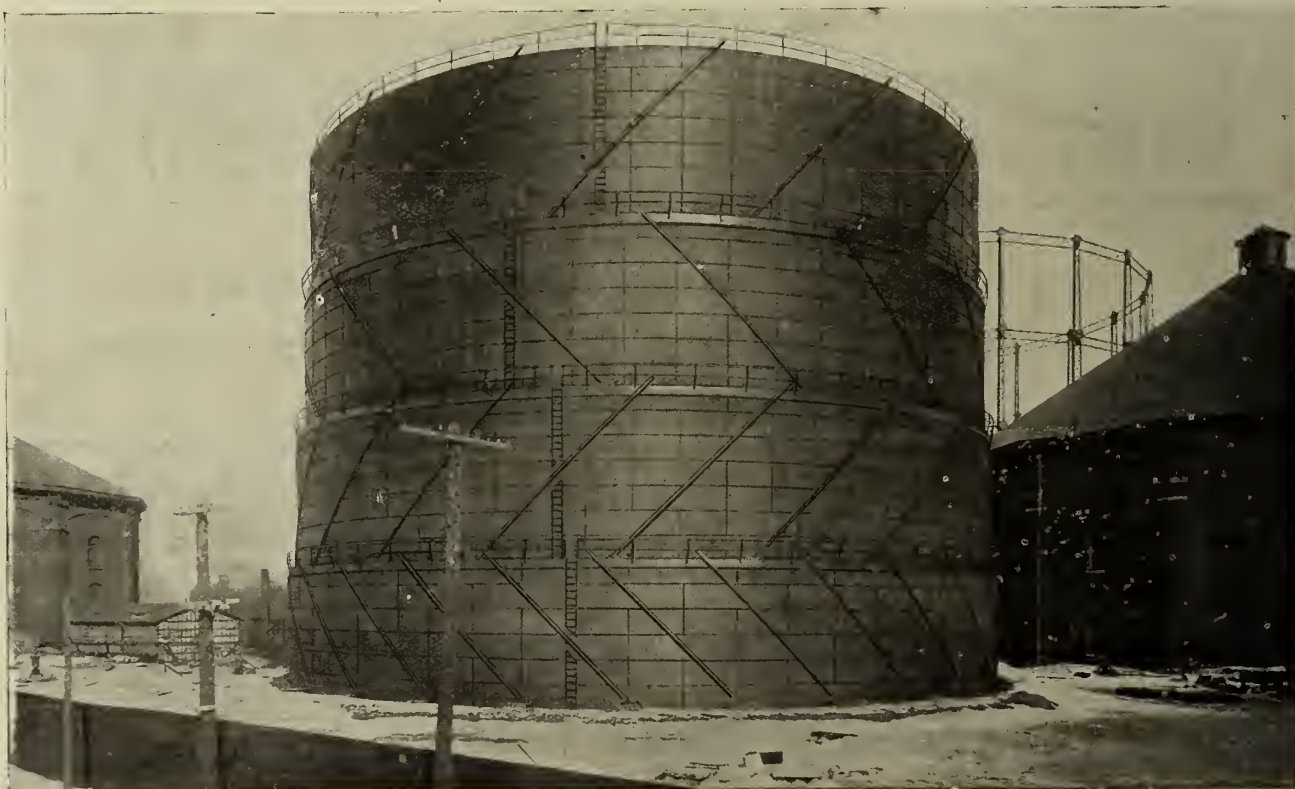
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Is a simple adaptation of the principle of the "Tape" machine to Recording Instruments.

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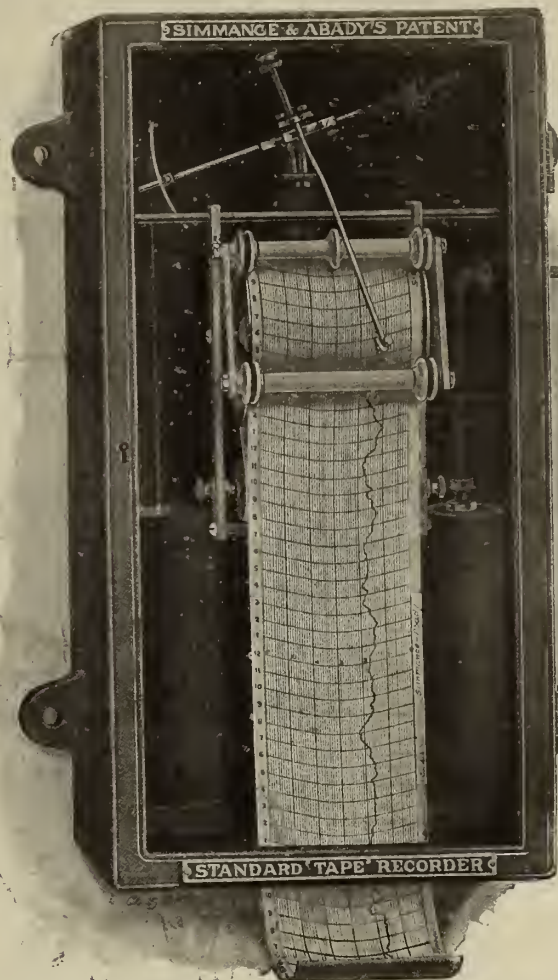
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Wind Clock once a Week.
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The Record for the previous 24 or 48 hours or any period is simply torn off.
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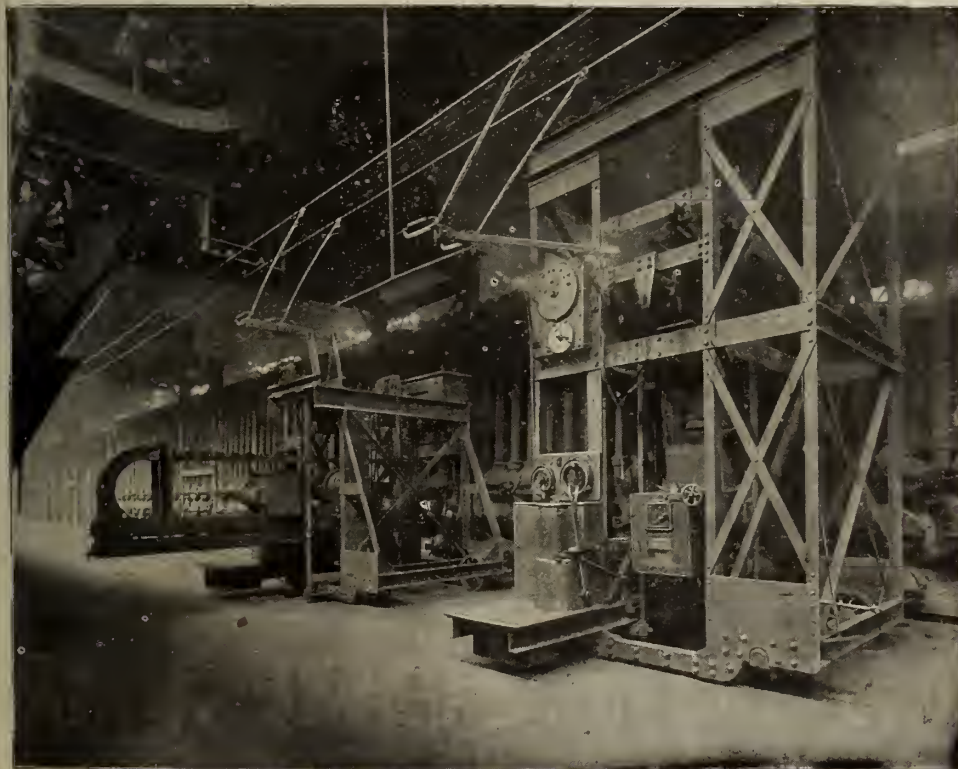
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AND
47
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DISCHARGERS
AT WORK
AND ON ORDER.

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**WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR
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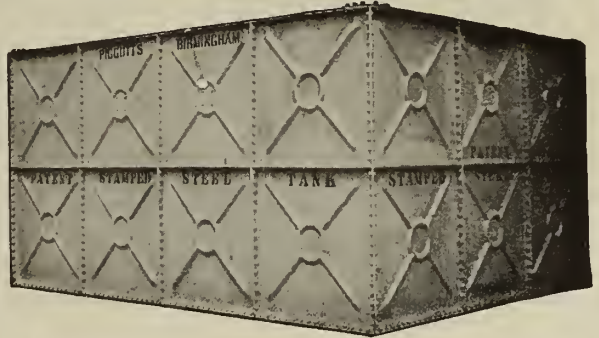
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BUNKERS - ROOFS - STEEL STRUCTURAL WORK.

HORIZONTAL, INCLINED & VERTICAL
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IMMEDIATE DELIVERY FROM STOCK.
UNBREAKABLE.
EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls.

Size, 16 x 12 x 8 ft. deep.

PATENT PRESSED STEEL TANKS.

MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
OF 4 FT. LENGTH, WIDTH, OR DEPTH.

HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.

Aggregate capacity of Plants supplied,
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**Gasholders,
Purifiers,
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S. S. STOTT & CO.,**ENGINEERS,****HASLINGDEN, nr. MANCHESTER.****LIME & OXIDE ELEVATORS & CONVEYORS.***COAL AND COKE STORAGE PLANTS.***Coal and Coke Elevators and Conveyors.****STAMPED AND RIVETED STEEL ELEVATOR BUCKETS***DETACHABLE CHAINS AND SPROCKET WHEELS.***HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.****GAS COAL AND CANNEL.****WILSON CARTER & PEARSON,****LIMITED****Gas, Steam, and other Fuel for Home and Export.****GAS COKE CONTRACTORS.****CHIEF OFFICES:****50, NEW STREET, BIRMINGHAM.****THE WIGAN COAL & IRON CO., LIM^{TD.},**

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Telegraphic Address: "WIGAN, BIRMINGHAM."

Telephone: No. 200.

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CARBONIZATION MADE EASY.**A Few Recommendations for this System:—**

Simplicity of Design.

No Machinery to get out of order.

Carbonizing charges **40 per cent. less** than with Horizontals.

No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution.

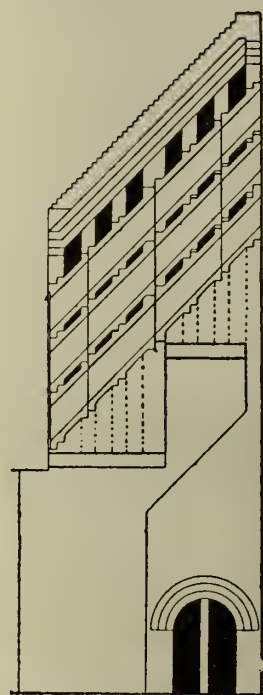
45 per cent. less ground space required.

Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

Several Installations in course of construction or completed.

FULLEST ENQUIRIES INVITED.**Sole Agents:**

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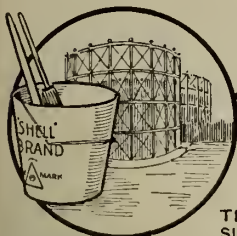
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(PATENTED PROCESS)

Awarded a **DIPLOMA OF MERIT** at the recent *Smoke Abatement
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The New Smokeless Fuel.

Why Gas Companies should adopt the above Process:—

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CLEANING COOKERS AND LANTERN REFLECTORS

Undoubtedly the Finest and Best Preparation on the
Market for **quickly** removing Burnt Grease from
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(Registered Trade Mark.)

Can either be applied with a Brush, allowed to
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Half-an-Hour, when Liners and Reflectors can be
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This Result can only be obtained at **lightning
speed** by using "**Gascolite**."

Now being used successfully by Gas Companies
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CLARKS LEAD & COLOUR WORKS CO.

Gas Company
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Established 1832.

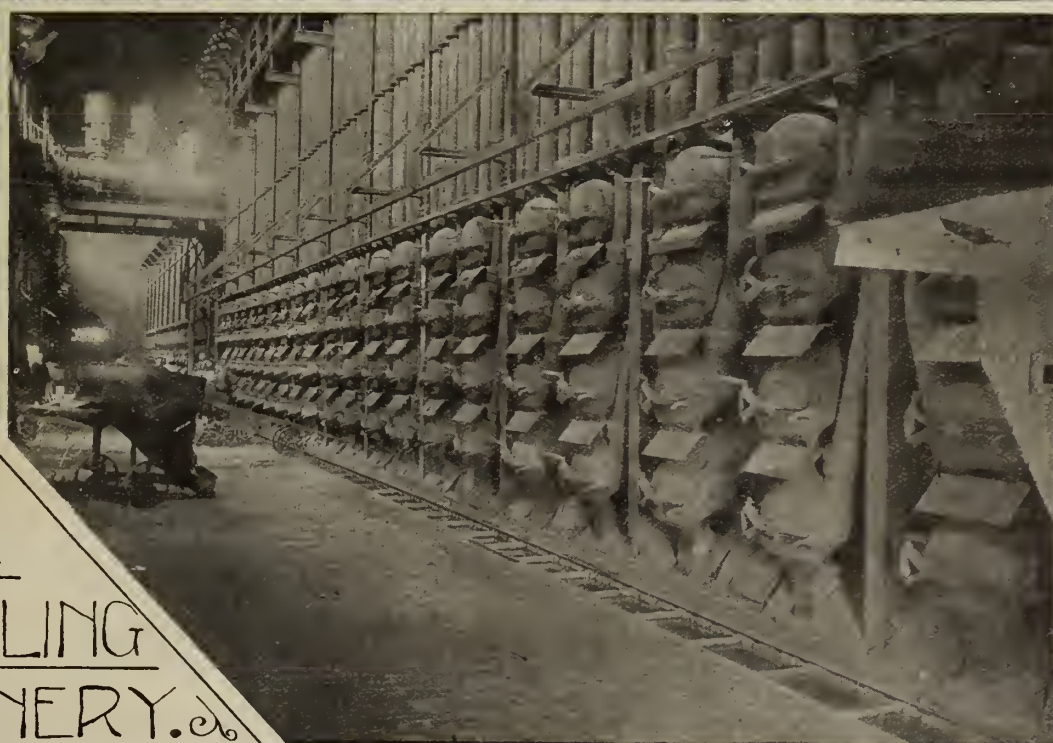
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FOR
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RETORT
BENCHES

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Miles Platting, **MANCHESTER.**

Telegrams: { "STOKER MANCHESTER."
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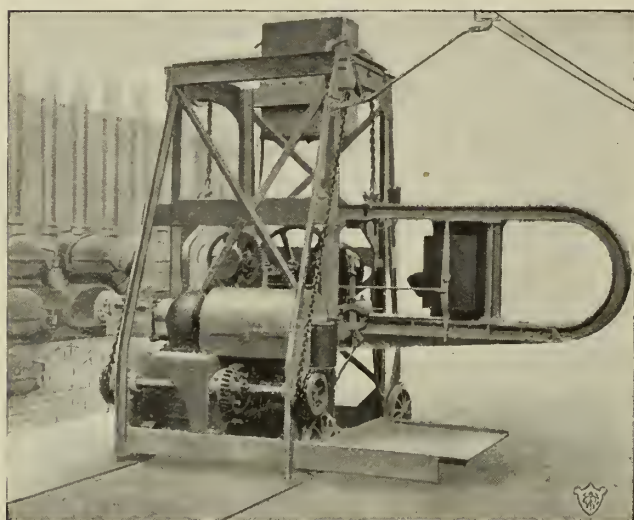
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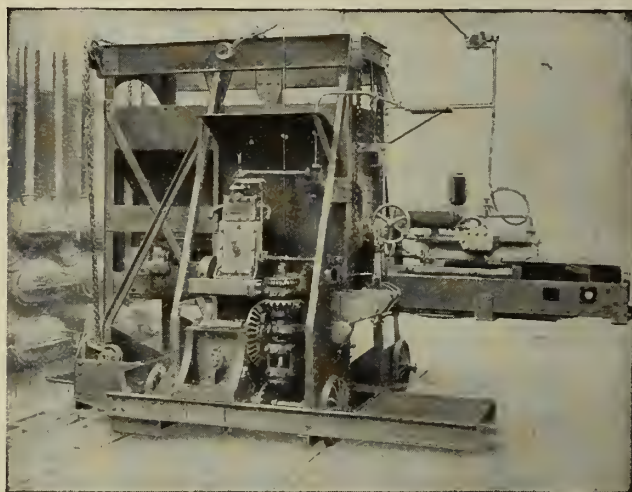
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West's Ram Discharging Machine.



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For Horizontal, Vertical, or Inclined Retorts.

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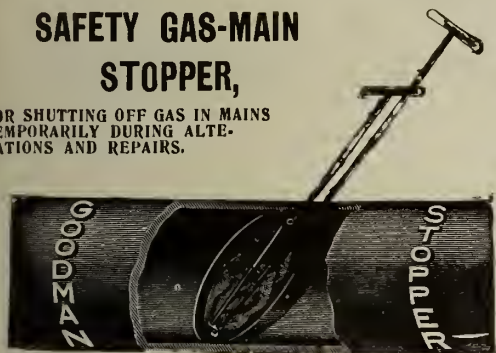
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FOR SHUTTING OFF GAS IN MAINS
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SHORT'S IMPROVED
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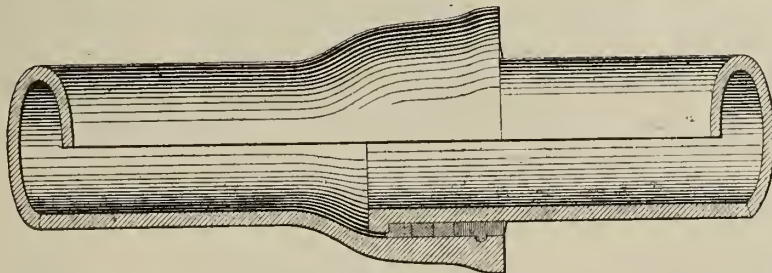
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Sockets, Weights, and Thicknesses varied to Engineers' Specifications.

MADE IN DIAMETERS 2 TO 80 INCHES. 8 TO 10,000 TONS IN STOCK.



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COCKEY'S PATENT WASHER SCRUBBER & TAR EXTRACTOR.

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"I am pleased to be able to state that the Scrubber Washer you erected at Harpenden has given every satisfaction. It has Five Chambers, and the Gas is divided into small streams, at each of these Chambers; water flows in at the top and all the Ammonia is eliminated without the aid of any other Plant. . . . The Liquor can be worked up to almost any desired strength. And the Plant has not been cleaned out since you fixed it, and has given us no trouble."

December 2nd, 1908.

"I cannot speak too highly of Cockey's Washers, they are simply invaluable. I gave full Information at the Meeting of an Association of Gas Managers, when President, at Southampton.

If you have plenty of room, I should have an Horizontal one, if short—why then a Vertical one.

The action of the Washer removes every trace of Ammonia."

December 23rd, 1908.

"You asked some time ago as to the working of Tar Extractor. I am pleased to report that it has been working for about six weeks, and is giving great satisfaction.

The whole of the Gas was passed through it for over a month, without the aid of any other Washing Plant (whilst the old Plant was being moved) and I was surprised at its being able to cope with the Gas so well, at this time of the year."

December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

December 2nd, 1908.

"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO₂ and H₂S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH₃, intending at a later date to erect a supplementary Scrubber. At the present time the 'Cockey's' Washer is doing the whole of the work, and we have not found any difficulty in removing the last trace of NH₃. We have passed equal to 300,000 cubic feet per diem.

The only trouble we find in working, is a stopping up of the teeth of the Washing Hoods with Naphthalene, but these are easily cleaned by removing a Hand Cover and applying a stiff Brush. The Overflows work well, and a little attention occasionally is all that is required."

December 2nd, 1908.

"Replying to your Letter of yesterday's date, I have very much pleasure in giving you my opinion of Messrs. E. Cockey and Sons' Vertical Washer, one of which I have here (to pass 500,000 cubic feet per day).

I consider the apparatus a most valuable one, very efficient and does all the work that one can wish, leaving very little Ammonia for the Tower Scrubber to deal with.

Should you desire any further Information, please do not hesitate to ask me for it, and I should be very pleased to show you the Washer at any time you might care to pay me a Visit."

For Prices and all Particulars apply to the Sole Makers—

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JOSEPH EVANS & SONS, (WOLVERHAMPTON) LTD.

London Address:
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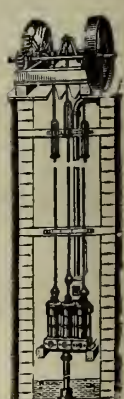
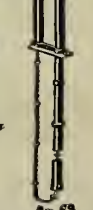
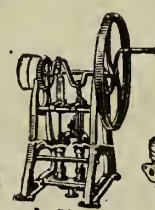
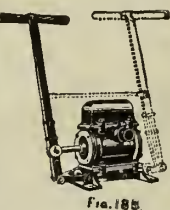
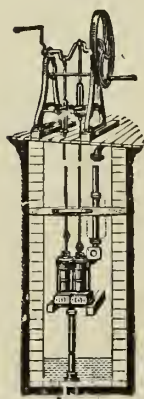
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THE BARROWFIELD IRON-WORKS, LIMITED, GAS ENGINEERS & CONTRACTORS, GLASGOW.

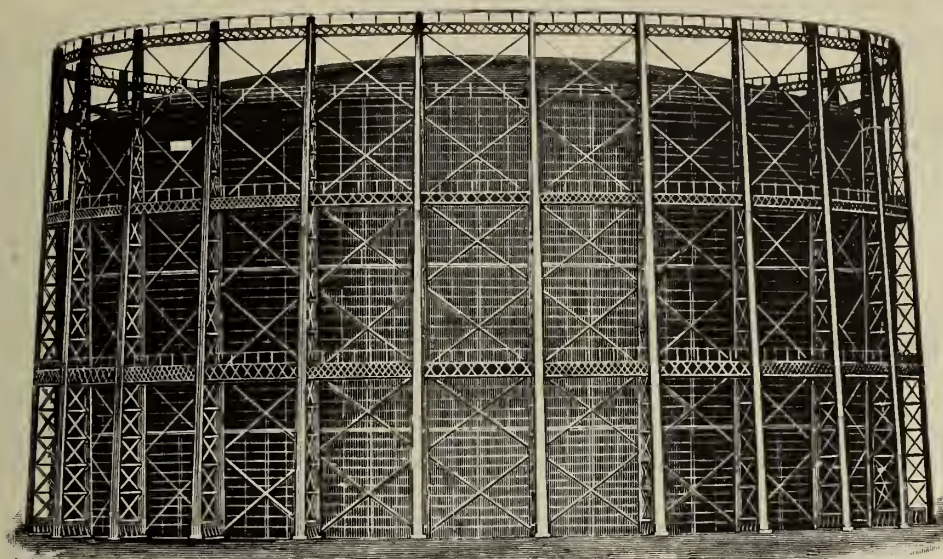
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EVERY STYLE.

PIPES, VALVES,
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GAS APPARATUS
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AND
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ENGINES,
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STEAM BOILERS,
AND
FITTINGS.

Three-Lift Gasholder. Capacity, Six Million cubic feet.
240 feet Diameter by 45 feet deep each Lift. Erected at Glasgow.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

GEORGE ORME & CO. (Branch of Meters Ltd.),

ATLAS METER WORKS,

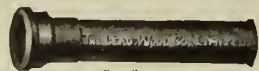
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**"NEW CENTURY" PATTERN
PATENT COIN PREPAYMENT GAS-METER
FITTED WITH
COLSON'S PATENT CASH-BOX
ENSURES ABSOLUTE SECURITY AGAINST THEFT.**

Particulars on Application.

For Modern Gas Distribution
USE
LEAD WOOL
FOR JOINTING.



Excellent results obtained on HIGH-PRESSURE MAINS.
33 $\frac{1}{3}$ % Cheaper than Run Lead.

THE LEAD WOOL CO., LTD., SNODLAND, KENT.

Phone: 199 SNODLAND.

Wire: "STRENGTH SNODLAND."

EVERITT'S Patent
TAR-FOG EXTRACTOR
AND
NAPHTHALENE REMOVER.

SOLE MAKERS:

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IN

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Cast-Iron Cases.**

ALL SIZES.

*Drawings, Specifications, and
Prices on Application.*

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LONDON, E.C.**



LATEST DESIGN.

Graetzin-Light

ALWAYS IN FRONT.

The most perfect gas light in the World.

40-60% Saving in Gas.

Beware of Imitations. No Graetzin Burner genuine without the Stamp

“GRAETZIN”

LATEST IMPROVEMENTS.

A scientific special process has been adopted for the Brass Casing on the **Graetzin-Burner**, so that the **Brass** will not change its original colour as ordinary Lacquered Brass does.

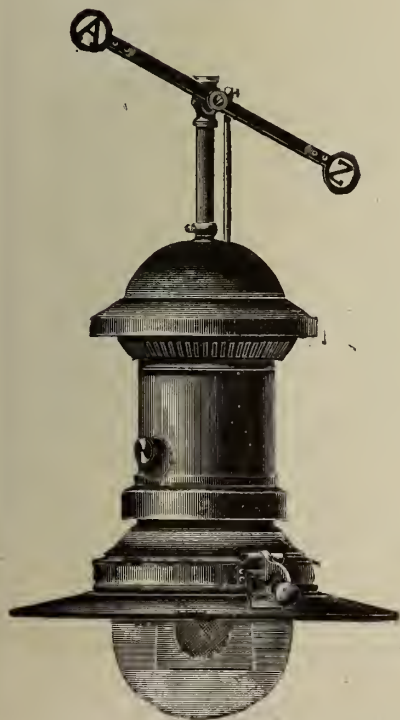
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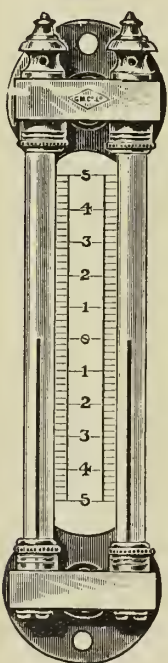
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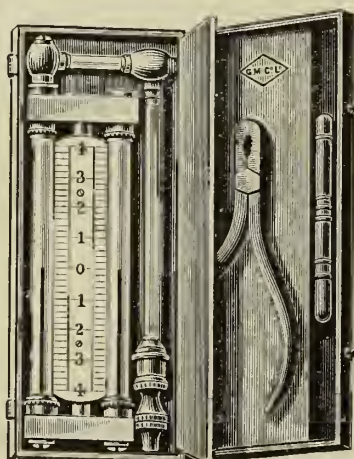
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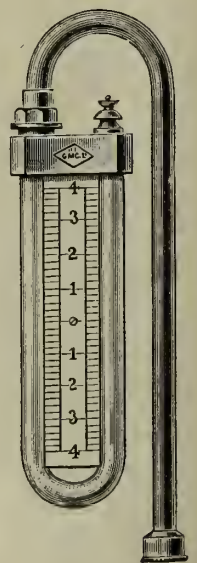
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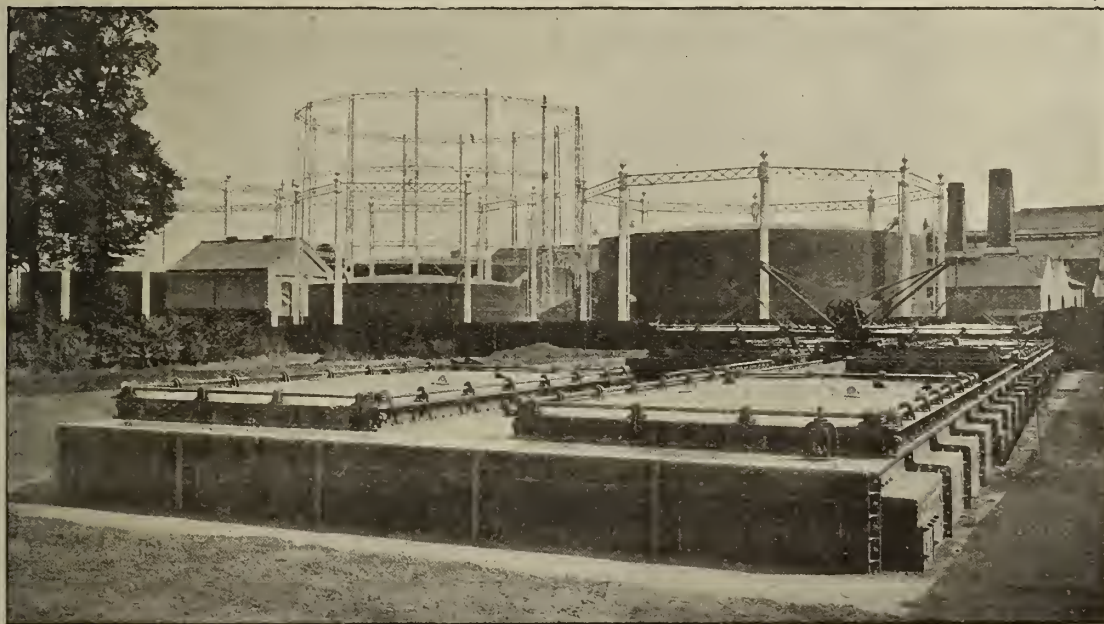
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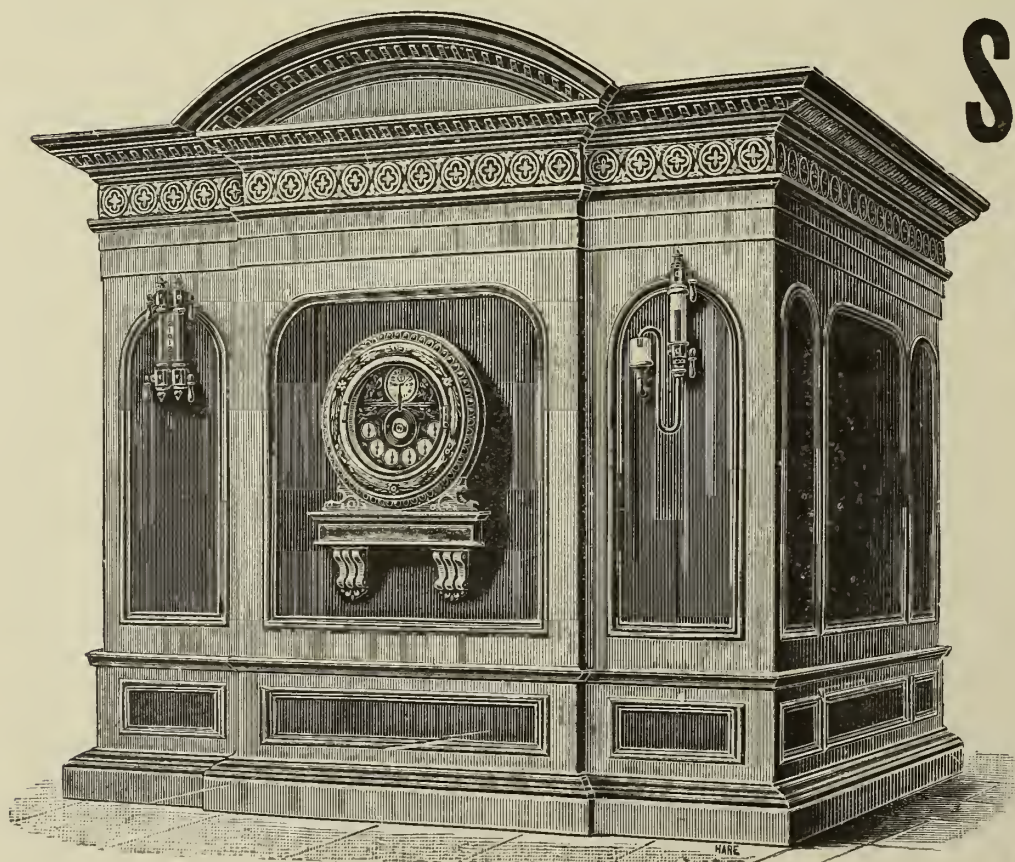
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VOL. CVI., No. 2398.—TUESDAY, APRIL 27, 1909.

EDITORIAL NOTES—GAS, &c.

The Advocacy of the Public Press.

It is a sign of the times that the daily and weekly newspapers should be taking more notice than has been their wont of the two principal artificial illuminating agents. This evinces a recognition of the fact that these illuminating agents are of the necessities of daily existence just as much as many articles of consumption that there is no need to enumerate. On the raising of the question of adulteration of whisky, or of the shortcomings of a tinned beef firm, columns upon columns of the daily papers have been devoted to it. Gas has a universality in use that cannot be boasted by either whisky or tinned meat. Hitherto, however, the public newspapers have not thought fit to regard its advances as a subject worth much public attention. There has been a change just recently. But there has been seen the old common failing of the daily newspaper journalists to be credulous, and precipitate in presenting views, when something that offers fresh topic is put before them. The electric metallic filament lamp is a case in point. A certain popular halfpenny newspaper, and a number of provincial contemporaries, swallowed, without hearing both sides, some claims made as to the latest invention having crowned electricity with an economical superiority among the illuminating agents. A little more discretion and judgment would have saved the papers in question the ridicule to which they exposed themselves. It is refreshing to see in the "Daily Telegraph" an article written in popular vein, but manifestly with a sense of responsibility animating the writer, in which an examination is made of the position, as economical agents, of the rivals gas and electricity. It is a pleasure for us to acknowledge the independent tone of the article. Most of the points made are quite familiar to "JOURNAL" readers; but we have reproduced the article as an example of fair exposition of the subject by a widely read paper of acknowledged high standing.

The writer confines himself to the present; he will not speak with any certainty as to the future. There may be a time when electricity may dominate, and gas be subverted. But those of us who actively move in the gas industry, and are able, from the indications and the technical knowledge of the day, to exercise some amount of penetration, are quite satisfied that the "inherent vitality and active development" of the gas industry, of which there is abundant evidence to-day, will continue. "Feverish as the attempt has been to outstrip the old force, the old force has shown itself capable of sustained and successful resistance. It abides on its merits." There have been repeated attacks from the electricians to win a greater share of the gains of the gas industry. But those repeated attacks have been repulsed; and the older agent has continued to add many cubits to its stature. Cheapness in relation to efficiency is the backbone of the gas industry. Of this fact the administrators and the technicians of the industry do not for a moment lose sight; and they are working as energetically as ever in keeping, in this respect, a wide division between their own commodity and the rival. In the race, electricity is severely handicapped by its costliness and innate imperfections; and while gas prices are being reduced, the necessity has arisen in many places to advance the charges for electricity. Even so, by tortuous reasoning, figuring, and assumptions, the cost of electric lighting is made to come out, by those interested in the sale of electricity and lamps, at a cheaper rate than incandescent gas lighting. By plainer method, the contrary is easily demonstrated; and the practical man takes as the best of testimony his account in comparison with a neighbour using the competing illuminant, where use and illumination have something of a parity. Instances are given in the article from practical experience, showing that gas maintains the lead as an economical agent. It is also

shown to be the more reliable; and as to the relative hygienic merits (which is claimed in other quarters to be a "vital matter" to gas suppliers), we read:

That the healthiness of an apartment is necessarily increased by the substitution of electricity for gas is not a safe assertion. The new Central Criminal Court is an illustration to the contrary. Apparently built on the best known principles, and electrically fitted throughout, it yet arouses bitter complaint on the score of ill-ventilation. Where human bodies are congregated, vitiating elements are exuded which, in the interests of health, should be dispelled. Artificial ventilation is therefore a necessity in all enclosed spaces which are inhabited. Gas, say the advocates of that commodity, ensures ventilation if properly regulated, and electricity does not. Therefore, before electricity can be said to equal gas hygienically, it must be developed in relation to new principles of ventilation.

It is one of the constant complaints of electricity consumers that the expenses supplementary to the account for electricity are so heavy; and as "new principles of ventilation" are required to make interiors sanitary where electric lighting is employed, users of electricity must prepare for a not inconsiderable outlay to achieve such a desirable end.

Calorific Power Records from Tottenham.

INSTRUCTIVE is the article that Mr. Arthur Edgcome Brown contributes to our columns this week on the question of his experiences in testing, for forfeitures, the calorific power of the mixed coal and water gas supplied by the Tottenham and Edmonton Gas Company. This Company were, so far as our information goes, the first in the country to be subject to a calorific power test with penalty accompanying for breaches. But this penalty test is only based on an agreement with the District Councils in the area of supply; still it is absolutely binding on the Company. The Gaslight and Coke Company, however, will be, if their Bill goes through (as it is now firmly believed that it will do), the first to have such a test statutorily applied for town gas, though, of course, the various Power Gas Companies who obtained parliamentary rights of supply some years since had such tests imposed upon them for gas used for other than illuminating purposes. In passing, the thought occurs that there is one matter which should be safeguarded if it has not already been done; and it is that there should be positive assurance that only tests made at the prescribed testing-stations are used for penalty purposes. The Gaslight and Coke Company, in this matter, should not, of course, be exposed to the claim that samples of gas can be taken from any place on the distribution system, which place might be a dead-end. At the testing-stations fair average samples of the gas under distribution are obtainable.

It would have been extremely interesting if Mr. Brown had been in the position to give us comparable tests with the same type of instruments, made the same days at both the works of the Tottenham Company and at the testing-station three miles away. There are tabulated figures giving the results of tests, at different periods, at the works using a Boys calorimeter, and at the testing-station using a Junkers instrument; and, so far as they have worth for comparative purposes, the figures show a very fair uniformity between the results at the works and at the testing-station, assuming that the proportions of the water gas and coal gas used in the corresponding quarters were about similar. The standard at Tottenham is 450 B.Th.U. net, which is the penalty line of the Gaslight and Coke Company at 112½ calories (125 calories net being the standard, less 10 per cent. before forfeiture is incurred). Although the Tottenham gas contains a large proportion of water gas, the nearest approach in the period of the works tests to 450 B.Th.U. was the minimum figure of 469 B.Th.U. in the fourth quarter of 1907; and in the period of the testing-station tests, 465 B.Th.U. in the third quarter of 1908. From his experience, Mr. Brown agrees that compliance with a standard of 125 calories net per cubic foot is not to be expected from a mixed 14-candle power gas ("Metropolitan" No. 2 burner test),

even when kept considerably above the statutory limit, but that a standard of $112\frac{1}{2}$ calories net per cubic foot is, under present working conditions, quite capable of being maintained. That is the view of the Gaslight and Coke Company; and it is the view that the study of the official calorific power testings in London for information only has generally led to, though the proportion of water gas used is probably not so great as at Tottenham.

The Expanding Scope of Gas-Works Business.

MUTABILITY is seen in the gas-works business as in other material conditions and affairs of life. The old order in the commercial work of a gas undertaking has long since been undergoing change; and every year witnesses the circumstances of the business receding further from the pre-existing routine and fixed practices. The flexibility that departure over the old boundaries has brought to light has been one of the amazing features of the history of the industry; and the flexibility shows no signs yet of a determinate end. The papers that were read at the meeting of the Eastern Counties Gas Managers' Association last Wednesday—the one by Mr. W. J. Carpenter on "Gas Practice at Great Yarmouth," and the other by Mr. J. H. Troughton on "Tar for Roads, Drives, Garden Paths, &c."—are, in the facts they present, alive with the testimony of the gain already accrued by change, and the possibilities still lying around. They also exhibit the importance of not dismissing the little things which, in the aggregate, go to make up something substantial. The commodities with which a gas undertaking has to deal are many; and, again and again, some thinker and business inventor is showing his colleagues where fresh profitable business is to be captured through the instrumentality of one or other of these products of carbonization. Not long since, the subject of retailing coke in small quantities was shown to be a business worth cultivating; and to this Mr. Carpenter adds a long history of successful enterprise in the same direction. Now Mr. Troughton instances how a business, in which there is money and employment, can be worked up in undertaking the making and keeping in repair of garden walks and drives through the waste of gas-works—slag, ashes, and unsaleable breeze—and by the aid of tar, over the disposal of which at a fair price there is so much difficulty. The ambition of every gas-works management should be to make the concern of the greatest use in its particular territory. The greater the number of the branches of usefulness, the greater becomes the indispensability of the undertaking, and the greater its power in the very seat of its operations.

These general thoughts run through the mind when considering the two papers—the one showing what has been done in the pursuit of business on liberal policy lines, the other suggestive of fresh expansion in one of the tributaries to the business and revenue of a gas undertaking. It has been a feature of the great vitality of the gas industry, that the evolution of the economies of production has proceeded concurrently with the broadening of the spirit of commercialism, which has pushed aside the old delimiting principles of conduct, and developed the seeking for business and the granting of facilities at one time undreamed of. In his works, Mr. Carpenter, with all modesty, does not claim any originality in the steps taken in achieving progressive economical operation. But what is not stated in the paper can be recognized here—that Mr. Carpenter, as the technical adviser of his Board, has not allowed himself or his works to get behind the best of modern practices in attaining, within the limits of situation and opportunity, the lowest costs and the highest working results. There are points in his statement of practice in this regard that will, when discussion on the paper is taken at the next meeting, be the subject of further inquiry.

It is, however, in the distribution and trading sections of the paper that the largest amount of interest is found. It is a generous but prudent policy that connects up the consumers with the gas undertaking at Great Yarmouth; and a generous policy in all areas must be the strongest of all bonds between gas consumer and supplier. There is something more than the mere shopkeeper in evidence at Yarmouth, through the provision of means for developing the sale of gas, out of which sale, rather than the appliances sold or let out on hire, the Company look for their reward on the enterprise. Hiring rates are purely nominal; and goods are sold at cost price. The slot consumer is not limited in his requirements. He may have as many lights

as he desires; and a specially-constructed cooker, gas-fire, hot-plate, grill, &c., with boiling-rings are, as required, provided free. There is free fixing; the maintenance and repair departments are kept up to a high state of efficiency; and what is of paramount importance well-educated and properly equipped fitters are rightly considered essential. So much so is this the case, that the apprenticeship system was revived by the Company some four years since. We join Mr. Carpenter in his expression of regret that the apprenticeship system is not now a common practice throughout the country. It is, however, one of those slips from right to wrong that can be easily remedied, and on higher lines than ruled in olden times, in the case of gas-fitters. Among those who have set an excellent example in this respect may be mentioned the Gaslight and Coke Company and the London County Council, in their joint scheme, initiated by the former, for the apprenticing and training of lads as fitters—the Company providing the practical training, and the Council the technical education. The greater the growth of the work of a gas undertaking, the greater must be the devolution from the chief of responsibility in the matter of detail—that is to say, while his responsibility enlarges with business expansion, the more reliance must be placed by him on his subordinates in the matter of detail. And the happier must be the chief, and the better will the undertaking be served, the greater the sense of responsibility among, and the greater the efficiency for their individual parts of the work of, the whole of the employees.

Accompanying the paper are diagrams and tables that in themselves speak volumes as to changing conditions and the flexibility of the gas business. History is graphically and statistically represented. The influence of internal and external factors is shown—the persistence of the former in building up consumption; and the temporary depressing effect of the latter. In one diagram, the influence of the introduction in 1889 of cookers is seen. Progress is made in consumption. In 1894, electric lighting is introduced. There is a slight and temporary recession in consumption. But four years later—coin meters having also been introduced in the meantime—the previous highest peak of 1892 has been exceeded; and then the output shows rises of considerable magnitude to the present time. Great Yarmouth as a popular seaside resort is among the places that are more than ordinarily well circumstanced for the development of the day-load in the summer months, through the aid of the gas-cooker. The active development of the cooker business was only taken in hand in 1889. And what is seen as the result? Whereas in 1887 the ratio of the day consumption to total output was heaviest in the winter months, and as low as 15, 16, and 17 per cent. in the daytime in some of the warmest months of the year, in June and July last year the day consumption exceeded the night—the ratios to total output in those months being then respectively 51.45 and 51.21. In the ten other months of the year, the ratios of day consumption to total output ranged between 39.99 and 48.81. This is a remarkable reversal of condition produced by the changing circumstances of the past twenty years; and its effect on the capital and the working economies of manufacture will be immediately apparent to every practical gas man.

We cannot here follow Mr. Carpenter through his other commercial and working practices. A further opportunity for reference to them will occur when the paper is discussed six months hence. But sections of the paper that invite particular notice are the elimination, through frequent collection from slot meters, of robbery and the loss occasioned by the repair of damage, and the gratifying experience of twenty years' work in the sale of broken coke in small quantities, delivered direct to consumers' houses. In Mr. Carpenter, the "New Commercialism" and the Commercial Sections of District Associations have a strong advocate. "May I," he remarks in a concluding paragraph, "emphasize the importance of the maintenance of strict attention to minute detail in all affairs affecting the conduct of the concerns we represent." The paper proves that the writer fully practises what he preaches.

It is the business of a gas undertaking to create new custom, and to get the best possible price for all its products. It stands to reason that the greater the quantity of residual products that can be sold locally, the higher the price realized than when the cost of transmission over long distances has to be paid, and the commodity brought into competition with production in the immediate neighbourhood of sale. We like the little idea that Mr. Troughton

puts forward on more than one ground. As remarked earlier in this article, the greater the usefulness of a gas undertaking in its own district, and the more its operations bring it into contact in different directions with householders, the better. It is a new business for a gas concern to undertake the making and the upkeep of garden paths, drives, &c. But a gas-works produces, in addition to tar, practically all the other materials required for the purpose; and there is no reason why gas-works employees should not become specialists in this work, and create a new outlet for a portion of the material produced in the course of gas manufacture. There is profit in it; and it is also work that fits in well when the busy gas-making season is over. Thus in it there are the means of employment for many gas-works hands, who would otherwise be thrown among the unemployed, and on their own resources, in the summer months. Only last summer, Mr. Troughton advertised that his Company were prepared to undertake work in the making of tar-surfaced garden paths and drives; and this advertisement and a testimonial from one customer brought him twenty orders ranging in value from £2 to £30. This is a business—not only in the making of paths, but in renovation and upkeep generally—that will grow with the satisfactory experience. Nothing in the way of business should be too small for gas companies, providing it comes within the scope of the application of their products. Mr. Troughton's experience is not a large one; but it is suggestive; and he also gives hints as to the manner of carrying out the work. In the discussion of the paper, the cardinal feature was generally disregarded. The one that seemed uppermost in mind was the larger question of the sale of tar for road purposes. It is gratifying to hear of the universality of the employment of tar for both road construction and surface painting, and of the enlargement of the demand for the product for such purposes. But words of advice are required in certain directions; and they are: "Encourage this demand now." The wisdom of doing so will be seen clearly later on, if not altogether appreciated to-day.

Views not Commonly Approved.

IT is a proper thing for the occupant of a presidential chair to have the courage of his convictions, and to bring them into the light of day. Mr. W. Brown, of Lasswade, as President of the Waverley Association of Gas Managers, in his address, gave expression to opinions that will not be generally subscribed to. He is, in fact, in places not altogether logical in his arguments and submissions. It is his proper opinion that the aim and ambition of all in the gas industry should be to try and improve themselves and those with whom they come in contact. He therefore believes in every man attaining as much knowledge as his opportunities will allow. But there is no use showing envy and hatred towards those to whom the Fates have been beneficently disposed, and who have made proper use of their opportunities. There is, though our duty is "to improve ourselves and those with whom we come in contact," a trace of light esteem for technical education in these presidential words: "There seems to be a feeling abroad that 'anyone can be a gas manager; and I think it would be well for our Association to look into the matter, for 'evidently men who have by their ability shown their 'worth are not wanted, and are being set aside for men 'who are technically trained.'" We will not argue over the literal meanings of the terms employed. What Mr. Brown wished to convey is clear enough. We must, however, confess to not having observed the evidence of the rejection of men who by their ability have shown their worth. They are the men who are sought after, and the men the industry cannot afford to do without. There is also the suggestion in the quoted sentences that men possessing only technical education and not practical experience are appointed to the superior official positions. A bad thing indeed would it be for the gas industry were this so in fact. At heart, Mr. Brown has not any real antipathy to technical education; but he does hold—and we are all with him—that technical education must be accompanied by apprenticeship. A man with all the technical education that our colleges and technical schools can cram into him, is not the one for the post of chief official of a gas undertaking if he has not had a practical training, and rubbed shoulders with, and shared the working lot of, Tom, Dick, and Harry in every department of a gas-works' operations. If the choice were to be between technical education and practical training, then we should

say give us the practical training; if the choice were to be between practical training on the one hand and practical training and technical education on the other, then we should say let us have the combination. There is every sympathy with Mr. Brown in his views as to the low salaries that are, with growing frequency, offered to those qualified for the positions of official responsibility—and it is a growing responsibility—in the gas industry; but we must claim that this niggardliness is much more apparent among municipal authorities than among companies. The reason for this need not be sought further than the changing constitution of our local governing authorities.

Mr. Brown got on to the old vexed question of differential prices. Many men who at one time possessed concrete views as to a uniform price for gas for all purposes have had their faith and their noble resolutions shattered by the inclemency of the competition of the present. Uniformity of price makes a respectable ideal; but it is impracticable if business is not to be sacrificed. Even where prices are low—say, at Widnes and Sheffield—it is found that differential prices possess an immense amount of persuasive virtue; more so than the ordinary price less a discount according to quantity used. Many an engineer can tell of the differential price having saved him consumers wavering between producer plant and town gas for industrial purposes, and the patronage of other large consumers astride the fence between gas and electricity, where the ordinary price, less varying discounts, which might or might not be reached according to the conditions of trade, would have failed. We have to-day to treat the purposes, as between industrial and domestic, as distinct departments of business, and apply an independent policy to each. These are not the days for sentiment, but for business. Mr. Brown does not think it is consistent that a person who uses gas for industrial power and heat should be supplied at (say) 1s. 6d. per 1000 cubic feet, while to another person the uniform rate is charged, simply because he uses it for light only. Nor do we think it at all right that the latter consumer, for whom Mr. Brown is so solicitous, should be robbed of the benefit to him of retaining for the undertaking the profit, whatever the amount, that the former gas consumer provides at the lower price, although for his purposes (from the point of view of cost) producer gas would answer. Other reasons why the lower price is justifiable were given—particularly by Mr. Henry O'Conner—in the discussion.

There is one other point. Mr. Brown cannot understand why the prepayment consumers should pay more than the ordinary consumers, though he fully appreciates that they entail more work and consequently cost and more capital expenditure. This, he says, is not the people's fault. Again, we say, Mr. Brown is not logical. He believes in uniform conditions of supply. Then why should he allow the prepayment consumer, who costs more to supply, to have gas at a price yielding, when all expenses are paid, a less profit than the ordinary consumer? By the amount that there is less profit on gas used for, as Acts of Parliament now put it, "like purposes," the ordinary—"ordinary" as distinct from exceptional—consumers of gas are injured. Where, however, gas administrators have any uneasiness of conscience over taking from slot consumers more in excess charge than is due for the additional expenditure incurred on their behalf, why not fix upon a total amount per annum or half year that will pay the outgoings special to a prepayment supply, and then return to each consumer all that he has paid above the value of the gas used at the ordinary price *plus* the fixed amount of additional charge? Some slot consumers might be tempted to burn more gas to experience the pleasant sensation of getting a few shillings returned (say) at Christmas time. There are a good many peculiarities in human character.

Gas and Electricity in South Africa.

Some of our readers may remember that towards the close of last year Mr. Henry Hack, late of Birmingham, left England for a tour in South Africa. He has now returned, and we are pleased to record that he has greatly benefited by the change. On his arrival at the Cape he received a cordial welcome from Mr. E. P. Reilly, the Engineer and General Manager of the Cape Town Gas Company, who assisted him in "seeing the sights," and gave him particulars of the gas supply. Mr. Hack availed himself of Mr. Reilly's hospitality, and he has recorded in an article

which appears elsewhere the results of his observations. Among the particulars furnished, it is interesting to find that the Gas Company are not regulated by any Act of Parliament, but are left to act according to their own judgment as to what is desirable to secure a demand for their commodity. They are not harassed by the municipal authorities, there is cordial co-operation among the officers, and the Manager is allowed to have a free hand in all things connected with his department; the local Director confining himself entirely to matters of policy. Consequently, it is not surprising to find that the Company's business methods are quite up-to-date. Of course, they have a powerful competitor in the shape of the municipal electricity supply undertaking, which is being pushed to the utmost; but there seems to be a good field for gas in the suburbs. It is not a little curious to read of several towns in South Africa—Durban among them—being lighted entirely by electricity. No doubt Mr. Reilly was pleased to have an opportunity of conversing upon gas topics with a professional colleague of Mr. Hack's standing; for, though he had kept himself well posted up through the medium of the "JOURNAL" and other technical sources, he confessed to feeling the need of an occasional visit to England to see for himself the latest things in the way of gas installations, and have intercourse with other gas engineers. The same need exists in the case of all managers of foreign and colonial gas-works, who will, we are sure, appreciate the sympathetic remarks on the subject made by Mr. Hack towards the close of his interesting communication.

Show-Room Attendants.

Show-room attendants play an important part in the commercial business of a gas undertaking in these times. It does not do to put any dunderhead and tactless individual in such a position. He must be a man specially gifted for such a purpose, and capable of exercising his gifts without obtruding them too much upon notice, and causing annoyance by the display of a sort of avalanche of superior knowledge. A writer in one of the electrical papers has been making a round of a number of electricity and gas show-rooms disguised (by word of mouth only) as the friend of a prospective resident in the neighbourhood, and, so far as his investigation carried him, he found the gas show-room attendant a more capable and qualified man than his compeer of the electricity undertaking. The results of his investigation are treated upon in our "Electricity Supply Memoranda," which, we hope, are found week by week helpful to show-room attendants of gas undertakings. To be up to the requirements of his business, the show-room attendant must not only be well-informed on the subject of the advances in the structure of gas apparatus and the progress in efficiency, but he must keep himself *au courant* with what is passing in the commercial sphere of the electrical competitor. From a study of the "Electricity Supply Memoranda" of the past twelve months, many useful points might be gleaned by those who have neglected to read the articles.

The Question of the Rates at Manchester.

The general body of citizens of Manchester, and their representatives in the Council, are still exercising themselves over the threatened increase in the rates owing to the falling off in the receipts from the Ship Canal and the growing demands of the Education Committee. Protests have been widespread, and all and sundry have been voicing their opinion that the rates must be kept down. To say this, however, is one thing; while to do it, may be quite another. Advice is always to be had for the asking; but it does not by any means necessarily follow that it is of a practical character. The finances of the Ship Canal and of the Education Committee must be to a very large extent beyond the control of the Council, who are compelled in these respects to take things as they find them. In directions where the exercise of economy is possible, the members are no doubt now—even if they have not always been—quite as anxious as anyone else that the expenditure should be cut down so far as may be done without endangering efficiency; but all that can be accomplished in this way will not, apparently, suffice to prevent at least an increase of 6d. in the pound on the rates. Not only is there increased expenditure foreshadowed, but the contributions to be received from some of the trading concerns are estimated at substantially smaller amounts. As a local paper remarks, "expenditure 'saved' one year has to be faced the next; and extra

contributions forced from trading committees in 1908 mean lower contributions in 1909." It will be seen from our "Miscellaneous News" columns to-day that the Gas Committee, who last year handed over to the relief of the rates a sum of £60,000, instead of the customary £50,000 (thereby depleting their reserve fund), have come to the conclusion that for this year it will be impossible for them to give more than about £26,500, unless the price of gas is to be raised. Whether the spending estimates will be further reduced, or the trading committees will be induced to increase their promised contributions, remains to be seen. If the latter course should be adopted, and the prices of the various commodities, &c., have to be raised to meet this extra demand on the resources of the departments, it will, of course, only be increasing the rates in another, and far less satisfactory, form than a direct addition to the amount payable in the pound. Municipal undertakings, the same as other businesses, cannot expect to escape the consequences of trade depression; and thus it is that ratepayers are liable to be adversely affected precisely at the moment when it is least convenient for them to have any further burdens placed upon their shoulders.

Free Gas for Public Lighting.

Relative to the paragraph that appeared last week on this subject, our friends of the "Oldham Chronicle," in a further allusion to the matter, cannot see that the supplying of free gas to the public lamps and buildings of Oldham is an inequitable system to the gas consumers. The gas consumers have consistently provided the money for sinking fund and interest on all the loans required for the gas-works, they have found the money for the maintenance of the works, they have supplied the money for the payment of the rates and taxes under the assessment of the gas undertaking, and they have contributed money in aid of the rates. In fact, since the works have been in the hands of the Corporation about £390,000 has been transferred from gas profits in aid of the rates. The consumers have done well for Oldham. But the Corporation bleed them still further. They extract from their pockets payment for the gas made, distributed, and delivered for all public purposes. The value of the gas so used since the works were transferred to the Corporation is about £158,000. Is this equitable? We say "No;" the "Oldham Chronicle" says "It is." If our contemporary is right, then we do not understand the true meaning of "equity." Public lighting is a public service just as much as the sewerage system, road cleansing, and many other matters that could be mentioned. Every penny that it costs should be made a common charge. Our contemporary says the people of Oldham are responsible for the gas and electricity works, and on them "if anything happened which made large and sudden expenditure imperative, the cost would fall." Has anything happened up to the present making large and sudden expenditure imperative? If anything did happen, the gas consumers would have to bear it through an increase in the price of gas. Already in profits and in the value of gas taken without payment for public lighting, there has been a transfer from the gas undertaking of an amount exceeding the total of the sums borrowed for the purposes of the undertaking, and the capitalized value of the annuities. The so-called "responsibility" of the ratepayers of Oldham (which responsibility, in fact, has been shouldered solely by the gas consumers) has been well rewarded.

Is it Illegal?

If we cannot agree with the "Oldham Chronicle" regarding the inequity of charging the gas consumers with the gas used for public purposes, perhaps our friends will tell us whether what the Corporation are doing in this respect is legal. By the 1886 Act, the Corporation are forbidden to make out of the gas undertaking a greater profit than the amount of annuities created for the purchase of the undertaking and 6 per cent. on the capital outlay of £128,910, on the capitalized profits of £75,436, and on the new capital to be raised under the Act. By taking free gas for public lighting, we claim, subject to the correction of disinterested legal authority, the Corporation are doing something that is in excess of the power given them by the 1886 Act. The value of the gas so wrongfully used in the past—if our interpretation is correct—amounts to many thousands of pounds. We are not arguing more for the out-townships than for the gas consumers of the borough. But if the authorities of the out-townships seriously contested this matter in the Law Courts, and it was proved that the Corporation had been acting illegally in regard to it, we

wonder what would be the position in respect of those many thousands of pounds' worth of gas the Corporation have taken over and above the amount of profit to which they are entitled by the Act of 1886. Perhaps the "Oldham Chronicle" will throw a little light on these questions, as we have failed to shake their opinion on the point of the inequity of the present practice, though it ought not to be possible to say in such a matter as this that there is equity in illegality—if so it be. We presume it was on the score of equity that Parliament in 1886 limited the "profits" to be taken by the Corporation.

A Big Gas Amalgamation.

An amalgamation of gas interests that will represent something gigantic in its kind at one move, is in a fair way of settlement in respect of the gas supply of the City of Buenos Ayres. The gas supply to the city has been a prosperous business, but not a peaceful one. Ever and again something is cropping up to disturb the minds of those who have the responsibility of the administration of these large concerns. For a number of months past, the Directors of the three Companies—the Primitiva, the River Plate, and the Buenos Ayres—have unitedly been negotiating with the Municipal Council over an unreasonable reduction in price that the latter wished to enforce on behalf of the consumers. The whole history of the affair, and its present position, is set forth in the speech of the Chairman (Mr. A. E. Bowen) at the meeting of the River Plate Gas Company last Friday. It presents a story of the disadvantageous circumstances under which—however liberal-minded Directors may be, and in fact are—the affairs of the gas supply in this distant city are administered through excessive zeal of the municipal authorities in making demands on these privately capitalized enterprises. There is competition between the Companies in the supply of gas; but competition in a commodity that requires such expensive plant for its distribution and sale does not really give to the consumers the same benefits as does free trading in other commodities. An unnecessary expenditure of capital for the purpose of conducting the competition annuls the supposed benefits of the free trade; while there are other ways and means—such as the sliding-scale system—whereby, without competition, consumers are ensured gas at the lowest price. There is no way in which the views of the municipal authority of Buenos Ayres as to price can be complied with, and at the same time give protection to the shareholders' interests, except by eliminating the competition from the gas supply, and bringing into operation the economies to be achieved by the three concerns being placed under one administration. Such a scheme is well on the road to consummation, if the shareholders of the Companies approve. With debentures there is an expended capital of not far short of four millions sterling involved in this amalgamation. Including £558,100 of debentures, the Primitiva Company have an issued capital of £1,757,800. Of this, £600,000 represents the purchase price of the assets and goodwill of the electricity section of the Company, instalments of which—amounting to £36,400—have been paid since the agreement for sale in 1903. Including £312,650 of debentures, the River Plate Company have a capital of £1,312,650; and including £250,000 of debentures, the Buenos Ayres (New) Gas Company have a capital of £950,000. These figures show that this amalgamation, if carried through, will be a big thing in the history of gas supply.

The Best Lighted Street in the City.

The deputation from the City Corporation have returned from their perambulation of Continental cities to learn of the systems in use for public lighting; and when their report is issued shortly, there should be in it, judging from what has fallen from the lips of Mr. Charles Alfred Teuten, much that is gratifying to the gas industry. Mr. Teuten, as Chairman of the Streets Committee of the City Corporation, headed the deputation; and, at the annual dinner of the Committee on Monday last week (as seen by a report in another column), he gave an indication of certain impressions. There is evidence that the Committee went on their visit with a single eye to the purpose of their mission. Their report will, it is anticipated, be a voluminous and instructive one, and will result in the adoption of an economical and efficient lighting system in the City. Among the notable remarks in Mr. Teuten's speech on Monday evening are these: "Looking through the City, Fleet Street is the best-lighted thoroughfare.

. . . The authorities in Berlin have decided to spend 7 million marks, at the rate of 1 million marks per annum, on installing in all thoroughfares incandescent inverted gas-burners under pressure; and this decision has been arrived at after much investigation and experimenting by their Professor of Chemistry." Fleet Street—the best lighted thoroughfare in the City of London—is illuminated by high-pressure inverted gas-lamps.

Employers and Co-Partnership.

It seems probable that steps will be taken to bring to a head a suggestion made by Sir Christopher Furness, M.P., the other day that there should be a national conference of employers of the United Kingdom on the co-partnership question. A number of employers have expressed themselves in sympathy with the idea. There is no question that Sir Christopher's enthusiasm for co-partnership is unalloyed. He believes it stands at the very head of the means at hand to enable the industries of the country to confront their rivals abroad with a prospect of success; and he is disposed to urge that it should be brought into operation in every trade to which it can be made applicable. The co-partners would, he believes, perform their due share in the vitally important work of safeguarding and extending the gravely threatened position of England as the world's greatest industrial power. If Sir George Livesey were with us now, no two calls would be required to bring him to the forefront of a movement for the application to industry generally, or so far as they could be applied, of the principles of co-partnership. He held in his day that there could be no hope of any permanent peace in industry until there was mutuality of interest between employer and employed. He spoke of what he knew.

Saving Daylight.

The Daylight Saving Bill is securing a large amount of support. Resolutions in its favour have been passed by two County Councils, the Common Council of the City of London, the Convention of the Royal Burghs of Scotland (representing 199 towns), and upwards of a hundred Corporations and Town Councils of the British Isles; the whole representing a population of about 16 millions. There has also been a public meeting in support of the measure in the historic Guildhall of the City, when representatives of financial and commercial circles, and men of position and influence in other of the higher spheres, flocked round the Lord Mayor to show their sympathy with the movement and to help it forward. The principal speaker was Sir Robert Ball; and, according to him, there is really nothing the change will disturb that is of importance to the community. The theatrical folk think otherwise, and so do certain morning papers, who will lose first publication of some of the foreign telegrams. And there are people who supply the agents for artificial illumination who think it may affect their summer revenue. But the least to care about the matter are the gas people, whose day consumption in the summer time of late years has gone up considerably. Those who care most are the men in charge of electricity undertakings in residential areas. There are unkind folks who say that the less people have to do with things artificial the better; so perhaps it is wise to remain silent over the little loss that will be suffered by gas undertakings through the proposed curtailing of the hours of illumination by one per day in the summer. Human convenience must be studied. At the City meeting, it was resolved that the passing of the Bill would "improve the physical, mental, moral, and financial welfare of the nation," and so "is deserving of the support of all classes of the community." The Government were also asked to give facilities for the passing of the measure.

The salary of £250 offered by the Shipley Urban District Council, in the "JOURNAL" for the 6th inst., for the post of Engineer-Manager attracted 85 applications; and though the Gas Committee have reduced the number to eight, they are leaving the General Purposes Committee to make the appointment. It appears that when the Council acquired the gas-works, one of the conditions was that the Manager (Mr. T. G. Wilcock) should be retained at a salary of £400 per annum, and that in the event of his retirement he should have a pension of £150 a year. Owing to ill-health, he had to resign about a year ago, and since that time the management has devolved upon the works foreman—the Council thus saving £250 for the year. It has now been suggested that the Council should continue to effect this economy by keeping the appointment vacant, and letting things go on as at present. The suggestion evidently does not find favour with the Gas Committee.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 250.)

THE past week was not quite all that could be desired on the Stock Exchange; but considering the epoch-making events in course of enactment in the Near East—historically the danger quarter of Europe—the steadiness and self-control of the markets were highly gratifying. The cue was given from the start; for Monday opened with a demonstration of determined cheerfulness. The atmosphere had been to some extent cleared by the realization the week before, which shunted weak operators out of the way. Thus many prices had a nice rise; Consols scoring $1\frac{1}{8}$, and the Foreign Market showing strength. Tuesday started on the same line; but business fell very slack, and, after some hesitation, prices began to give way. Consols lost $\frac{1}{8}$, and other gilt-edged quotations were easier; but the Foreign Market stood steady. Wednesday was much firmer—taking a more hopeful view of the Turkish situation. The Foreign Market was strong, and Consols recovered. Business on Thursday was very quiet; and the general attitude was cautious and rather shy. The Foreign Market, however, showed no alarm. Railways were depressed at the sight of the tripartite working agreement being doomed. Things continued quiet on Friday; but they showed no sign of weakness till late in the day. Saturday opened in this mood, but improved again later on; so that at the close there was not much change on balance. In the Money Market there was an extremely abundant supply at increasingly easy rates, and discount quotations steadily relaxed. Business in the Gas Market was more active, quite regaining its normal level; and several quotations in the London market were advanced. In the Sheffield and Liverpool markets, the local undertakings had one issue each slightly lowered; but they could well bear it. In Gaslight and Coke, the ordinary was active and touched higher figures; transactions ranging from 103 $\frac{1}{4}$ to 104. The secured issues were quiet; the maximum realizing 88 $\frac{1}{2}$ and 89, the preference 106 $\frac{1}{2}$, and the debenture from 85 to 85 $\frac{1}{2}$. South Metropolitan was more active than of late, and commanded prices ranging from 123 $\frac{1}{4}$ to 124—a rise of 1. The debenture fetched 85 and 85 $\frac{1}{2}$. In Commercial, the 4 per cent. was done once at 107. Among the Suburban and Provincial group, Alliance and Dublin new changed hands at 12 $\frac{1}{4}$, Bournemouth "B" at 16 $\frac{3}{4}$, British at from 42 to 42 $\frac{1}{2}$, Bromley "A" at 115 $\frac{1}{2}$, Ilford "A" at 134 $\frac{1}{2}$, and West Ham at 119 $\frac{5}{8}$ and 120 (a rise of 1). In the Continental companies, Imperial was stronger at from 184 to 186 (a rise of $\frac{1}{2}$), ditto debenture realized 95 $\frac{1}{2}$, Union 101 $\frac{1}{2}$, ditto preference from 139 to 140, European fully-paid 24 $\frac{1}{4}$ and 24 $\frac{3}{8}$, and ditto part-paid from 17 $\frac{3}{4}$ to 18. Among the undertakings of the remoter world, Buenos Ayres changed hands at from 13 $\frac{1}{4}$ to 13 $\frac{3}{8}$ (a rise of $\frac{1}{2}$), Oriental at 141 $\frac{1}{2}$, Primitiva from 6 $\frac{1}{2}$ to 7 $\frac{1}{8}$ (a rise of $\frac{3}{8}$), ditto preferred at 5 $\frac{1}{8}$, ditto debenture at 96 $\frac{1}{4}$ and 97, and River Plate at from 14 to 14 $\frac{1}{4}$ (a rise of $\frac{1}{4}$).

ELECTRICITY SUPPLY MEMORANDA.

A Fillip Required—Show-Rooms and their Attendants—Lethargy in the Gas Show-Room and its Dispersion—Difficulties of the Electrical Salesman—Heating and Cooking the Ways of Salvation.

THE electrical industry, we read in the "Electrician," is badly in need of a fillip at the present time; and our contemporary has been displaying much energy of late in trying to infuse a little more spirit into the commercial operations of electricity undertakings, and inculcate practices that are considered as founded on the right lines. The effort is praiseworthy; and it must be a matter of delight to the readers to observe the robust faith existing in the future of an industry that, after thirty years' labour in establishing itself, stands "badly in need of a fillip at the present time." Among the writings in recent issues of the "Electrician" bearing upon the subject is an account of visits paid by an electrical engineer to a number of show-rooms of both electricity and gas undertakings. He went in the guise of a good-natured person seeking information for a friend of his who happened to be thinking of taking a house in the neighbourhood, and who desired to get at the truth, before commencing to fit up the place, regarding the relative merits and demerits of gas and electricity. The ruse was thinly veiled; and probably some of the want of success of this delightful friend was due to the fact that the attendants were not dealing direct with the prospective customer himself. Nevertheless, the trick succeeded so far that the investigator obtained sufficient impressions to form a judgment on the subject in hand. On the whole, though prejudice here and there peeps out, he treats of his adventures fairly; and on the score of efficiency for the purpose, he certainly awards the palm to the show-rooms of the gas undertakings that he visited, and to their attendants.

The show-room men of the gas industry, however, must recognize that, just as gas has a competitor in electricity, they, too, have competitors in the electricity show-room attendants. They must therefore look to it that they maintain the reputation they have of being well-versed in their subject, and eager in the interests of those they serve. From the very cheapness of gas, its greater heating efficiency, and the cheapness and efficiency and low cost for maintenance of gas appliances compared with elec-

trical appliances, they have advantage on their side. But the knowledge of this must not allow them to lapse into the dormancy oftentimes produced by a sense of security, as the inevitable consequence would be the loss of ground that might otherwise have been retained. In the gas show-rooms, the electrical visitor asserts that he at first found the attendants lethargic; and he cannot repress a little joke by remarking that he does not know whether this was due to the amount of gas being consumed for lighting and heating. He himself shows that it was not so; for a mere inquiry as to the relative costs of gas and electricity for different purposes roused the attendants to such cerebral activity that their interrogator has to admit they were well up in their subject on both this and the relative hygienic advantages of the two illuminants. The investigator regards this latter point as a vital matter for gas undertakings; and the statements of the gas show-room attendants he naturally pretends that he received with a grain of salt. In the gas show-rooms, there was no doubt a great deal more gas being burned for demonstrating lighting and heating than would be the case under normal conditions in a house, and yet it was an easy matter to rouse the attendants from the lethargy which he fancied possessed them on his first introduction. If he turns this matter over in his mind, and applies a little reasoning to his experiences, he must come to the conclusion that they show that the "lethargy" was not at all serious, and that there are exaggerated and unfounded notions in electrical circles on this "vital matter" for gas undertakings.

In the electricity show-rooms, the investigator does not appear to have found anything to his satisfaction. The attendants themselves did not appear to him to be up to their business; but he does not make sufficient allowance for the difficulties of the position of the electrical show-room man. The electrical show-room man who could answer all the questions of an inquirer to the satisfaction of the central station engineer should be one without any conscience, and one who has a sufficiently broad back to bear the after-reproaches of the deceived consumer. The electrical show-room attendant has to deal with an adverse condition of affairs, including complicated systems of charging and complicated apparatus, neither of which the public can take to kindly. The attendants themselves prove the difficulties of their situations by the narrowness of their knowledge. At most of the show-rooms, there was found an incapacity for explaining the systems of electricity charge lucidly and in language and terms that could be understood by the man in the street, and for describing the working and the efficiencies of the apparatus the use of which the attendants are there to advocate. They volunteered little information; and the only way that the inquirer could get particulars was by a process of catechism, and sometimes not then. He accuses these attendants of being a lot of pessimists. It may be suggested that perhaps the attendants are more particular about their hereafter than their masters. It is not a pleasant thing to tell a consumer that with electricity this and that piece of apparatus will work out cheaper in first cost and in use than gas, and that it will be more efficient and give less trouble than its equivalent among the means of using gas; and then to have the irate and deceived consumer returning after a period's experience, and telling the show-room attendant that his proper category is headed with a word containing only four letters. Deceived consumers can do as much mischief as the best of show-rooms can do good. We firmly believe that the mendacious literature and pictorial caricatures issued by electricity supply undertakings have done as much as anything to disgust householders, and to cause them to dismiss from consideration the question of a change from gas to electricity; their experience of gas being directly opposed to the printed assertions of the electricians. Our advice is to now try the effect of telling the truth, and hiding nothing. Perhaps, too, the show-room, forming a direct communication between the electricity station and the public, may be the means of inducing the electrical industry to try to replace complication by simplicity. This they could do in their charges; the greater difficulty is, of course, to simplify the fittings and apparatus.

It may be said in reply that the employment of truth by electricity show-room attendants, as found by the "Electrician" investigator, has not met with any great success in developing business. But if the attendant tells the truth in answer to direct questions, and gives evasive replies when he dare not give a direct one, and then the inquirer is supplied with literature that makes such bold assertions that light for light electricity is cheaper than gas, and that gas scatters sickness and death around by its poisonous qualities, confusion is produced in inexperienced minds, and a want of confidence in experienced ones. This is also bad for the business. This investigator did not inquire much into the question of lighting; but relative costs (on which he could get no satisfaction from the electricity show-room men) and heating and cooking were the subjects of most of his inquiries. Regarding heating and cooking, he found the attendants cautious; their arguments lukewarm. When he inquired as to heating appliances, he was told that a separate circuit would be required for the heating current, and that the electric radiator was no use for heating a large room. These are truths. Then why complain? The substantial first cost of electric cooking and heating appliances was also pointed out. Well, there is also truth in this. But it is called "crying stinking fish." Would the investigator have business obtained under false pretences? The "Electrician" thinks it in the highest degree unlikely that, until some uniform system of charging is introduced, electricity for heating and cooking can have any very general vogue, as the ordinary

consumer thinks twice before putting in a duplicate service, as he must at present do to obtain the reduced rates for these purposes. But our contemporary apparently overlooks the fact that a uniform rate could not be put (if at all in these times) much below lighting prices; and at the 1d. per unit rate, electricity is so inefficient as a heating agent as to be expensive in comparison with gaseous or solid fuel, upon which point Mr. Cyril Davis supplied some valuable information in a letter which appeared in our "Correspondence" columns last week.

Albeit our contemporary is of opinion that "electricity for heating and cooking will in time be generally employed;" and the peripatetic searcher into the usefulness of show-rooms and the ways of their attendants says: "That electricity for heating and cooking will in time be universally employed, no sane man can have any doubt; but how long before such a state of affairs will exist, depends not a little upon the efforts of those whose business it is to supply the necessary energy and the apparatus for these purposes." There is something else, and that is the finding of a way to get a greater proportion of the heat units of the fuel used under the steam-boilers at the generating-station represented at the points of heating and cooking use. It is not by any means altogether a question of the improvement and lowering in price of the apparatus; but the suggestion that these are the directions in which the electricians are looking for further rays of hope shows that heating and cooking apparatus are not yet perfect—failure is a common experience, inefficiency a constant one—nor that their cost is at anything like a popular level. We are not by any means disposed to agree as to electricity being the general and universal heating and cooking agent of the future, nor is Sir Oliver Lodge, nor are the public—judging from the rate at which gas cooking and heating stoves have been adopted during recent years, and which shows that they appeal to others besides "gas enthusiasts." The prospects for electric heating and cooking are not bright; and we cannot suppress the fear that the expressed belief of our contemporary and of the show-room visitor masquerading in an assumed character is but the reflection of a shadowy hope.

In another article, the "Electrician" carries the subject of heating and cooking further by advocating the hiring-out by electricity undertakers of the necessary apparatus. There are many undertakings where a motor load is unobtainable; and our contemporary points out the most obvious truth that their future welfare is largely bound up in the supply of electricity for all household purposes. "The greatest possibility" for these unfortunates "lies in the direction of the use of electricity for heating and cooking." The advice is given that much may be learned by a study of the methods of gas undertakings in hiring-out gas cookers and fires. Electricity undertakings have been reluctant to take up the letting on hire of electric cooking and heating apparatus; but our contemporary insists that some such arrangement is imperatively necessary. It is, however, all a question of Will it pay? We are as confident that it will not as our friends are that the hiring-out system is necessary. Under present circumstances, hiring-out must act as a drag on an undertaking rather than be a helper out of its troubles. In the first place, we have never yet seen any rational defence by our electrical friends of the charge of 1d. per unit for such a short-hour and intermittent and fluctuating load as cooking and heating. The 1d. per unit certainly cannot pay. Upon this there is the capital expenditure, repair, and wear and tear costs, which are all heavier for electrical cooking and heating apparatus than for that of the competing agent. Upon both of these sides of the question, the electricity supplier has to look in considering the hiring-out of such apparatus. It is a matter of business; and it is inexpedient to open up any branch that is going to create a loss. The Blackpool Corporation are going to try an experiment with a rental of 10 per cent. on the cost of heating and cooking apparatus and a charge of 1d. per unit for the electricity. It is admitted by our contemporary that 10 per cent. on cost as rental may prove insufficient to cover maintenance and depreciation for the time being. Besides this, it is understood the Corporation are employing their "reserve funds" to purchase the apparatus to be let on hire. Are these funds going to be replaced out of the 10 per cent. and the "profit" from the 1d. per unit electricity? We fear not. It is, in our opinion, an unsound financial policy upon which the Blackpool Corporation are embarking. Is the 10 per cent., too, to be spread over the cost of installation as well as that of the apparatus? Ten per cent. on an electrical cooker would be a heavy rental, without being extended to the cost of installation. But someone has to pay for this. Altogether, if heating and cooking offer the greatest possibility for electricity undertakings without a power load, then they deserve to be the objects of pity, with so much internal and external disadvantage against them.

Concrete-Covered Piles.—The piers on the San Francisco waterfront are partly carried on creosoted piles and partly on concrete covered timber piles. The latter type has proved a great improvement over the former; but, according to a recent report by Mr. Ralph Barker, an Assistant State Engineer, it has some defects. If there is no hard bottom within a reasonable depth, the pile has to carry the heavy weight of the concrete in addition to its proportion of the load of the pier; and, consequently, its efficiency as a pile is reduced by the concrete envelope. Where a hard stratum is reached, the concrete cylinder rests on this, and may render the timber pile superfluous.

PERSONAL.

Mr. WILLIAM R. GLOVER has been elected a Director of Messrs. Glover and Main, Limited, Messrs. Thomas Glover and Co., Limited, and Messrs. R. & A. Main, Limited.

The "Journal für Gasbeleuchtung" announces that the German Continental Gas Company have appointed Dr. L. LANG, who has hitherto been in charge of their works at Gotha, to be Manager of the Potsdam Gas-Works—in succession to Dr. G. Mohr, whose death is reported in to-day's obituary notices.

OBITUARY.

Much regret is felt at Fareham at the death of Mr. THOMAS HEWETT, who had recently retired from the chairmanship of the Fareham Gas Company after a quarter-of-a-century's service in that position. The deceased was in his 85th year.

We regret to hear of the death, on the 14th inst., of Dr. G. MOHR, the Manager of the Potsdam works of the German Continental Gas Company. He had been in the service of the Company for thirty-six years, during the last twenty of which he had been in charge of the Potsdam station. He was about to retire from work—having reached his seventieth year, but failed to recover from a long illness. Deceased was well known among his professional colleagues for his activity in connection with the "Berufsgenossenschaft" or professional union of gas and water works, of which body he was President.

The death occurred on Saturday, the 17th inst., after five weeks' illness, of Mr. GEORGE CROWE, the Engineer of the Chester Water Company. Deceased was a native of the city, having been born there in December, 1844. His father was an engineer in the firm of Messrs. Peto, Brassey, and Betts; and the son was in their service when the business had been reconstituted as Messrs. Peto, Betts, and Crampton. After having had varied experience in connection with engineering, he returned to Chester, and obtained an appointment with the Water Company as a mechanical engineer. This he held till the death of Mr. Dugdale, the Chief Engineer, in 1891, when he was promoted to the position, which he filled with the greatest credit. At his suggestion, and under his supervision, the Company's system of filtration was changed, and his method of graded sand filtration was introduced with the utmost benefit. He was of an inventive turn of mind, and among other patents taken out by him was one for a water-meter. The funeral, which took place at Chester Cemetery last Tuesday, was largely attended. Mr. Crowe leaves a widow and two sons.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£ s. d.		
April	19	Previously acknowledged	9120	1 1
	23	John R. Heath, Stoke-on-Trent . .	2	2 0
		Leslie E. Clift, Chairman of the		
		Redditch Gas Company	3	3 0
		Redditch Gas Company	21	0 0
	26	Aberystwyth Gas Company	5	0 0
		Total	£9151	6 1

THE BUILDING TRADES EXHIBITION.

AMONG the trade exhibitions which are held periodically, one of the most popular is certainly that connected with building, which (under the organization of Mr. H. G. Montgomery, M.P.) takes place biennially at Olympia. For the fortnight ending next Saturday, every available foot of space in this enormous hall is crammed with objects of interest to those who erect buildings and those who have to use them. Not everything that is utilized in the building industry is represented; but most things must be—more or less—among the hundreds of exhibits. A thorough inspection of all that is to be seen involves a walk of several miles; but the excellent arrangement of the stalls enables the task to be accomplished, catalogue in hand, without any of the retracing of steps and random search for descriptive matter which is so trying to the patience of the conscientious visitor. A trade exhibition is of necessity very largely "fashionable;" and in this case several questions that have lately been to the front receive due emphasis. For instance, the efforts that have been made to remedy the dust nuisance are demonstrated in an excellent show of tar-spraying appliances and special compositions; while there is also a good display of coke and other stoves for use in connection with hot-water circulating systems. Other examples there no doubt are in plenty; but these are the two which struck the writer while engaged in a search for any exhibits that might have a direct bearing on the gas industry.

To come to the point of the article, it may be remarked at once that this search was not very productive; but at the same time gas is not entirely unrepresented. Indeed, there is provided at the stand of Messrs. Davis, Bennett, and Co. a thoroughly up-to-

date exhibition of lighting, in the shape of an installation of Keith high-pressure inverted gas-lamps (giving 60-candle power per cubic foot of gas consumed), of the kind which have lately proved so successful in the lighting of Fleet Street. The exhibit of Messrs. Davis, Bennett, and Co. includes a model kitchen, in which is to be seen a gas-cooker fitted with Serne's patent hot-closet, manufactured by the Davis Gas-Stove Company, and which is supplied on hire by the Gaslight and Coke Company. This hot-closet, which is fitted above the cooker, is intended to keep plates, dishes, puddings, &c., warm by utilizing the waste heat from the oven and hot-plate burners. The waste heat from the oven is conveyed to the hot-closet by means of a special pipe fixed at the back of the cooker, and passes off through an outlet on top of the closet. When neither the oven nor the hot-plate is in use, and the closet is required for warming purposes, it can be heated by a small atmospheric burner (which can be swung back when not needed) fitted immediately under the closet. The space between the bottom of the closet and the hot plate is 18 inches, which gives ample room for the use of large utensils; and it is made in two stock sizes, 24 and 30 inches wide outside respectively. There is also a Fletcher-Russell water-heating apparatus, fitted with patent thermostatic valve, and capable of supplying 400 gallons of hot water per day. This can be fitted to an existing system of pipes, so that either coal or gas may be used as required.

Gas is also represented at the stand of Mr. Thomas Potterton, who, in addition to the Davis steamless radiator and other appliances, makes a special show of the "Queen" combined coal or gas burning range and the "Victor" gas-boiler. The "Queen" range can be instantly converted from a coal-burning to a gas-heated cooking-stove, or *vice versa*, each presenting all modern details for efficient results. A special feature is made of the fact that the water heating is provided for by two distinct boilers—one for the coal-fire, and the other for the gas. A high-pressure boiler is fixed at the back of the fire to supply the hot water when coal is being used; while for the gas there is a "Victor" boiler combined in the range. The pipes from both boilers are joined above the hot-plate, so that the supply of hot water to the tank and taps is regular, whichever boiler is used. When gas is used for the oven, the necessary ventilation is automatically provided when turning on the gas-taps. The ventilating openings cannot be closed while the gas is on, as the shutting of one turns off the other. When coal is being burnt, the gas tables are lifted; but though they are hinged at one side, the gas service has no hinged or working joints in it. The range, which is portable, is made in three sizes. As to the "Victor" gas-boiler, this is an already well-known and well-tried appliance; and its uses include the supply of hot water and the warming of rooms or greenhouses by hot-water pipes or radiators. Among the large installations now in use, it may be mentioned that at Sandow's Institute of Physical Culture in St. James's Street, eight of the boilers were fitted up in 1907, and have since continuously supplied from 200 to 250 hot baths per day; while a further installation of sixteen boilers, to supply another 450 baths daily, is now being carried out. The cost per bath for gas is stated to work out at something like 1d.; and, as will be imagined from the fact that the further installation is being put in, the boilers have given entire satisfaction.

The Aerograph Company show their spray-painting apparatus, which, in the larger sizes, is particularly suitable for gasholders and other big surfaces; and Messrs. Williamson, Cliff, Limited (to whose works reference is made in the report of the meeting of the Eastern Counties Gas Managers' Association, in another part of this issue), exhibit their fire bricks and blocks. The "Gem" cast-iron multitubular gas-boiler (fitted with vertical steel tubes), which is made in two sizes, is to be seen at the stall of Messrs. Hartley and Sugden, Limited; while Messrs. James Stott and Co. make a working display of their gas-governors, and also show their instantaneous water-heaters. A large number of geysers are to be inspected at the stand of Messrs. Fenlon and Son; and Messrs. Ellkay and Co. have on view their "Perfect" fire or gas wash-copper. There is a numerous show of air-gas plants; while the use of gas for power purposes is represented by Messrs. Richard Hornsby and Sons, who exhibit a "Hornsby-Stockport" gas-engine, to give 17 B.H.P. with suction gas, or 21 B.H.P. with town gas. "Ye Olde Yule Log" gas-fires are shown by the London Warming and Ventilating Company; and at the stand of the Webb Lamp Company are to be seen the Company's various ventilating appliances and other specialities. A display which deserves special mention is that of the Birmingham Guild of Handicraft, Limited, which embraces a beautiful selection of gas and electric fittings. Messrs. John Barker and Co. again invite attention to the Kennedy tube bending machine.

An extensive show of gas and water works appliances is made by Messrs. J. Blakeborough and Sons—among other things being Boyd's drilling and tapping apparatus for inserting ferrules in water-mains under pressure. With this appliance, it is stated, a main can be drilled and tapped, and a $\frac{1}{2}$ -inch ferrule inserted, in less than ten minutes. Among its advantages are placed simplicity in operation and lightness. Messrs. Ham, Baker, and Co. show the Ham apparatus for drilling and tapping water-mains under pressure, without loss of water, with which it is also stated that a 6-inch main can be drilled and tapped, and the ferrule inserted, within ten minutes. The advantages claimed for the appliance are that it is strong, portable, quick, and does good work. Other exhibits of special interest to the water engineer are Callender's water-tight bitumen sheeting, plans and drawings of the Candy filter, and Bobby's "Simplex" water softener.

NOTES FROM WESTMINSTER.

PARLIAMENTARY business was resumed last week, after the brief respite afforded by Easter; but there was no disposition to get to work with any rush. The Gaslight and Coke Bill is still hung up in connection with the blocking movement of Mr. Will Thorne. It is now expected to come before the House this evening for third reading, and then Mr. Thorne will move that it be read—according to the old formal manner of gently disposing of a measure—"this day six months." As we have said before, it is not at all likely Mr. Thorne will have the sympathy of the House with him in view of the passing of the measure by the Select Committee to whom it was referred, and of the part that the West Ham Corporation took in the settlement before the Committee. In recent sessions, too, Parliament have shown—excepting in the one case of the Irish scheme for generating electricity by peat gas—notably in the cases of the East Hull and Worthing Gas Bills, a disinclination to interfere with decisions of Select Committees. On Thursday and Friday, the Yorktown and Blackwater Gas and Electricity Bill was before Mr. Rose's Committee; and possibly early this week, the decision will be given. It depends largely on this decision whether it will be necessary to trouble the Committee with the Aldershot Gas and Water Company's Bill, or at all events to a very small extent, because, as a matter of fact, there seems to have been practically, if not entirely, a complete wiping away of the original opposition to the measure—the chief outstanding dispute being the one with the Yorktown Company as to the supply of gas for use at the Government Military Staff College. Practically, on this point, the two Bills are simultaneously before the Committee. However, at the time of writing, it is too soon to speak precisely as to what will happen in regard to the matter. The clearing away of so much opposition from both the Aldershot and Yorktown Bills is a matter of some surprise; but it is decidedly complimentary to the Companies and to their advisers. Amicable arrangement of differences outside the Committee rooms is doing more this session to speed the progress of Bills than fighting within the rooms. The parliamentary papers are constantly noting the withdrawal of petitions.

The Oldham Corporation Bill has again been before the Local Legislation Committee; and the water section has been partially passed on certain conditions. The gas section will probably be under consideration this week; and we shall be looking for interest on the matter of the appropriation of profits and the free supply of gas for street lighting. The amount of profit Oldham may take in aid of the rates is limited by their 1886 Act; but they appear to supplement their power by making the undertaking supply gas free for public use. This requires looking into. The question of the limitation of the profits to be taken from the Gas Department is also coming forward we believe in connection with the Salford Corporation Bill. It will be peculiarly interesting to hear the case that is made out—in these times of the municipal ownership of electricity undertakings, and the increasing use of gas by the poor—in defence of the practice of taking so much from gas in relief of the rates, and so little from electricity, when, if ever, any profit is made. New regulations in the changed circumstances require to be applied to the conduct of municipal trading. The Chairman of the Gas Committee of the Manchester Corporation—who is always attacking the system that allows £50,000 or more per annum to be taken from the gas consumers of the city, and to be used largely in reducing the rates of the electricity consumers—will watch with special interest the attack made on the unlimited profit-in-aid-of-the-rates system in connection with the neighbouring borough of Salford. The water section of the Cardiff Corporation Bill has been before Committee, but has not yet arrived at any definite stage.

A Territorial Question. Territorial questions have been fairly frequently raised in the Committee rooms in various forms during recent sessions; and it was a question of a small area, but an area not to be despised, that really brought the Yorktown and Blackwater Gas Company's Bill before Mr. Rose's Committee. The Aldershot Gas and Water Company were there disputing any right on the part of the Yorktown Company to be placed in full possession of the coveted ground. The Easthampstead Rural District Council were also present objecting to electricity powers being given to the Company. There was a strong representation of Counsel for the two principal parties; and the Yorktown Company had as their gas experts Mr. E. H. Stevenson and Mr. Arthur Valon. The Chairman of the Company (Mr. A. H. Claypole, J.P.), the Engineer and Manager (Mr. John Meiklejohn), and the Secretary (Mr. S. Rowe) were also watching and helping. Mr. Charles Hunt was there looking after the interests of the Aldershot Company. Mr. A. F. Wilson, the Chairman of the Company, and Mr. R. W. Edwards, the General Manager and Secretary, were also in attendance. A big survey was made in the evidence of matters that went beyond the points upon which the judgment of the Committee was desired. Respecting the latter, the simple facts were: The promoters want to extend their limits of supply, and in doing so to repeal certain unexercised powers of supply of the Aldershot Company. On a part of this land where the pipes of the Aldershot Company have not been carried stands the Staff College of the War Office, which is an important consumer of gas. At one time, however, the War Office made their own gas at Sandhurst; and then they discontinued doing so, and threw the supply open to tender. The contract was secured by the

Yorktown Company; and for seven years they have been supplying in bulk into the War Office holder at Sandhurst, which is now within the Company's district of supply, and from the holder the War Office has taken the gas to the Staff College, which is within the area of the Aldershot Company. Of course, the cessation of gas manufacture by the War Office altered the condition of affairs; but the Yorktown Company got the contract to supply in bulk, and they would now feel the loss of the business. The Aldershot Company are of opinion that their neighbours are acting *ultra vires*; and there is an action pending in regard to the matter. The Yorktown Company by their Bill are virtually seeking protection for the existing conditions, and asking for the transfer of powers possessed by Aldershot, but, through not being exercised, never enjoyed. In the Draycott and other cases, Parliament has shown little sympathy with companies holding unexercised powers; and at the time of writing, it certainly looks as though the Yorktown Bill will make an addition to the precedents in this respect. The object of the Easthampstead District Council in opposing was to protect the gas consumers in their district. They fear there may be loss on the electricity supply, and that the gas consumers will suffer in consequence. The promoters frankly admitted that there might be a loss on the electricity business for a time, but contended that an electricity concern could be worked more economically in conjunction with a gas undertaking than in a state of separate existence.

Oldham Water—Costs against Corporation.

There has been a tremendous fight over the water part of the Oldham Corporation Bill; and it only ended last Thursday. It has been, for several days prior to and since Easter, before the section of the Local Legislation Committee presided over by Sir F. Leyland Barratt. A rare representation of Counsel and eminent experts has been engaged both in favour and against the projects for an additional water supply for this great manufacturing centre. The constituent elements of the scheme were described when the provisions of the Bill of the Corporation were under review in our columns. The two principal features were the extraction of a good quality of water from the Butterworth Hall Colliery, and a pumping scheme at Delph and Linfitts. The latter had to take the brunt of the assaults of the attacking party, which comprised public authorities and millowners. There were a great number of matters raised bearing more or less directly upon the schemes before the Committee; but excepting to those directly concerned, there is not any particular interest attaching to them. The Committee gave most careful consideration to the whole question; but the upshot was that they only granted the Butterworth Hall project, and showed their sympathy with the millowners and other representatives of local interests opposing the Delph and Linfitts portions of the scheme. The Committee were quite persuaded that the pumping-stations at these places would have "a dangerous and deleterious effect upon the industries of the district." The Corporation, moreover, stand convicted of having put the millowners to unreasonable and vexatious expense in defending their interests and in resisting the proposals of the promoters. The Committee, so believing, exercised the power they possess, and put upon the Corporation the costs of the millowners' opposition. It is quite clear that someone has bungled over this matter. It is not often that a Committee go to such a length as this; and what the Committee thought on this occasion is to those familiar with procedure in the Committee rooms somewhat emphatically expressed in their act.

The Electricity Supply Committee of the Marylebone Borough Council recommend the appointment of Mr. A. H. Seabrook, M.I.E.E., as Engineer and Manager of the local electrical enterprise. There were 128 applicants for the office. Mr. Seabrook is at the present time Engineer and Manager of the West Ham municipal electricity undertaking, and he formerly filled the positions of Assistant Electrical Engineer at Hampstead and Great Yarmouth.

At the annual meeting of the Iron and Steel Institute, to be held in London on the 13th and 14th prox., the following will be among the papers submitted for consideration: "On the Preservation of Iron and Steel," by Mr. A. S. Cushman; "On the Rusting of Iron and Modern Methods for its Prevention," by Professor W. H. Walker; "On the Value of Physical Tests in the Selection and Testing of Protective Coatings for Iron and Steel," by Mr. J. Cruickshank Smith; "On the Manufacture of Peat Fuel," by Dr. M. Ekenberg; and "On a Comparison of the Methods of Determining the Hardness of Iron and Steel," by Professor T. Turner.

The waterproofing qualities of clay and alum when mixed with concrete were tested recently by the Maintenance Department of the Delaware and Ulster Railroad Company. In the clay tests, the cement was first mixed with clay in proportions of one part of clay to seven parts of cement, and the mixture then used as the cement in a 1:3 sand mortar. Blocks of this mortar over 8 inches thick were impermeable. Specimens 6 inches thick containing the same materials, but mixed with a 5 per cent. alum solution, were also impermeable when subjected to 40 lbs. water pressure. Other investigations were made on the effect of clay on tensile strength. The 1:7 mixture increased the strength; while 22½ per cent. of clay, a 2:7 mixture, and any alum tended to decrease it.

GAS AND ELECTRICITY IN SOUTH AFRICA.

Mr. Henry Hack's Impressions.

It may be remembered that in the "JOURNAL" for the 29th of December last it was announced that Mr. Henry Hack, who a few months previously had retired from the position of Chief Gas Engineer of the Birmingham Corporation, purposed leaving England for a three months' tour in South Africa. He has now returned, and is so greatly benefited by the sea voyages, the sunny climate visited, and the change of scene that for the present he intends to remain at Langley Gorse, Sutton Coldfield. When advising us of his safe arrival home, Mr. Hack sent the following observations on gas and electricity at the Cape.

A CORDIAL WELCOME TO THE CAPE.

Although gas-works were generally "conspicuous by their absence" in the chief towns of South Africa which I visited, I should like to make a few remarks relating to the Cape Town and District Gas Company. Mr. E. P. Reilly, the Engineer and General Manager of the Company, having learned from the "JOURNAL" that I was about to visit South Africa, looked for a time for my name among the advertised list of "arrivals" from England; and two days after I landed I was agreeably surprised to get a message from him on the 'phone at my hotel in Cape Town, welcoming me, and wishing to make an early call on me. This was promptly arranged. I do not remember having met Mr. Reilly before he went to the Cape; but I soon found in him a genial and welcome *confirer*, and gladly accepted his kind offer to take me about in his carriage, assist me in seeing the sights of Cape Town and the beauties of the various suburbs, and accompany me on a visit to the gas-works. I feel that I am very greatly indebted to him, busy man as he is, for devoting so much time and hospitality to me. A short description of the works will prove of interest to those of your readers who may not have previously had particulars relating to them.

THE OLD AND NEW GAS-WORKS.

The original works at Cape Town are situated about half way between the docks and the town, on the principal road from the former; but they are not at present used for gas making—the Company being able to produce more gas, at less cost, at their Woodstock works, about 2½ miles distant. At the Cape Town works there are seven beds of seven single retorts; the place being very much cramped. There are two holders of small capacity, one of which, at the time of my visit, was being re-crowned, and undergoing a general overhaul, entirely by the Company's own workmen. Gas, which is now made at Woodstock, is delivered into the Cape Town holders by two of Waller's exhausters, through a 16-inch and a 9-inch main; the latter being more of a reserve pipe. At Woodstock, where the works are not so cramped, there is a fine open purifying-house, containing six boxes, each 20 feet square, all on the "Green" cover system, an oxide floor above and a revivifying-floor below, with an electric hoist for filling the purifiers. The connecting-pipes lead up to rack-and-pinion valves, instead of an ordinary centre-valve, for, in their case, easier manipulation of gas from box to box. At these works there is a Dellwik-Fleischer "blue" water-gas plant, which is said to be working now very satisfactorily. At the time of my visit, a further four beds of through retorts, eight in a setting, were in progress; and I was told that, owing principally to labour not being of sufficiently intelligent kind for regenerative firing, the Engineer keeps to direct firing, rather than adopt the more scientific methods of heating by means of generators and recuperators so largely in vogue in modern gas-works. The results obtained are, however, in my opinion, good, considering that the coals come from England and have to cross the Equator, where Mr. Reilly suggests some of the gases from them pass out into mid-ocean through the ventilating-pipes in the ships. The usual production is 10,500 cubic feet of gas per ton, and including water gas it works out at something over 11,800 cubic feet.

The works are capable of producing about a million cubic feet of gas per day. Last year they made a total of 151,212,000 cubic feet, of which 22,984,000 cubic feet were from the Dellwik plant. The quantity of coal carbonized was 12,765 tons. It comes mainly from Northumberland, and, as may be imagined, costs a high figure when landed into the works. The retorts are drawn and charged (scoop charging) by Kaffirs, employed in gangs of three, as usual. They were a tall and fine set of men, and performed the operations quickly and well. They are paid 7s. 6d. each per shift, and labourers (Kaffirs) 4s. 6d. per day. A good mechanic or fitter earns on an average 12s. per day. With the exception of coke and tar, the residuals are useless. The Government bringing in guano bark kills sulphate of ammonia; and the cyanogen compounds in the gas are much too small in quantity to justify the erection of plant for their extraction and subsequent manipulation.

The plant at Woodstock is all comparatively new; and I noticed that a large battery condenser, of more than 200 square feet capacity, had been made on the works from an old gasholder. This I thought indicated no little ingenuity and forethought. Coals arrive in Clan Line steamers, and are then carted by road or rail into the works, where gangs of "boys"—i.e., coloured men of any age from twenty to sixty years—unload the vehicles

straight into the store. Most of these "boys" were of a good, strong, well-formed type, with plenty of bone and muscle. I may remark here that, as regards conduct of works and maintenance, the engineer of a South African gas-works labours under adverse conditions compared with one at home. So long as things go well, he bustles along; but as soon as a stoppage or accident occurs, he is often "up a tree," because he cannot readily purchase a valve or special pipe connection of any kind, through being so far away from contractors or from another gas-works from which to borrow what may be required. Invention, of which necessity is said to be mother, then comes into play. The nearest gas-works to Cape Town are those at Port Elizabeth, 800 miles off—four days' journey by rail, and boats only calling from there once a week.

FEATURES OF DISTRIBUTION.

The districts served by the Cape Town Gas Company cover a very great area—the two ends of the distributing mains being 13 miles apart; while the places supplied between these two ends include eight different municipalities and a road authority called the Cape Divisional Council. I learned that the Gas Company are on exceptionally good terms with all these local authorities. This cannot, perhaps, be always said as regards the old country. A mountainous district called the "Kloof" is supplied from the Cape Town holders, and some idea of the ascents may be gained from the fact that with a governor there set at 22-10ths on the sea level, the pressure increases to as much as 45-10ths to 48-10ths in the Kloof. Temperature plays an important part at midday; for about Christmas time the sun is "blazing" hot, rendering it impossible to keep one's hands on the holders for any length of time. In December last, the temperature recorded there was 168° Fahr., while in the evening it was down to 48°! The Sea Point district is lit with incandescent gas-lamps. Here, again, great variation of pressure occurs, though the district is divided into two portions—Green and Sea Point and High Level respectively; the latter being on the slopes of the famous "Lion's Head" and Signal Hill, and several streets reaching up to this summit. The pressure on the sea level being $4\frac{1}{2}$ inches from the works, is greatly increased when supplying the high levels.

QUALITY OF THE GAS.

The Cape Town Company have always been in the happy position of which Sir George Livesey was of late years so strong an advocate—they have enjoyed a "leave alone" policy. Their business is not regulated by any Act of Parliament, there are no restrictions with regard to sulphur compounds or any other impurities, or to pressures, candle power, or price, as to all of which the Company are left to act according to their own judgment as to what is desirable to secure a demand for their commodity. I noticed by the test-papers in the laboratory (records extending over long periods) that the gas sent out was free from sulphuretted hydrogen; and its illuminating power was stated to be about 14 to 15 candles. The light from the incandescent burners and generally was, in my opinion, most satisfactory; the candle power being, in fact, that which the coal would be expected to produce, the yield per ton being taken into account. Shop lighting by gas is said to be making good headway; but as every shop closes at 8 p.m., it has not yet come to be what one might call a brisk business.

THE COMPANY'S BUSINESS METHODS.

The pushing methods adopted by the Company were very apparent, for the very latest gas appliances are in stock at their show-rooms; and in the Mowbray district, one can see a fine specimen of high-pressure street lighting—certainly as good as one is accustomed to see in England. Mr. Reilly suggests that the reason for this is that the Mowbray Council pay for good light; and they get it. Within the past ten years, the Company appear to have had both "ups" and "downs." They introduced slot-meters in 1901, and now they can count users of these meters by the thousand. But the quantity of gas consumed per meter has, owing to depression in trade, become less, notwithstanding that the Company boom cooking and heating by gas, going so far as to adopt the practice in England of having the "lady demonstrator."

Just now, not only Cape Town and its suburbs but the whole of South Africa is in a state of abnormal depression. "Union" and "Federation" are largely talked of; and if either of these is definitely settled upon, South Africa should prosper more than ever it has done, and the gas industry again flourish, alongside of the supply of electricity, and result in a return to the payment of dividends by the Company. I was glad to learn from Mr. Reilly that he thought considerable improvement would be shown in the results by the Directors' report for last year, particulars for which he had already forwarded to them. I hope his Directors may see their way to consider a suggestion that I am going to make. Although generally a man of robust health, Mr. Reilly has had several drawbacks to it, by family losses, and more recently by the after poisonous effects of a blow he received from a native, with whom he had to severely deal for an unpardonable offence while at the gas-works.

THE COMPANY'S COMPETITOR.

The Municipality of Cape Town own the electric tramways, and have set up a large and up-to-date electrical station from which they supply current for electric lighting, which I learnt was being pushed, and was going ahead—a powerful competitor of the Gas

Company in the town area. Judging from this and the general appreciation of the South Africans for electric lighting, as is evidenced by this kind of illumination being in vogue exclusively in many of the large towns which I visited (but I may be wrong), I think the future profits of the Company will result mainly from the supply of gas to the important suburbs, with the supply of electricity in the hands of the Municipality; for much increase in the demand for gas in the town is hardly likely.

HARMONIOUS WORKING AMONG THE OFFICIALS.

Mr. Reilly introduced me to Mr. Gallagan, the Company's local Secretary, with whom I was very pleased to learn he worked most harmoniously; no friction or worry having at any time arisen in connection with their respective duties. Mr. Reilly also introduced me to the local Director, Mr. A. C. F. Gore, from whom I received great kindness and hospitality, and with whom I spent a pleasant hour or two. In the course of conversation, I happened to touch upon some matters of plant at the works. He promptly explained that his duties were only and entirely of an advisory character, being limited to matters of "policy," upon which he and Mr. Reilly consulted together as occasion required. In all other respects, he said, Mr. Reilly had quite a free hand; and his advice on engineering and the management of the works the Directors always accepted and solely relied upon. During our several days' interview, it was observable that Mr. Reilly had kept himself quite *au courant* with all matters "gaseous" which he could obtain from the "JOURNAL" and other technical sources. Still I sympathized with his wish that the Company should desire him to have a long holiday for a visit to England, and perhaps the Continent, every three or four years, to see for himself new and up-to-date gas installations and practice, and rub up against members of his profession. Opportunities for doing this are afforded by attending the meetings of the Institution of Gas Engineers. I intend these remarks to apply to all chiefs engaged at foreign gas undertakings.

A TOWN WITHOUT A GAS SUPPLY.

Among the places lighted entirely by electricity, I would particularly name Durban, Natal, a modern, clean and beautiful town, which I greatly admired. It has a native population of about 20,000, and 35,000 Europeans. It was the best example of electric lighting that came under my notice. I could scarcely credit that so large a place had no gas supply whatever. Through the kindness of Mr. Fletcher, formerly of Sutton Coldfield, the City Engineer and Surveyor, upon whom I naturally called, I was introduced to the ex-Mayor, Mr. Ellis Browne (he was Mayor at the time of Mr. Chamberlain's visit), who kindly drove me in his motor-car through the best parts of the town and suburbs. While with him, I touched upon the admirable lighting of the town and the absence of gas; asking him if he did not think that the inhabitants would appreciate a gas supply for heating, cooking, and power, even apart from lighting. His reply was: "Well, I have thought a good deal about the matter; but I can learn of no general desire for such a supply, and the Corporation are not likely to incur the cost of giving it by an undertaking put up out of the rates, in face of the great expenditure already incurred upon electric lighting, and they would certainly not grant a monopoly of a supply to a private company or firm. Moreover, the climate here is so different from that of England that the demand for gas for heating purposes would be insignificant." The charge for electricity is 8d. per unit to ordinary consumers, less 10 per cent. for monthly payments. Large supplies are given at a reduction; while the prices for special supplies to works, factories, &c., are all dealt with separately, according to circumstances.

Reverting to the Cape Company, I should state that the price of gas to ordinary consumers is 9s. per 1000 cubic feet, with 5 per cent. discount if paid within thirty days. This price has been reduced, for power only, as follows:—

Small quantities	7s. 6d. per 1000 cubic feet.
10,000 cubic feet and upwards, monthly,	7s. 6d. per 1000, less 10 per cent.
20,000 " " " "	7s. 6d. " " " 15 "
30,000 " " " "	7s. 6d. " " " 20 "
50,000 " " " "	7s. 6d. " " " 25 "

If payment is not made by the date specified on the invoice, the ordinary lighting rate of 9s. per 1000 cubic feet has to be paid.

A CLOSING TRIBUTE TO MR. REILLY.

I would conclude these notes by a further reference to Mr. Reilly's attention to me. Not resting satisfied with what he had already done for me, he met me on the day of my leaving for England, to bid me a hearty "Good-Bye" and "Bon Voyage;" and I therefore suggest that if any other gas man of position goes to Cape Town, he should remember that there is there a Mr. E. P. Reilly, and "make for him."

Association of Gas and Water Engineers of Austria-Hungary.—The last number to hand of the "Zeitschrift des Vereines der Gas und Wasserfachmänner in Oesterreich-Ungarn" contains a provisional announcement of the twenty-eighth annual general meeting of this Association. It will be held at Grätz from the 20th to the 23rd prox., under the presidency of Herr Josef Anzböck, Chief Inspector to the Imperial Continental Gas Association in Vienna. It is announced that a number of interesting papers have already been arranged for. The detailed programme will be published later.

THE CALORIFIC VALUE OF MIXED COAL AND WATER GAS.

By ARTHUR EDGCOMB BROWN.

In a letter to the "JOURNAL" for April 6, the writer pointed out that as long ago as 1906 a standard of calorific power was fixed by agreement for gas supplied by the Tottenham and Edmon-ton Gas Company. It is not necessary to give here the history of the negotiations which were entered into at the time of the passing through Parliament of the Company's Act, 1906. Suffice it to say that the illuminating power standard was reduced from 15 candles in the No. 1 "London" argand to 14 candles in the Carpenter burner; the sulphur restrictions, which had been the source of much trouble, were removed; and, finally, a calorific standard of 450 B.Th.U. net per cubic foot was fixed, with a penalty for non-compliance. As already stated, the last proviso was not inserted in the Act, but in an agreement.

It is well known that the Tottenham gas contains a large proportion of water gas. The results of the official tests for the last three years are, therefore, of considerable interest at the present time. The tests for calorific value were at first carried out with the Boys instrument at the gas-works—some three miles from the official testing-station. Subsequently a change was made to the Junkers calorimeter. Since when all tests have been performed at the latter place; the illuminating and calorific values being directly comparable, which was not the case under the first arrangement.

Table I. shows the values obtained during the first period.

TABLE I.

—	Illuminating Power. "Metropolitan" Argand No. 2.			Net Calorific Power. B.Th.U. per Cubic Foot.		
	Max.	Min.	Aver.	Max.	Min.	Aver.
4th quarter, 1906 .	15'54	14'52	15'12	528	484	500
1st " 1907 .	15 81	14'50	15'09	515	487	499
2nd " " .	16'27	14'90	15'54	506	481	492
3rd " " .	15'50	14'61	14 99	491	470	484
4th " " .	16'12	14'34	15'23	502	469	490

Table II. gives similar figures for the second period.

TABLE II.

—	Illuminating Power. "Metropolitan" Argand No. 2.			Net Calorific Power. B.Th.U. per Cubic Foot.		
	Max.	Min.	Aver.	Max.	Min.	Aver.
1st quarter, 1908 .	16'05	15'11	15'53	505	470	488
2nd " " .	15'91	14'51	15'28	506	477	490
3rd " " .	16'28	14'57	15'42	496	465	487
4th " " .	16'20	15'20	15'62	501	477	490
1st " 1909 .	15'85	14'37	15'18	506	473	485

While, generally speaking, the two values rise and fall together, it is nevertheless possible with mixed gas to have considerable variations from this rule, as may be clearly seen from Table III., which exhibits the results of a few tests selected from the period corresponding with Table II.

TABLE III.

Illuminating Power.	Net Calorific Power.	Illuminating Power.	Net Calorific Power.
16'16	500	15'55	481
15'20	501	14'51	482
15'45	491	15'21	477
14'57	489	14'37	475

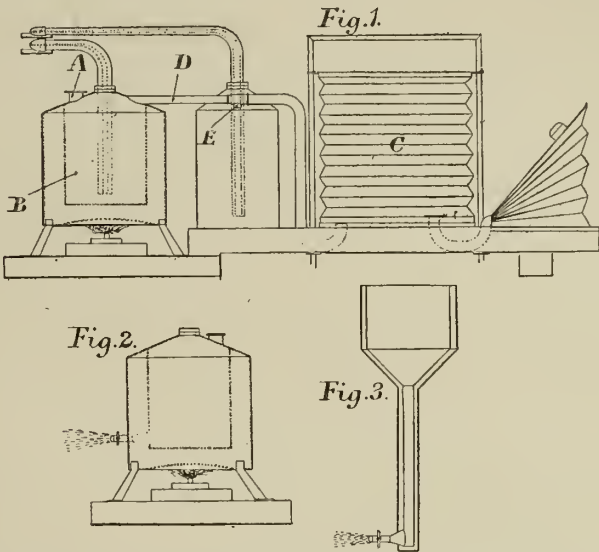
From a general survey of the above-quoted figures, it appears :

- 1—That the calorific value varied between 528 and 465 B.Th.U. (133.1 and 117.2 calories) net; the illuminating power lying between 16.28 and 14.34 candles.
- 2—That compliance with a standard of 125 calories net per cubic foot is not to be expected from a mixed 14-candle power gas, even when kept considerably above the statutory limit; but that a standard of 112½ calories net per cubic foot is, under present working conditions, quite capable of being maintained.
- 3—Finally, if in the perhaps not far-distant future illuminating power standards become obsolete, considerable difference of opinion is sure to arise as to the calorific standard which ought justly and fairly to be set up in each individual case. Seeing, however, that heat, and not luminosity in a given burner (never used by the public), is the all-important factor in present-day lighting, it is eminently desirable that the change should be speedily made; for existing statutory enactments cannot, in face of the varying composition of the gas supplied, secure that same uniformity in calorific value which they have of late years sought to establish in illuminating power.

UTILIZATION OF TAR AS FUEL.

The current number of "Le Gaz" contains the specification of a French patent taken out by M. Ramon Garzon, for a process for treating coal tar so as to allow of its utilization as fuel. It consists in the combination of a heated vessel, wherein the tar acquires the requisite fluidity to allow of its atomization, with a compressed air chamber in which this operation is performed. By means of a second atomizer, a certain quantity of water is conveyed to the mouth of the tar-sprayer, which makes it possible to effect the combustion of the tar under much better conditions than if the substance were used alone.

The plant required for the operation is shown in the accompanying illustration, in which fig. 1 is a general view (partly in section) of a group of appliances suitable for the purpose; fig. 2, an elevation of a tar-heating vessel, provided with a nozzle for the ejection of the tar in a continuous spray; and fig. 3, one in which the discharge of the tar is effected simply by its own gravity.



Before reaching the plant, the tar is raised nearly to boiling-point, and strained through close wire gauze, so as to remove from it any foreign matter calculated to obstruct the sprayers. It then enters the plant by the opening A in a receptacle B having a double bottom, which may be heated by any suitable means, such as a lamp, as in the diagram. Into the inner reservoir, containing the tar, passes a pipe of small diameter, one end of which dips to nearly the bottom of the vessel, while the other is at the point where the tar is to be burnt. On this end is mounted a sprayer, of a type suitable for injecting the tar into the furnace. The device to the right of the diagram is to enable sufficient air pressure to be obtained to drive the liquid tar up through the pipe in the reservoir to the sprayer at the requisite speed. A bellows is shown; but an air-pump of any kind, and worked in any way, may be substituted. In order to ensure greater regularity in the delivery of the compressed air, it is not sent direct on to the tar, but is conveyed into a special receptacle C, whence it is run through the small horizontal pipe D into the vessel B. The air-pipe is divided—one portion D delivering above the tar, and the other E passing into a water-tank, where it makes the water rise in the pipe shown, on the free end of which there is a suitable sprayer, placed as close as possible to the one used for tar. The combination of the two sprayers ensures good combustion of the tar. When used alone, it burns with a dark reddish suffocating flame; whereas the water causes it to burn with a white flame and clean smoke.

In starting the plant, a small wood fire is kindled in the furnace into which the tar is to be injected; and when once the tar has become ignited, the apparatus acts as an ordinary burner. In the illustration, the sprayers are shown parallel to each other, the jet being thrown horizontally. But they can also be fixed so as to produce vertical jets. Instead of injecting the tar and water in the form of spray, it may be desired to use the liquids in a stream. In this case, the sprayers would be replaced by appropriate nozzles; and air pressure can be dispensed with by placing the two receptacles at a convenient height above the orifices, so that the liquid may flow by gravitation. The water employed for spraying and injection can be heated to the requisite degree by some suitable means, in the same way as the tar; and electricity may be employed if economically available. Jet injectors can be used for atomizing the tar, with the aid of air or steam under pressure.

At St. Paul's Church, Colwyn Bay, on Monday last week, the wedding took place of Mr. James Taylor, Engineer and Manager of the Mossley Corporation Gas-Works, and Miss Laura Buckley, daughter of Mr. Thomas Buckley, of Colwyn Bay. After the ceremony, a reception was held by Mr. and Mrs. Buckley at the Hôtel Métropole, Colwyn Bay.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Stamford.

The old-world town of Stamford on the borders of Lincolnshire was visited by the members of the Eastern Counties Association for their half-yearly meeting—the forty-first—last Wednesday; an invitation having been extended to them by the Chairman (Mr. G. Edmonds) and Directors of the local Gas Company, and their Engineer and Manager (Mr. J. West).

The programme opened by the fulfilling of an engagement to lunch with Mr. Edmonds and his colleagues at the Stamford Hotel. Mr. Edmonds was in the chair; and he was supported by the President of the Association (Mr. C. F. Ruggles, of Leighton Buzzard), Mr. G. Higgs, J.P. (Vice-Chairman of the Company), Mr. J. Ringham, Mr. C. Atter (Town Clerk), and Mr. R. Ryman (Borough Surveyor). There were about 75 present at the luncheon; and among the visitors were noticed Mr. W. Ford, of Stockton (President of the North of England Association), and Mr. Charles Meiklejohn, of Rugby, who looked exceedingly well after his Mediterranean trip. After luncheon, the President said by request there were to be no speeches at this part of the proceedings; but he should feel wanting in duty and appreciation if he did not at once propose a hearty vote of thanks to the Chairman and Directors for their invitation, reception, and hospitality. The suggestion was heartily endorsed. The Chairman thanked the President for the kind manner in which the vote had been passed—remarking that the Directors of the Company were delighted to see the members of the Association in the town for the first time. Although the gas-works were so small as to be scarcely worth the attention of those of their guests who came from much larger places, yet he hoped the members would do the Company the honour of paying them a visit. He had pleasure in welcoming the Association on behalf of the Directors of the Company; and hoped the meeting would be successful and enjoyable.

VISIT TO THE GAS-WORKS.

Informally several of the members visited the gas-works; and they were not disappointed. They found everything in orderly condition; and all the evidence required that the Directors and the Engineer and Manager (Mr. J. West), within the limits of their opportunities, are intent on keeping up to modern practice on the technical side of their business. The latest thing claiming attention was found in the retort-house, where part of the old carbonizing plant has been removed, and a modern bench put up in its place. The scheme for this was entirely formulated by Mr. West; and it was carried out under his supervision—Mr. R. G. Shadbolt, of Grantham, being called in to make an examination of the proposals. As a result, he unhesitatingly endorsed Mr. West's plans. The retort-house practically consists of two houses; there being a partition with access from one to the other part. In the one part, there stand three settings of sevens, direct-fired; and in the other part, there formerly stood five settings of fives and one of fours, also direct-fired. This latter is the part of the house that has been remodelled, and the carbonizing plant brought up to the more scientific practices of the times. In considering the scheme, certain curtailing problems were encountered. It was found that the subterranean water would not allow the retort furnaces to be carried any great depth below the surface; and, on the other hand, a stage-floor was impracticable, owing to the lowness of the roof, and the walls not being of sufficient strength to justify raising the roof. So between these two limits the Engineer was restrained. The result was the adoption of shallow regenerators, with travelling platforms in front of the bench, a shortening of the height of the ascension and arch pipes, and the making of openings through the roof, primarily for the cleaning tools, and secondarily for securing better ventilation above the bench. The reason that Brooke's patent shallow regenerator system was adopted was that it gives a large amount of heating surface to the secondary air. The patents for this system are the property of Messrs. Robert Dempster and Sons, of Elland; and they were the Contractors for the new bench.

In passing, it may be mentioned that in making the excavation for the furnaces an old archway was found; but no one can trace or divine the purpose for which the archway formerly existed. It must remain one of the little unsolved problems of history. However, the new bench which was inspected comprises five settings of eight retorts, 22 in. by 16 in. by 10 feet, single ended, with, as remarked, Brooke's patent shallow regenerator system. Each arch has its own separate hydraulic main; and the mountings and equipment consist of 6-inch ascension, arch, and dip pipes, self-sealing mouthpieces, retort-house governor, and tar-tower. The seal on the dip-pipes can be regulated by means of a valve fixed to each hydraulic main, or by the tar-tower. A few words about Brooke's regenerator. In this system, the secondary air travels inside parallel rows of rectangular tubes, each 9 inches deep and 6 inches wide. The stay walls in the setting are continued down through the regenerator; and into these walls the secondary air tubes joint. By this arrangement, in conjunction with a set of dampers at the bottom of the regenerator, the draught between each stay wall can be regulated to a nicety, and the main draught be controlled by a main damper—that is to say,

it can be subdivided between the different stay walls, so as to obtain absolutely perfect heating. With this arrangement, the combustion chamber can be worked at lower heats than have been customary, as the heat, after leaving the combustion chamber, rises between each stay wall and descends between the pier wall and the outside retorts in a direct and simple manner, instead of undergoing any tortuous travel—that is to say, it simply goes straight up and down. One arrangement in connection with the setting was pointed to as a subsidiary but useful advantage and convenience. It is the introduction of an additional damper, which is used to curb the draught on the setting when the producer is being clinkered, and thus stop the inrush of cold air into the setting during the operation. When this is finished, this particular damper is again opened, and the original draught on the setting is restored—just as before clinkering started. It was learned from Mr. West that these settings have proved extremely economical in fuel; and inspection showed perfect heating. They were started about last September; and it is found that the maximum productive capacity of the settings is some 300,000 cubic feet, which means that about twice as much gas as formerly can be produced on the same ground space. The managers of small gas-works should make a note of the fact that there is the proof here that they are not confined to an antiquated carbonizing system, but that the benefits of more scientific operation are within their reach.

There is yet to be dealt with what was to most of the visitors the novel feature of the two travelling platforms. These are constructed in accordance with Scott and Dempster's patents—Mr. F. Scott, the Engineer and Manager of the Galashiels Gas-Works. The objects and advantages of the platforms are well demonstrated at Stamford. There is the open subway, and over it the two travelling platforms, which, running on ball-bearings, can be easily moved by hand into any position, and at all times leaving a taut wire-rope hand-rail over the parts of the subway not covered by the platforms. Here the conditions limited choice. A closed-in subway would have been impracticable, excepting at a prohibitive cost. The open subway, with movable platforms, was the most practical method of dealing with the situation. In addition to the advantages of attending to the furnaces in, to all intents and purposes, the open house, there are, it is seen, several considerations, in such houses as this one, favourable to the mode of construction and the use of the platform. The men engaged in clinkering operations are protected from scalding by steam generated by large pieces of clinker dropping into the ash-pan; and the clinkering operations can be performed in daylight. The Manager can see at a glance, too, that the subway is kept tidy and clean, and that there has been no tampering with the primary and secondary air dampers. He can also readily observe that water for feeding the fire-bars is being run into the tundishes, that there is no water running from the ash-pan, and that the air-inlets are free from ashes. Further, it enables the clinkers and ashes to be thrown up with the minimum trouble and labour. Free ventilation is also a consideration.

These are the features that particularly arrested the attention of the visitors; and the clean and solid character of the work carried out by the Contractors was the subject of remark by several.

THE BUSINESS MEETING.

The Business Meeting was held in the Town Hall—the President (Mr. C. F. Ruggles, of Leighton Buzzard) in the chair.

The HON. SECRETARY (Mr. Thos. A. Guyatt, of Ely) read the minutes of the meeting held at Leighton Buzzard last September; and they were confirmed.

ANNUAL REPORT AND ACCOUNTS.

The PRESIDENT said all the members had received copies of the annual report and accounts, and he assumed they would therefore take them as read.

The report outlined the proceedings of the year, and concluded as follows:—

The year commenced with a membership of 97. One member resigned, and one severed his connection with the Association under Rule 19. Two new members were elected; leaving a total membership at the end of the year of 97.

The accounts show that a balance of £31 10s. 5d. was brought forward, and subscriptions paid during the year amounted to £57 15s.—making a total of £89 5s. 5d. The expenditure was £84 19s. 3d., which leaves a balance of £4 6s. 2d., and three subscriptions outstanding.

In accordance with the resolution passed at the spring meeting, the Committee selected a design for the Presidents' medals; and these were presented at the autumn meeting to all the Past-Presidents who were present. [The expenditure shown in the accounts for the Presidents' medals amounted to £29 14s. 7d.]

The usefulness of the Commercial Sections has been fully maintained during the year; and the benefit of these informal meetings and discussions on commercial matters is generally acknowledged. The sectional reports show that the average attendance has been good, and that many important matters have been considered, to the mutual benefit of the undertakings represented.

Mr. J. W. AUCHTERLONIE (Cambridge) moved the adoption of the report and accounts, remarking that, though the latter had been somewhat depleted by unusual expenditure, he thought they would soon right themselves.

Mr. J. H. TROUGHTON (Newmarket) seconded the motion, observing that he had no doubt the accounts would look more flourishing next year.

The motion was unanimously carried.

NEW MEMBERS.

The Hon. SECRETARY read the names of the following gentlemen who had been nominated for membership: Mr. Joseph Hawksley, of Great Yarmouth; Mr. John Terrace, of Grimsby; Mr. Cyril Towers, of Brentwood; Mr. William Orme, of Woodbridge; and Mr. Augustine Davenport, of Mildenhall, Suffolk.

Mr. W. J. CARPENTER (Great Yarmouth), in proposing that these gentlemen be elected members, said he should like to impress upon them the importance of belonging to the Commercial Sections.

Mr. G. R. CASTERTON (Melton Mowbray) seconded the motion, which was unanimously passed.

GAS PRACTICE AT GREAT YARMOUTH.

Mr. W. J. CARPENTER (Great Yarmouth) read the paper on the above subject which is published on p. 216. In introducing it, he remarked that he thought the matters dealt with were such that a better discussion would take place by postponing the consideration of the paper until the next meeting, by which time the members would have had an opportunity of making comparisons with their own commercial methods and the results.

At the conclusion of the reading of the paper,

The PRESIDENT remarked upon its admirable character, and invited discussion.

Mr. R. G. SHADBOLT (Grantham) asked whether it would not be preferable to postpone the discussion. Although many of those present might be able to get up and talk generally round the subjects dealt with, he was of opinion they could not treat of the matters in the manner deserved, and they certainly could not draw comparisons until they had had the opportunity of consulting their own results. He thought there was much in Mr. Carpenter's suggestion that, if the paper was taken home by the members, and comparison made with their individual working, they would probably be able to show points where they compared well with him and equally in other respects they would no doubt find points where Mr. Carpenter led the way.

The PRESIDENT observed that, after all, he quite thought with Mr. Shadbolt it would be better to leave the discussion of the paper to the next meeting, which would, he believed, be held at Hull in September, in order to give an opportunity to make profitable comparison with their own working.

TAR FOR ROADS, DRIVES, YARDS, GARDEN PATHS, &c.

Mr. J. H. TROUGHTON (Newmarket) read a paper on the above subject. With a report of the discussion, it appears on p. 220.

VOTES OF THANKS.

Mr. R. G. SHADBOLT proposed that a hearty vote of thanks be accorded to the readers of the papers. Without being at all invidious, he might particularly call the attention of the members to the paper submitted by Mr. Carpenter, and for the excellent manner in which it had been got up. This alone was worthy of their satisfaction and appreciation. It showed the amount of time and work Mr. Carpenter had put into its preparation. The paper that Mr. Troughton had read was valuable for its practical suggestion. No doubt if the President had desired to prolong the discussion, the members might have gone on talking on this subject to dinner time, as most of them had had experience of the tar painting of roads. There was one little point he should like to mention; and it was that the authorities at Grantham tarred all the asphalt paths once a year for hygienic purposes as much as for extending the life of the paths.

Mr. W. H. MAINWARING (Lincoln) seconded the motion, which was unanimously agreed to.

Mr. CARPENTER, in reply, said both Mr. Troughton and himself thanked the members for the recognition of their little efforts that day. They undertook to do something, and they worked as hard as possible to make it interesting under the circumstances. He should make a point of being present at the Hull meeting; and he hoped as many members as possible would make comparisons in the meantime, so that there might be a profitable discussion.

ELECTION OF OFFICERS.

Mr. JOHN CARTER (Lincoln) said it was his duty to propose a successor to Mr. Ruggles in the dignified position of President. He was quite certain when he named for the position their friend, Mr. John Young, of Hull, he was naming one who would be equal to their utmost requirements.

Mr. J. S. DOUGALL (Boston) seconded the motion.

The PRESIDENT said the motion did not need any support from him; but he should like to say that they were all delighted when Mr. Young consented to take the presidency later in the year, and the members, he was certain, would be very pleased to visit Hull.

The motion was cordially passed.

Mr. YOUNG, in acknowledgment, said he was exceedingly grateful to the members for having made him President-elect. It was gratifying to him to know that he was succeeding to a position

that had been occupied by an old master of his own—Mr. J. G. Hawkins. All possible would be done by him (Mr. Young) to uphold the dignity of the office during his year, and add to the usefulness of the Association.

Mr. H. WIMHURST (Sleaford) was pleased to say the choice for the vice-presidency had fallen upon Mr. Auchterlonie, of Cambridge. He had pleasure in proposing his election to the position. In due course he would worthily follow Mr. Young.

Mr. S. SHADBOLT (Kirkby-in-Ashfield), in seconding, said the members had the greatest confidence in Mr. Auchterlonie. He had shown much interest in the ordinary meetings and in those of the Commercial Sections.

The motion was cordially passed.

Mr. AUCHTERLONIE, in acknowledgment, thanked the members for the honour conferred upon him. It was not, he said, without a considerable amount of misgiving that he consented to accept the office, as he was aware of his own shortcomings, one of which was that he had no talent for public speaking.

Mr. YOUNG proposed the re-election of the Hon. Secretary and Treasurer. He remarked that he was sure the Association was well served in its secretarial work by their friend Mr. Guyatt. If he again accepted the office, the Association would be under a further debt of gratitude to him.

Mr. J. B. FENWICK (Retford) seconded, remarking that all the members appreciated the services rendered to the Association by Mr. Guyatt.

The motion was heartily agreed to.

Mr. GUYATT having returned thanks,

Mr. JOHN BARTON (Peterborough) proposed that Mr. E. G. Smithard, of King's Lynn, and Mr. H. Duesbury, of Hertford, be elected members of the Committee.

Mr. AUCHTERLONIE seconded the proposition, and it was adopted.

Mr. AUCHTERLONIE moved, and Mr. W. B. PALMER seconded, the re-appointment of the Auditors (Messrs. H. Wimhurst and T. Dann); and this was agreed to.

THE LIVESLEY MEMORIAL FUND.

Mr. BARTON asked whether anything had been done by the Committee in the way of subscribing to the Sir George Livesley Memorial Fund. He knew the finances of the Association were low just now; but they would recover in a short time. Did the Committee propose to do anything in this matter?

The PRESIDENT remarked that the Livesley Memorial Fund had not been forgotten. It was, as a matter of fact, brought forward that morning at the meeting of the Committee; but it was thought, as the matter was not put on the agenda for the meeting, it would be better to bring it up for consideration at the meeting in Hull.

Mr. R. G. SHADBOLT: Supposing the fund is then closed?

The PRESIDENT: It will not be closed. Money can be taken at any time for the purpose of the fund.

FROM THE NORTH.

Mr. W. FORD (Stockton) said he wished to tender the President and Committee the sincere thanks of himself and the members of the North of England Association for the personal invitation to him to attend the meeting that day. It had given him the greatest pleasure to come among the members, and make new acquaintances and revive those acquaintances that had been somewhat subdued the last few years owing to his own ill-health. He was glad to have been able to come to one meeting of the Association before his time expired as President of the North of England Association; and he should be delighted if the President or any of the members could come to the meeting of his own Association at Newcastle [next Saturday]. There would be a hearty welcome for them. He also desired to thank the Chairman and Directors of the Stamford Gas Company for their kind invitation to him to be present at their luncheon.

The PRESIDENT said it was a great pleasure to him, as it was to the members generally, to have Mr. Ford with them that day. He was personally obliged to Mr. Ford for the invitation to Newcastle; but he was sorry to say he would be unable to be there. However, they hoped to see Mr. Ford among them many times in the future.

THE NEXT MEETING.

Mr. YOUNG proposed that the next meeting of the Association be held at Hull. The Directors of the British Gaslight Company would be exceedingly pleased to receive the members there. He hoped Hull would not be considered too far or out of the way for the members, and that they would have a large attendance. As a personal compliment to himself, he should like to have a record gathering.

Mr. TROUGHTON seconded the proposition; observing that it was his pleasure some years ago, as the then Hon. Secretary, to arrange a visit to Mr. Young's former works at Norwich. The members spent a pleasant time then; and he could promise that they would all spend a happy time in going to Hull.

Mr. WIMHURST suggested that, as the Association would attain its majority with the meeting at Hull, the Committee should take into consideration the question of doing something to celebrate the event.

THANKS TO PRESIDENT AND OFFICERS.

Mr. R. G. SHADBOLT proposed a vote of thanks to the President, officers, and members of the Committee for the way in which they had discharged their duties during the past year. Their President

had acquitted himself in the most courteous and amiable manner; and he had given full proof of his realization of the responsibilities of the office. As to Mr. Guyatt, no man could work with greater pains; and this was the eighth time he had taken the office of Hon. Secretary and Treasurer.

Mr. W. J. CARPENTER seconded the motion, which was heartily approved.

The PRESIDENT, in responding for all included in the vote, said that, so far as he was personally concerned, he did not deserve all that had fallen from the lips of Mr. Shadbolt. If, however, he had fulfilled the desires and wishes of the members, he was very pleased. He acknowledged the assistance he had received from their worthy Secretary and the Committee, as well as the kindness of the members in being blind to his own shortcomings.

This concluded the business proceedings.

DINNER.

In the evening dinner was served at the "George" Hotel. Probably some eighty sat down under the presidency of Mr. Ruggles. The Mayor of Stamford and the Chairman and Directors of the Gas Company were among the guests. The usual toast list was gone through; and music was interposed between the speeches. It was altogether a most enjoyable evening.

A DAY'S OUTING—FIRE-CLAY RETORT MANUFACTURE.

On Thursday, the weather was brilliantly fine, and several of the members enjoyed a visit that had been arranged to the fire-clay works of Messrs. Williamson, Cliff, Limited, who were through their processes able to impart both interest and instruction to the members. They were received by the Managing-Director of the firm; and, under his guidance, they thoroughly examined material, plant, and processes. Three grades of raw material were seen. They range from a fire-clay not far removed from 2 of silica to 1 of alumina to a silicious fire-clay containing 90 per cent. of silica. The firm have also a large quantity of ganister available, containing about 94 per cent. of silica. The information was given that there are no alkalis in the clays, or only traces; but they carry 1 to 3 per cent. of iron. Various grades of fire-brick and silica bricks are manufactured at these works for different purposes. The 90 per cent. silica clay is claimed as an ideal composition for the manufacture of the top or dome bricks for segmental retorts; and a large quantity of these were seen in the process of making. The clays, it was stated, will stand about 3300° Fahr., and are regularly supplied to work at 3000° Fahr.

Three methods of retort manufacture were explained: (1) The hand-made process, or the Newcastle style of building retorts in lifts of from 12 to 20 inches—an operation remarkable for the fewness and simple character of the tools used, and a method obtaining most extensively in this country in the Stourbridge district, where Mr. Albert Cliff said the clayworkers do this work with a skill and a finish almost equal to machine manufacture. By a second method, it was shown how retorts are made by hand; but the entire length is, with the aid of a few mechanical appliances, made without joint and at one operation. Long drums are clamped together to the required length; and the clay is built to fixed collars, fastened at each end, when laid in a horizontal position. They are spoked and set up vertically; and the inside cores or drums are withdrawn. This is a method which our guide said would widely prevail among the large hand retort makers, if once cultivated. It is a quicker process than No. 1. A jointless, perfectly straight, and even retort can be so obtained in the hands of a skilful and proper man. Method No. 3 was an explanation of the manufacture of machine-made retorts. Speaking as a manufacturer, Mr. Cliff preferred machine-made retorts on account of the speed at which it is possible to get an immense tonnage out of hand. On the other hand, he realizes that if gas engineers persist in their call for improved manufacture, it will probably move in the direction of clay working by hand.

Inviting the engineers to inspect a large quantity of finished retorts in the yard, special attention was drawn to one which had been made purposely for the occasion. This was a single retort, perfectly sound, of A section, the flat and sides of which had been made of aluminous clay and the dome or top containing 85 per cent. of silica. The experiment was to graduate and combine the two classes of material; and by mixtures and manipulation, to produce a retort calculated to remain stationary, to be gas-tight, to be a good heat conductor, to take extreme punishment if required, and generally to see if, in one whole piece, it was possible to make and fire at a high temperature and cool rapidly, and without fracture, a retort of more aluminous clay for the parts in contact with the stoking and charging apparatus, with a material heavy in silica for the top. This, it was learned, had been successfully accomplished; and experiments on these lines would be continued. The sample seen was strong, and would no doubt carry well.

Having gone thus far on the question of retort manufacture, Mr. Cliff was questioned on the subject of the discussion raised in the technical gas press by Mr. Bywater's Institution paper on fire-brick material and retort manufacture. He stated that this had encouraged the Editor of the "British Clayworker" to secure a writer said to be familiar with the processes of German retort manufacture to contribute some information on the subject. Two articles were contributed ostensibly for the instruction of British makers. If, in Mr. Cliff's view, these articles are an accurate survey of processes obtaining in German factories, they will strike English clayworkers as astonishingly belated contributions; and

in many respects so hopelessly preposterous as to hardly merit challenge. The articles in many points were not credible—at least by Mr. Cliff—from any point of view. Another question referred to the work of the Committee appointed for the standardization of British fire-clays. The trend of the proposed work was considered by Mr. Cliff to be all right. Fire-brick people, he said, could hardly complain if men assist them with the complex problems involved in their work, and investigate them with knowledge and good sense. "Ignorance can never prevail over intelligence for long; and so light from any quarter is not to be spurned." Mr. Cliff said he did not believe in rushing to extremes; and it was rubbish to talk disparagingly of the rule-of-thumb methods which had no doubt in too full a measure obtained in an old manufacturing country like ours. Rule-of-thumb methods are a splendid legacy from the skilled workers of the past. They are the best ideas—and live because they are the best—which have filtered down through generation upon generation, and withstood the supreme test of trial and experience. It is equally stupid to have neglected chemistry. It is indispensable, and teaches us so much that we cannot discern without it. Yet we are called upon to remember that chemistry in clays is not an infallible guide; and there are subtle things about fire-clays which are likely still to baulk and elude our most accomplished chemists. However, the most constant thing in the world is change; and the manufacture of clay products is in a state of transition.

On these and many other points, the visitors gained knowledge; and on their behalf the kindness of the firm was suitably acknowledged by Mr. Ruggles.

THE FIRM'S HOSPITALITY.

The party were subsequently entertained by the firm at luncheon at the Crown Hotel. The President occupied the chair, and was supported by the Mayor of Stamford (Mr. T. S. Duncomb) and other leading residents. At the conclusion of the repast, the President said there would be only one toast, expressing the hearty thanks of the Association to Messrs. Williamson, Cliff, Limited. The members had all spent a delightful morning, and Mr. Cliff had been good enough to take them round and explain many things which were not only instructive, but of great value regarding fire-bricks and other products daily used in gas-works. From what he had told them, they had gleaned information upon securing the best material at the lowest expenditure. Mr. R. G. Shadbolt proposed the toast, and thanked the firm for their courtesy and hospitality. He said they had given the members a valuable object-lesson in showing how those who were not actually engaged in the production of gas assisted the industry by endeavouring to solve problems which affected its welfare and concerned every gas director and manager. In Mr. Cliff, the firm had one of the greatest assets such an undertaking could wish for; and he had admirably explained the difficulties that had to be attacked, and were being closely studied. Thus higher and better results were to be attained in the industry represented by the Association. He wished the firm all possible success, and trusted they would continue the important work of manufacturing and perfecting fire-resisting materials. Mr. Cliff, in acknowledging the toast, which was cordially honoured, said there was a special fitness in asking the members of the Association, as gas managers, to inspect the works, for there was a great deal of common ground between them and the firm he represented. All were interested in fire-brick manufacture and the distillation of coal—endeavouring to extract from the latter its utmost value. This was a problem that had to be faced by fire-brick people all over the country. No less than 14 million tons of coal were annually used in this way, and at present there was a vast amount of waste. It would be better for fire-brick manufacturers if they could combine for their mutual information, as did the members of the Association, and often rub shoulders. They would then go back to make even more successful efforts. Mr. Williamson also replied, and expressed the hope that the firm would in the near future, as the result of Mr. Cliff's endeavours, be even more capable than they were now of meeting the requirements of those engaged in the gas industry.

In the afternoon, Burghley House was visited; and there was a drive through the beautiful grounds. For this treat, there was indebtedness to the Marquis of Exeter.

Last Wednesday, at Crossgates Wesleyan Chapel, Leeds, the marriage was solemnized of Mr. Joseph Clayton, a Director of Messrs. Clayton, Son, and Co., and Miss Fanny Louise Cowell, youngest daughter of Mr. Charles Cowell. Among the presents was a silver tea service and tray from the workmen in the bridegroom's firm.

At the monthly ballot last Tuesday, Mr. Frank H. Jones (Messrs. H. E. Jones and Son), of Palace Chambers, Westminster, was elected a member of the Institution of Civil Engineers. On the same occasion, it was announced that Mr. H. G. F. Barham, of the Korean Water-Works, had been transferred from the class of associate members to that of members.

Mr. Charles Hussey, the Chairman of the Croydon Gas Company, has been elected representative of the Central Ward on the Croydon Town Council, in succession to the Mayor (Mr. J. E. Fox), who has been elected to the aldermanic bench. Mr. Julius Wilkinson, a Socialist, was Mr. Hussey's opponent; and this makes his fourth unsuccessful attempt to get into the Council since he resigned from it two years ago.

INSTITUTION OF MUNICIPAL ENGINEERS.

Last Saturday, a numerously attended meeting of this young Institution was held at the Building Trades Exhibition, which is now taking place in Olympia. The chair was occupied by the President (Mr. J. T. Pegge, of Durham); and at the commencement of the proceedings there was a short discussion on the question of examinations under one of the bye-laws, which reads as follows: "The Council shall cause examinations, open respectively to members and students, to be held in all the chief branches of the municipal engineering profession, and shall frame and publish rules regulating admission to, and the conduct of, such examinations, and shall award certificates or diplomas to those successful in such examinations." A Committee had been appointed to go into the matter; and they had drafted up a scheme, which it was thought might suggest some workable plan to the members. When the question was brought up, however, the President suggested that it should be deferred for another six months, and that in the meantime members should communicate further with the Council on the subject. Mr. H. Cubitt, as a member of the Committee, said the scheme was drafted with the idea of getting the views of the members. Considerable differences of opinion existed on the point. Other Associations had been perhaps twenty years in arriving at a satisfactory system of examinations; and it would not do for the Institution to act in a hurry. This was the view of the matter unanimously taken by the members; and accordingly the further consideration of the question was deferred for six months.

Subsequently three papers were submitted to the meeting; and, following the rule laid down at the first meeting of the Institution, these were taken as read—printed copies being in the hands of the members. In this way, the whole of the time at the disposal of the meeting was available for discussion; and full advantage was taken of it by those present. The titles and authors of the three papers were: "Essential Formulæ in Structural Engineering," by Mr. Horace Cubitt; "The Practical Sterilization of Water and of Sewage Effluents," by Mr. H. C. H. Shenton; and "The Design and Requirements of Electric Power Works," by Mr. Horace Boot.

At the adjournment, the members were invited to partake of light refreshments with Mr. H. Greville Montgomery, M.P., the organizer of the exhibition, who had arranged to accompany the members at the close of the meeting on a tour of inspection of the countless exhibits which are on view in the hall. A notice of these exhibits, in so far as they are of direct interest to readers of the "JOURNAL," will be found in another part of to-day's issue.

KEITH HIGH-PRESSURE GAS SYSTEM
FOR LIGHTING AND HEATING.

At the Meeting of the Incorporated Association of London Dyers and Cleaners, held at the Dyers' Hall, on Monday last week, a paper on the above subject was read by Mr. H. A. Taylor Stoakes, of the James Keith and Blackman Company.

The author began by expressing his pleasure in submitting to the audience a brief description of the Keith high-pressure gas system, and explaining its application to the class of works in which they were specially interested, where, it was considered, gas-heated irons should be more generally adopted. No doubt the cost of gas in proportion to the benefits derived from its use had, he said, an important bearing on the profitable working of the allied laundry undertakings, where gas-heated machines were so largely used and good and abundant light was such a necessity. Those who employed gas in the combined businesses, and whose knowledge had been derived from costly experience, would, he thought, readily admit this proposition, and confess that they had spent to no purpose large sums of money upon governors, waste-preventers, and gas-saving devices of every description. They must not, however, overlook the fact that the details of their business, including the control of their gas, were carried out by women; and therefore it was necessary that any apparatus under their control should, as far as possible, be positive in its action. Nothing should be left to chance.

Coming to the practical part of his subject, the author remarked that when the incandescent gas-burner was first introduced, though it was a great advance on what had been previously accomplished, there was obviously a great opening for improvements. The burner was constructed to suit the average gas pressures in use, which might range from 1½ up to 4 inches. If the highest efficiency could have been obtained at the former pressure, the solution of the problem would have been easy; but it was otherwise. The firm with which he was connected, among others, experimented in this direction, and introduced the Keith light, working at a pressure of 8 to 10 inches. The velocity of the gas at the burner nipple was found to be sufficient at this pressure to take up the requisite quantity of air to ensure ideal combustion. The firm were still supplying lighting plants working at the pressures named, and giving upwards of 30 candles per cubic foot of gas consumed per hour. For some purposes, they recommended these plants as most suitable; but for the class of work under consideration, their latest type of apparatus, put on the market about a year ago, was more efficient and economical. By means of the improve-

ments effected, the efficiency obtained from their burners was upwards of 60 candles per cubic foot of gas per hour. Though they were now working at 4 inches of mercury, equal to 54 inches of water, the pressure on the mantle of the latest type of burner was no greater than it was in the original type—being considerably reduced in its passage through the heating chamber at the bottom of the burner-tube, which was an essential and important feature of the firm's latest pattern of inverted burner lamp. The author described the heater, and then proceeded to deal with the fittings suitable for indoor and outdoor lighting. He stated that they range for the former from 60 to 300 candle power, and for the latter from 500 to 1500 candle power. A 120-candle lamp consumes 2 cubic feet of gas per hour; a 300-candle lamp, 5 cubic feet; a 500-candle lamp, 8½ cubic feet; and a 1500-candle lamp, 25 cubic feet.

Passing on to the question of cost, Mr. Stoakes cautioned his audience against being misled by statements appearing in the papers about the wonderful advances now being made in electric lighting, whereby gas is to be superseded in the near future. He assured them that these statements are at variance with known facts, and that gas is going ahead by leaps and bounds. He stated that, taking the average costs, the Keith light is as much cheaper than the best electric lamp as the ordinary incandescent lamp is than the old flat-flame burner. In support of this assertion, he gave the following figures, taking gas at 3s. per 1000 cubic feet, electricity at 3d. per unit, and the amount of light required at 10,000-candle power:

	Cost per Hour.
Carbon filament electric lamp	10s. od.
Osram lamps	3 1½
Do., with transformer	2 6
Ordinary incandescent gas	2 0
Keith light (latest type).	0 6

Mr. Stoakes asked his audience if it was worth while to generate electricity at the present time, with so small a prospect of resultant economy. He explained that the figures he had given were based on the results claimed by the manufacturers—viz., for Osram lamps, 1-candle power for 1½ watts per hour on high voltage, and 1-candle power per watt per hour with a transformer; 15 candles per cubic foot per hour for ordinary incandescent gas-burners; and 60 candles per cubic foot per hour for the Keith burners, as tested by many authorities. With regard to maintenance, a metallic filament lamp went out of action at a cost of at least 3s. 6d.; but quite a considerable number of gas-mantles might be replaced for this money.

The next subject considered was the heating of irons; and the author pointed out that where economy is any object, the use of electricity for this purpose is entirely precluded. Referring to the Keith gas-iron, he said the key-note of its design is simplicity. Bearing in mind that it would be entirely under female control, a special locking device had been arranged, whereby when once the proper mixture of gas and air had been obtained, the air adjustment could be fixed in position, safe from any interference by nervous and hasty fingers. Though this necessary safeguard had been arranged, the burner body could still be taken to pieces for cleaning purposes without special tools. In the construction of the iron itself, special care had been devoted to avoid lighting-back, and to secure an even distribution of heat—in fact, to secure the maximum efficiency with the least possible consumption of gas.

Mr. Stoakes closed this portion of his paper by laying stress upon the fact that every type of gas-heated machine can be fitted with the Keith patent burners with the most economical results, and with little alteration to the apparatus itself. When the gas-services are properly arranged, all the lighting and heating appliances can be supplied from the same compressor without duplicating the mains; and, as all secondary air supplies are dispensed with, great simplification of arrangement results, allowing more working space, and reducing leakage to a minimum.

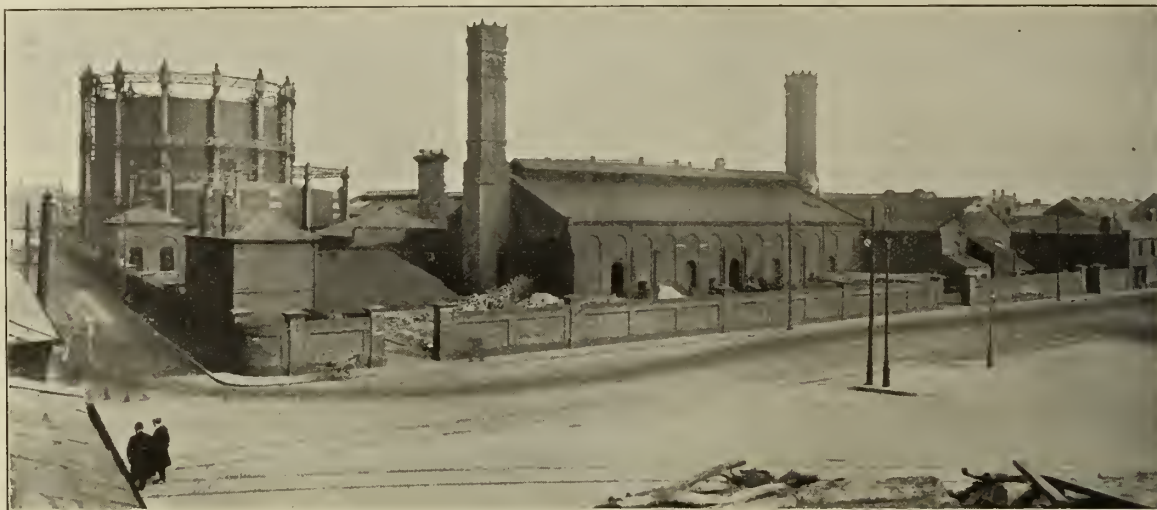
Having arranged for the lighting and heating fittings, the next question considered was that of the compressing plant; and Mr. Stoakes stated that for the special purposes of his audience the firm's water-driven machines would be unsuitable, on account of the low pressure obtainable, and that it would be necessary to instal a patent rotary compressor plant. These machines were, he said, made in sizes capable of dealing with the lighting of a town or meeting the requirements of the smallest laundry with only about half-a-dozen hand-irons in use. He gave details of the compressors, and said they were arranged either for being driven direct from live shafting, or coupled to a small gas-engine or an electric motor. He added that in most establishments it was customary to depend entirely upon one compressor; but, of course, plant in duplicate was desirable to obviate anxiety. Moreover, by duplication, the machine could receive proper attention when required. Mr. Stoakes said a good arrangement was to have a belt-driven compressor for general running, and one electrically or gas-engine driven to take up the work when the main engine was not required to be run.

In conclusion, the author pointed out that people who installed Keith plant must not assume that it would run on by itself for ever. Yet this was a mistake frequently made; and it caused vexation both to the user and to the maker. Every installation required regular and systematic attention. Maintenance was needed; but he claimed that in the Keith system it was reduced to a minimum. He impressed upon his audience the necessity, in order to reap the full advantage of the system in dye-works, to classify the work; but he assured them that, with it installed, there was absolute security against waste.

GAS PRACTICE AT GREAT YARMOUTH.

By W. J. CARPENTER, of Great Yarmouth.

[A Paper read before the Eastern Counties Gas Managers' Association.]



The Works from the Boundary Road.

In order to be as comprehensive as possible, I purpose to briefly describe or outline the history of the Great Yarmouth Company, with works' items to date, and to follow with some of the most interesting and important commercial matters. I am afraid it will be said that little or no originality will be evidenced in the methods about to be described, or particular merit exhibited in some of the figures hereinafter to be described. The difficulty of initiative is greater perhaps than most; and although some of my subjects may be laboured, you may be assured of every care having been exercised in order to present accurate statements.

The gas lighting of Great Yarmouth was inaugurated in the year 1824, when a local worthy, Mr. G. S. Palmer, contracted with the Paving Commissioners to supply the town with the new illuminant of those days. It was not until twenty-one years later (1845) that a Company was formed for the purpose, quaint as it appears to-day, of carrying out the execution of existing contracts or arrangements with the Commissioners under the Act of the 50th year of King George III. (1810), and for making and executing any similar contracts or arrangements with the Commissioners, for lighting the streets, highways, lanes, rows, passages, &c., with coal gas. In 1863, the Company was incorporated by Special Act of Parliament, and from that time onward much progress was made in the development of gas lighting, which proceeded with the continuous enlargement of the works, purchase of land, and other important matters.

PLANT AT THE WORKS.

With these few preliminary remarks, I propose to shortly describe the existing works and the arrangements of the Great Yarmouth Company for supplying the town with gas in all its up-to-date methods of application. The coal used is that of the best Durham varieties. For many years it was shipped in sailing vessels of small tonnage; the unloading being effected by the time-honoured "whipping" method, delivered into hundred-weight bags, and carted to the store. Mechanical contrivances have been adopted in recent years, not only to cheapen the cost of the delivery and storing, but to expedite the discharge of the collier steamers now employed in freighting the coal from the collieries. Hydraulic power now takes the place of hand labour, and vehicles specially designed to receive the coal-skips are provided for the service. The saving in working amounts to £50 for each 1000 tons of coal delivered to the Company's stores. Coal-breakers, elevators, and conveyors are utilized in the storing of the coal; and compressed air machinery does the further work required in its carbonization. The general arrangement of the works provides for a daily output quite equal to present requirements, with a good reserve available for anticipated needs.

The gas is produced in retorts regeneratively fired; and the hydraulic mains are provided with liquor seals and tar-towers. Retort-house governors are now being brought into use. The make of gas per ton of coal carbonized averages slightly over 11,000 cubic feet. A tar-extractor follows the condenser and exhausters; and two tower scrubbers are employed with a rotary washer. One of these tower scrubbers is occasionally used for the reduction of naphthalene present in the gas; and the rotary machine is also used in part for dealing with naphthalene. It has been found that if a fair quantity of accumulated washed-out tar is allowed to remain in the mechanically driven washer, considerably less oil is needed in washing to keep the naphthalene within reasonable limits. The oil employed is carefully distilled strained anthracene oil obtained from the tar-works belonging to the Company.

The purification of the gas is brought about by oxide and lime, and finally a carburettor is used through which a fair proportion of the outgoing gas is made to pass. Ordinary paraffin oil only is employed. This latter process has been in use for some years with good results.

DISTRIBUTION.

It was not until 1889 that steps were taken to actively push the sale of gas by means of the gas-cooker, to be followed a few years later by the introduction of the automatic gas-meter system. Hitherto the distribution arrangements had been much in common with those usually obtaining in many contemporary concerns, both in and out of the district of East Anglia—that is to say, no responsibility was undertaken beyond the fixing



A General View of the Interior of the Works.

of the meter on the consumer's premises, the local gas-fitter doing all required therefrom. Alike to the experience of others, the supply of gas appliances of all kinds and modern construction, requiring trained intelligence in fixing and methodical attention when in use, has entirely changed the old order of things, until the Company is now equipped with its various departments of gas-fitting in all its branches, maintenance and repairs of cookers, the maintenance and upkeep of incandescent burners, hiring of outside lamps, &c. Competition has done much to bring about this most desirable change in the interest of the consumers; and the Company's position has shown further strength in its new condition of things.

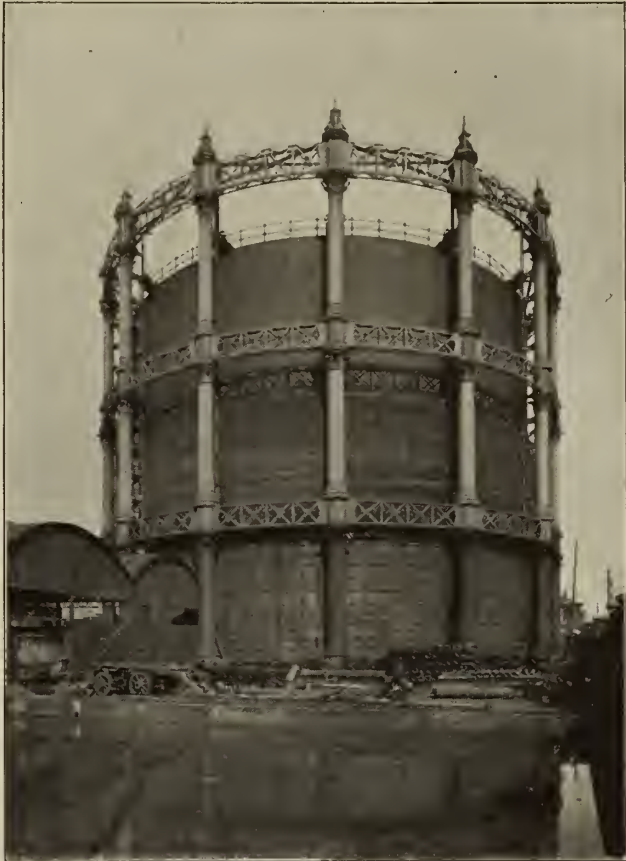
Overlooking the antiquated, and perhaps it may be truly said autocratic, conditions at one time prevailing in gas administration, and adopting ideas in line with the circumstances as they are found to-day, let it suffice when I say that the business of sales and distribution is carried out quite on the lines of shop-keeping as observed in successful commercial undertakings. Every attention is devoted to the question of obtaining new

consumers, and to their wants when once on the books of the Company. Suitable arrangements have been provided so that the business may be conducted with comfort to the customers and credit to the concern. In the establishment of the gas-fitting department, the importance of having well-educated and properly addressed fitters, led to the adoption of the apprenticeship system, which was started some four years ago. [By the way, it

than by that of the appliances sold. All the various appliances are fixed free, irrespective of length of service, similar obstacle, or hindrance. The coin-meter has become very popular in Great Yarmouth, until at the moment there are over 3000 in use; and the system provides a most important factor and ever increasing part of the total revenue of the Company. Practically no limit is determined



Looking through the Works.



One of the Gasholders.

is a pity that apprenticeship is not in common practice throughout the country; the advantages of it to the industries, and to master and youth alike, being paramount.] Gas appliances of all approved kinds are hired at nominal rates, or sold at cost price. In some instances, it has been found necessary to accept even less than cost price, to secure business in these competitive days. The object is to make a profit out of the gas used, rather

respecting the requirements of the slot-meter consumer. He may have as many lights as desired; and a specially-constructed cooker, gas-fire, or hot-plate griller, &c., with boiling rings, are provided free. It is found necessary in Great Yarmouth to provide a large size slot-cooker with hot-plates of good dimensions, to suit the exceptional requirements of the lodging-house keepers of this seaside resort.

MONTHLY AVERAGE HOURLY OUTPUT OF GAS.

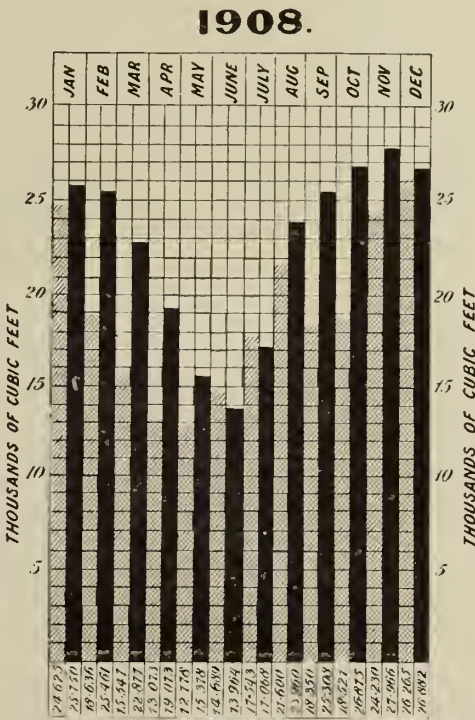
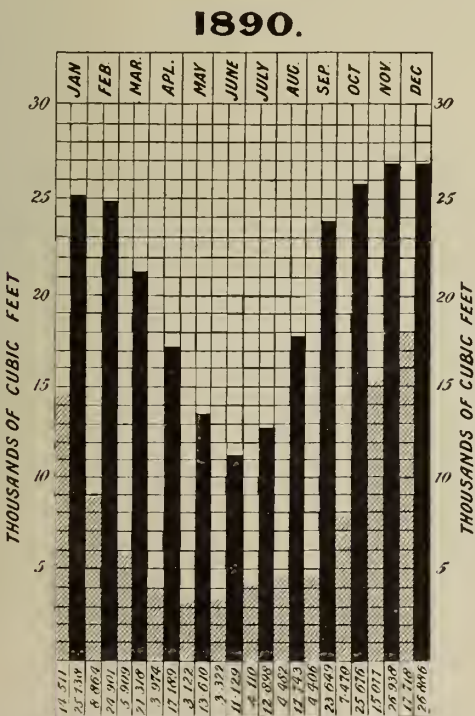


Diagram showing the Levelling of the Load-Line due to the Increase in Day Consumption. The Figures at the Foot of each Column are those of the Average Hourly Output.

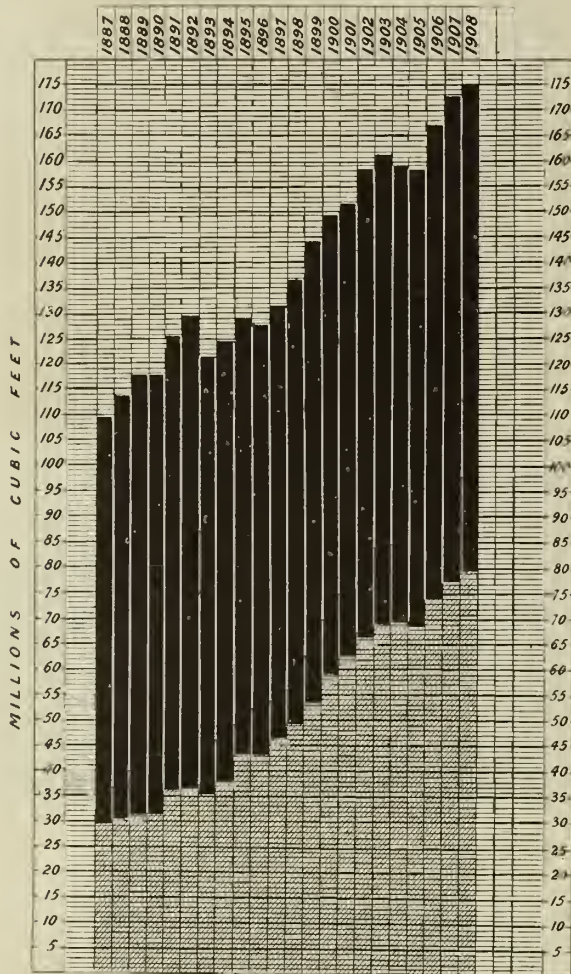
The Day Proportion (6 a.m. to 6 p.m.) is Shown Light.

The effect of the introduction of gas appliances for use during the day shows, when plotted on a diagram, the more even character of the load-line during the year 1908, compared with 1890. It has brought about many advantages in working, as during some months of the year the gasholders are but governors, and the necessity for increased storage does not arise.

COIN-METER COLLECTION.

In accordance with the experience of others having the coin-meter system in operation, the uncollected, and also the empty,

YEARLY OUTPUT OF GAS.



Gas Cookers were First Hired in 1889.
Coin-Meters were Introduced in 1895.
Electric Lighting was Commenced in 1894.

meters become the prey of the thief, who not only remove the money, but damage the meters and properties in which they are allowed to be employed. This pilfering and consequent damage cause considerable anxiety; and much thought has been given to the numerous ideas suggested, with a view of bringing about a better state of things. It was decided to alter the system of collecting by shortening it to two collections per month—thus leaving a much smaller sum of money in each meter, and reducing the obvious attractiveness to the thief rendered by well-filled money boxes attached to flimsy meter cases. This step was not taken without misgivings as to its popularity or otherwise with the householders, owing to the system necessitating more frequent calls. But it has been found to be a positive

convenience to them in the way of the facility given to report and have any little trouble or irregularity of supply put right. By this innovation, the Company benefit appreciably by turning over the ready money more frequently; and instead of locking up so much copper coin, it is necessarily advantageous to keep it in circulation. The system also allows of the empty houses being quickly reported and the meters removed—thus avoiding damage to a meter, with perhaps an empty money-box. Again, the return of the meters to the store ready for re-fixing considerably reduces the expenditure under this head. Moreover, the landlord is protected; the success of the scheme having practically stamped out burglarious entry to dwellings and buildings.

Following the unfortunate troubles prompting the introduction of the remedy as before described, it is interesting to record the small loss of 6s. 9d. from two meters—one in 1907, and the other early this year.

In the arrangement of the collections, the town is divided into A, B, and C districts, giving about an equal number of meters to each of the three collectors. These each work singly, carrying a convenient hand-bag. They count the money, and give a receipt out of a duplicating receipt-book. On returning with the afternoon's collection completed, the collectors make up the coppers into 5s. packets, and pay to the appointed clerk, who, with other clerks, promptly checks the entries in the receipt-books before each following day's work is commenced. With the commencement of this system of collecting, it has been made a positive rule that each collector takes a different district at the beginning of each month. This rule has many advantages to recommend it, and has been the means of bringing about a more complete organization generally. The cost of collection per meter per annum works out at 1s. 3'24d. I should like to suggest to the members the convenience of this figure in making comparisons. The following extract from a handy "Records" book will convey some idea of the way the work proceeds.

Slot-Meter Records.—Quarter ending Lady Day, 1909.

1909. Date.	Number of Consumers.	Districts of Collectors.	Amount of Collections.		Increase on 1908, Per Cent. of Collections.	Monthly Amounts Collected per Consumer.	Increase Per Cent. of Consumers.
			£ s. d.	£ s. d.		s. d.	
1st Collection, January		A	111 10 10				
		B	140 8 6				
		C	144 7 5				
2nd Collection, January	3021	A	89 14 6				
		B	107 4 6				
		C	102 1 1	695 6 10	6'9	4 7	13
1st Collection, February		A	78 1 4				
		B	97 3 6				
		C	93 9 3				
2nd Collection, February	3015	A	68 3 1				
		B	87 18 3				
		C	86 2 5	510 17 10	6'4	3 4	11
1st Collection, March		A	72 16 8				
		B	81 13 4				
		C	80 7 11				
2nd Collection, March	3070	A	73 17 0				
		B	94 1 5				
		C	91 13 11	497 10 3	15'4	3 2	12
Total and averages :—			1703 14 11		9'5	3 8	12
Year Ending Christmas, 1908.							
Total and averages			£ s. d. 7300 15 11		s. d. 14'9	s. d. 4 2	13

TABLE showing Output of Gas (1887-1908), with Proportion Due to Day Consumption.

	1887.	1890.	1893.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Yearly total gas sold (millions)	109'402	117'808	121'091	131'792	136'593	143'951	149'048	151'816	158'202	161'255	159'116	158'154	167'037	172'860	175'066
Day ratios to ditto	27'85	27'09	29'60	37'40	33'88	37'09	39'79	41'30	42'05	42'82	43'66	43'43	44'30	45'01	45'35

TABLE showing Ratio of Day Consumption to Total Monthly Output.

	1887.	1890.	1893.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
January	34'86	36'08	38'35	42'31	42'05	41'25	44'85	45'72	46'65	47'28	47'22	46'31	46'18	48'36	47'95
February	26'57	26'87	28'83	34'00	34'17	34'03	39'32	39'37	42'31	39'44	42'21	39'93	41'60	43'28	41'91
March	20'13	21'26	18'49	25'40	28'82	28'19	33'39	35'55	33'02	35'38	37'13	35'90	37'90	36'98	39'99
April	16'98	18'55	18'18	25'67	26'63	27'92	31'86	33'71	35'47	36'58	36'33	36'87	36'75	39'38	40'59
May	17'76	20'86	23'30	30'21	31'49	33'19	36'17	39'07	39'74	40'82	42'57	42'93	42'54	44'59	45'58
June	20'54	23'24	28'19	36'18	39'65	38'39	41'23	45'16	45'98	45'63	47'76	49'21	48'51	50'42	51'45
July	19'98	24'38	26'12	36'03	36'56	40'37	42'91	45'13	44'92	46'74	47'87	49'81	50'33	50'96	51'21
August	16'06	18'82	22'80	32'40	35'15	37'86	39'88	42'33	42'77	43'69	45'71	46'57	47'33	47'53	48'04
September	14'78	15'91	19'22	26'80	29'76	32'74	34'93	36'06	37'67	38'84	40'21	39'42	41'51	41'94	42'14
October	22'99	21'93	29'67	33'14	32'29	33'09	36'14	36'13	37'78	38'11	38'90	38'41	40'21	41'18	40'78
November	36'60	35'45	37'57	42'00	41'65	42'04	45'19	45'03	44'65	46'13	46'79	45'81	46'59	45'91	45'72
December	41'07	37'96	41'69	44'90	44'39	46'29	45'19	47'84	48'69	49'77	47'89	47'45	48'54	48'60	48'81

NOTE.—The above tables demonstrate the gradual and important growth of the day-load, and they are not without instructive reflection. Among the collateral advantages derived from an even load, the economy in expenditure due to gasholder construction is by no means the least.—W. J. C.

DIFFICULTIES IN DISTRIBUTION.

I purpose now to deal with the difficulties met with in the required attention to the growing needs of the consumers. In the first instance, attention will be drawn to the carefully compiled summary of complaints. This compilation is the result of work commenced in 1886. The figures given, although in concrete form, include many interesting abstract items of the recorded complaints. Enumerated, they are as follows: Insufficiency of supply due to water, corrosion, naphthalene, and meters; leakages of gas, due to meters, meter connections, main taps, services, mains, and fittings. Some little extra trouble has been occasioned in very hot weather by the collection in the fittings of water through condensation, and considerable attention directed towards finding a remedy for this very inconvenient description of complaint. The best thing to be done, so far as my experience goes, is to cover the water in the gasholder tanks with paraffin oil and avoid contact in this way. This is done regularly just before the hot weather commences; about 150 gallons being used for a gasholder tank 100 feet in diameter, and in proportion for other diameters.

Several of the enumerated heads under which are tabulated the respective number of complaints do not give cause for much comment; the record being fairly regular, and presenting no particular difficulty. Complaints due to leakages in the fittings, gas-cooker taps and slot-meter installations show an increasing figure; but this must be expected and looked for, seeing that the Company are owners of such a comparatively considerable distributing plant and under obligations as to its upkeep and maintenance.

Summary of Complaints.

Total Number of Complaints.	Total Number of Complaints per Cent. of Consumers.	Total Number of Complaints.	Total Number of Complaints per Cent. of Consumers.
1886 416	4'01	1898 1596	12'6
1887 798	7'65	1899 2191	16'3
1888 470	4'55	1900 2025	14'3
1889 554	5'41	1901 3241	22'3
1890 754	7'43	1902 2382	15'8
1891 782	7'70	1903 1858	11'8
1892 738	7'43	1904 1929	11'8
1893 845	8'70	1905 1852	10'3
1894 659	6'70	1906 2577	13'0
1895 1157	15'30	1907 2186	10'3
1896 1123	10'60	1908 2123	13'9
1897 1322	11'40		

NAPHTHALENE.

One cannot pass so lightly over the recorded figures as to complaints due to naphthalene. The records in the summary of complaints go back to the year 1886, when the gas was produced in oval and round retorts, well charged and at a moderate temperature. Naphthalene was not a trouble in those days, but gradually made its presence felt as higher temperatures were brought into use, until in 1901 the complaints reached a startling total. Means were then taken in hand to reduce the naphthalene present in the gas by washing with anthracene oil, with an accompanying process by which paraffin was vaporized and allowed to pass into the outgoing gas. The experience gained by the interesting character of the experiments made in the early working of the process more than compensates for the trouble taken in attempting

average which works out at just under two complaints per day—in point of fact, the figure is 1'93.

It is now an accepted idea in the management of gas affairs in Great Yarmouth that more trouble has been found through the



The Station Meter House and Scrubbers.

deposition of naphthalene in the services after salt water had been substituted for that of the town water supply. This opinion has been formed by the close observance of the prevalence of complaints as to the supply of gas and otherwise in certain districts most freely deluged with the briny element.

MAINTENANCE OF INCANDESCENT BURNERS.

The maintenance system as applied to incandescent burners has met with success, and helped very considerably in keeping gas well to the front by the maintenance in efficient condition of the shop lighting, out-door lamps, and consumers' indoor installations. No system of hiring or even selling lamps can be attended with success, if the upkeep is not insisted upon. The cost works out at 2s. 11-25d. per burner per annum; and although the department still shows a small loss, it is an expenditure proved to be well worth incurrence.

COKE SALES.

Having exhausted the more important features of distribution, it may be of interest to the members to know something of the sales of coke, as shown by the returns of the Company. The following statement [see next page] gives full particulars of the price realized per ton of coke, with the price paid for coal into store for the years 1885 to 1908, both inclusive.

The sales of broken coke for domestic use were commenced 20 years ago, and better average prices than otherwise possible have been maintained, through the support given by consumers to this useful and economical fuel. At the time of this new departure from existing practice, little or no coke was delivered directly through the agency of the Company. Local malting (and Norfolk is a barley county) accounted for much of the production of coke after the ordinary "over the counter" customers had been satisfied. It was felt that better figures could be realized by undertaking the breaking and delivery of the coke, to be supplied at popular and remunerative figures. It happened fortunately that these steps were taken at this time, seeing the trouble resulting some few years later in the disposal of gas and other coke due to the restrictions placed upon maltsters in the use of coke for the production of malt. The system was commenced by means of advertisement; and perhaps the best type of advertisement has been found in the provision of suitable lorries and carts, well horsed in well-kept harness—the particulars of the product for disposal being prominently displayed on the fronts and sides of the vehicles. The delivery of unbroken coke was also included in the scheme—the smallest quantity delivered in each case being 1 cwt. It is significant of the striking popularity of broken coke to record the complete neglect of the unbroken material; and a delivery of the latter is of rare occurrence.

Owing to the mild autumn and early part of the season we have just experienced, the question of accumulating stocks was considered at one of our Commercial Section meetings; and it was generally conceded by the members present that greater efforts were needed individually in order to promote, in a greater degree, the local sales of coke, even to seriously considering the question of 28 lb. parcels. Accepting the suggestion, and feeling assured



Interior of the Purifier-House.

to reduce our theory to practice in this very complex subject. The processes are still persevered with; and at the moment we do not consider the naphthalene complaints a nuisance. Taking the last four years, we find from our records a yearly

Cost of Coal and Price Realized per Ton of Coke.

Year.	Coal Price. s. d.	Coke Price Realized. s. d.	Year.	Coal Price. s. d.	Coke Price Realized. s. d.
1885	13 11	11 3	1897	13 7	11 8
1886	12 8	11 7	1898	13 11	12 5
1887	13 3	11 7	1899	14 1	15 3
1888	13 6	13 7	1900	17 8	19 3
1889	13 9	11 8	1901	17 2	15 9
1890	14 11	14 5	1902	14 11	16 4
1891	15 6	14 10	1903	14 3	16 9
1892	16 0	14 4	1904	13 7	17 4
1893	14 0	13 4	1905	13 1	14 3
1894	13 7	15 5	1906	13 2	15 9
1895	13 1	13 5	1907	15 5	16 3
1896	13 3	14 0	1908	15 6	18 0

of its importance, immediate steps were taken by the Great Yarmouth Company to endeavour to increase the total coke sold in the town through the medium of 56 lb. parcels. This development had the advantage of extensive advertisement in the local journals. Comments were made in the general news columns as to the usefulness of the system, handbills were distributed from house to house, the town was posted, and an immediate response on the part of small consumers resulted. It was evident that the poorer classes appreciated the delivery to their doors of $\frac{1}{2}$ -cwt. bags of broken coke, at a proportionate price to that charged for larger quantities. The inclusive price for the coke, breaking, and delivery, is at present 14d. per sack of 1 cwt., and 7d. per half sack.

The demand for the smaller quantity is getting quite a feature of the every-day delivery; and in order to foster the business, offices for receiving orders have been arranged for in the three districts of the town. Of the total of the sales of broken coke during February and March last, 30 per cent. is accounted for by the quantity sold in small parcels. This figure also represents the increase in this particular trade over the period mentioned as compared with the corresponding months of 1908. Great Yarmouth, owing to its geographical position, is not well situated for the local and immediate district disposal of coke. In similar instance to other towns where railway companies have to meet the competition of sea carriage, the rail rates are arranged on a lower scale than those applying to surrounding points of fuel consumption. It is in consequence quite common to find some of our Midland friends—Nottingham, Leicester, and Yorkshire—selling coke *via* Great Yarmouth (it is not routed thus) and cutting the trade in the town and its vicinity. To combat competition of this kind, the practice observed year by year is that of the maintenance of the quality of the coke, by securing the coal most suitable for its production.

Coke Sales.

Year.	Total of Sales. Tons.	Tonnage per Cent. of Total Sales. Delivered into Craft or on Rail.	Local Sales Unbroken. Tonnage per Cent. of Total Sales.	Local Sales Broken. Tonnage per Cent. of Total Sales.
1894	4553	28'3	68'3	3'4
1895	5362	38'8	54'4	6'8
1896	4723	39'5	52'5	8'0
1897	5381	42'2	52'0	5'8
1898	5218	47'3	45'9	6'8
1899	5235	33'8	61'7	4'5
1900	5502	34'5	59'7	5'8
1901	5806	36'8	54'1	9'1
1902	5774	31'8	57'5	10'7
1903	5746	36'1	52'8	11'1
1904	5168	28'5	58'3	13'2
1905	6050	41'6	48'7	9'7
1906	6075	42'7	46'9	10'4
1907	7033	44'7	43'9	11'4
1908	6313	41'5	44'7	13'8

A WORD FOR COMMERCIAL SECTIONS—AN APPRECIATION.

It is intensely interesting to note the growth of what is now called the "New Commercialism." Although I have to admit a reluctance in joining any Commercial Section, I am now most enthusiastic in the important work so ably carried out by the gentlemen who have devoted much time and help to its development. The frequent meetings provide the advantages of general discussion of that informal character conducive to the collection of desirable information to be gained in no other way. Gas companies and gas committees are greatly benefited by sending their representatives to the meetings arranged at convenient times and places; and I cannot too strongly advise the importance of the maintenance of the interest of the members themselves in this regard. These remarks may be considered somewhat extraordinary, coming from one whose support did not originate with the inception of our section; but I can most assuredly affirm that, among other benefits, the Eastern Commercial Section, news, and work, together with that of our Western contemporary, has been very material in the determination of the prices realized for residuals by the Company I represent, and I have pleasure in making this record of the advantages derived.

In conclusion, allow me, if I may, to emphasize the importance of the maintenance of strict attention to minute detail in the conduct of all affairs affecting the concerns we represent. In whatever capacity our services may be directed, the question and

observance of detail is the direct point at which success begins. We are all of us judged by results; and the figures of our annual balance-sheets are indicative of the work undertaken to promote financial and economical excellence.

TAR FOR ROADS, YARDS, GARDEN PATHS, &c.

By J. H. TROUGHTON, of Newmarket.

[A Paper read before the Eastern Counties Gas Association.]

Owing to the depression in the tar-distillery business, coal tar is almost a drug on the market; and the price distillers offer for the surplus has induced many gas engineers to look about for fresh outlets for its use and disposal. Some are burning it for heating boilers, with satisfactory results; while its usefulness for painting roads and mixing with road-making material seems likely to create an increased demand by county councils and urban authorities as an antidote to the dust nuisance brought about by motor-cars, which is the principal cause of prejudice against their use at present. It is, however, my desire to put before the members of the Association my experience of disposing of some of our surplus tar at a reasonable price, while, at the same time, finding employment during the summer months for the winter hands of gas authorities, which has induced me to submit this short paper.

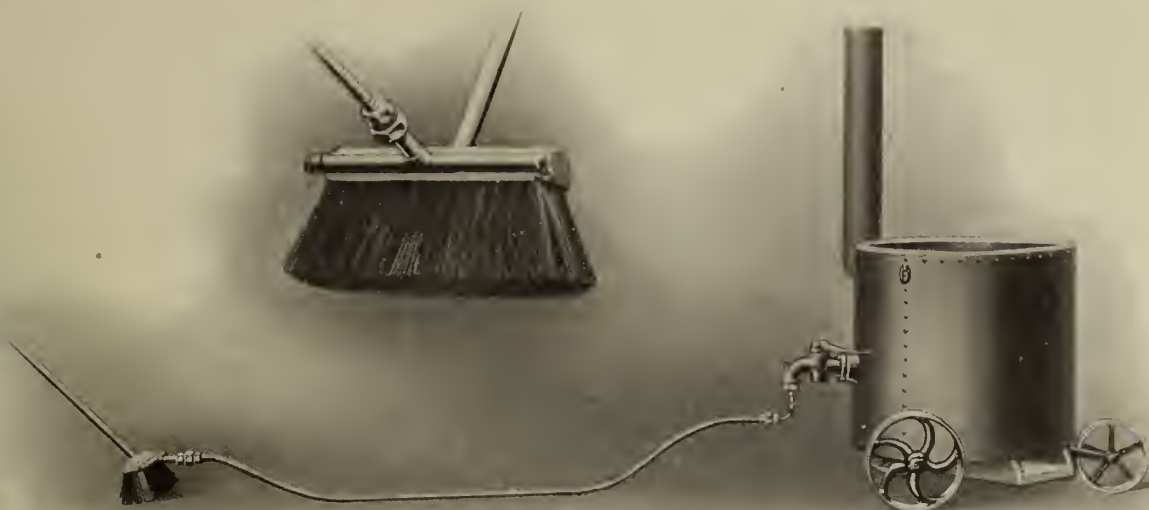
Last summer I advertised that my Company were prepared to give estimates for tar-painting footpaths, drives, and yards; and a circular was sent out giving extracts from a customer's letter for whom I had tar-painted garden paths and the entrance drive to his residence the year before, who said that the original cost of the work had been more than saved in labour previously spent in weeding, raking, and rolling, and, in addition, the paths, &c., were firm and clean all the winter, and he was saved the disagreeable picking-up of the gravel in frosty and wet weather, and the consequent mud and dirt. These paths, &c., had one coating only; and the gentleman was so pleased with it, after twelve months' use, that he gave me the order to give it another coating and other similar work, which has made his paths look like lasting for several years to come. Indeed, there is not a single flaw over the surface after the past severe winter; and the drive has been constantly used. This letter brought me several applications, and close on twenty jobs—varying in amount from £2 to £30 each. I believe satisfaction has been given in every case; and I expect much more similar work this year, which has already commenced to come in.

There are many methods of applying tar for the purpose. The way I commence is to first thoroughly sweep and clean any ground about to be painted, in fine weather, and, if necessary, level-up, and then apply a coating of tar by hand. Cold tar will do very well on hot days; otherwise it is preferable to put it on hot, and sweep it in well, leaving it for a few hours for the sun to shine on, which enables it to penetrate and soak into the interstices of the gravel, slag, or granite surface. It is gone over again with a broom to sweep out any little pools of tar which may form before sprinkling it with granite chippings, slag dust, sharp boiler ashes, or sand, and afterwards rolled with a moderately heavy hand-roller, when the traffic may be forthwith allowed over it. This is a very cheap way of tar-painting for garden paths and drives; and if treated in the same manner with a second coating a month later, they will last for several years.

My experience is that if this kind of work could always be carried out in hot weather, cold tar makes a better job than hot tar, as the sun has greater power for causing the tar to penetrate into the interstices of the material on the road than hot tar will do without the assistance of the sun. Hot tar quickly runs off to the sides; cold tar is gradually absorbed while the sun is melting it. The chief item towards ensuring success is to make sure that every part of the surface gets a good coating, which will effectually make it waterproof, and that there is no caked mud covering the hard material on the roads painted, or it will break up and peel off in a short time. Tar containing water should be dehydrated, as any degree of moisture tends to prevent it binding and setting. It will be readily understood that the best and most lasting results are obtained where the tar has got a good penetration and grip of the underlying material, as well as a good waterproof covering.

Fine granite chippings, or slag chippings or dust, are the best for sprinkling on the painted surface. Sharp sand and boiler ashes sifted through a $\frac{1}{2}$ -inch mesh will also do very well, and make a good surface. If a more pleasing effect is desired for garden paths than the sombre black of ordinary tar painting, a sprinkling of fine Derbyshire spar, well rolled into gravel paths, has a nice effect, as this, after a short time, wears itself bright, and will only add to the cost according to the locality.

The Surveyor to the Newmarket Urban District Council (Mr. Waithman) has recently patented a labour-saving appliance for distributing hot tar. A distributing pipe is attached to the rear of any kind of tar boiler. This feeds one, two, or three brooms with tar by means of $\frac{1}{2}$ -inch flexible tubes, each 10 or 12 feet long, which are connected to a perforated piece of pipe fixed on the head of each broom, from which the tar trickles on to the road or path in front of each broom—a man behind manipulating the broom. In this way, two men can cover a quarter-of-a-mile



Showing Reservoir Attachment fixed to an Ordinary Broom.

Showing Reservoir Broom connected to Tar Boiler.

Walthman's Reservoir Tar-Broom.

of roadway, 8 yards wide, per day. The flow of tar is easily governed by means of a cock on each feed pipe. With a small tank boiler for paths, two men (one to attend the boiler and the other to manipulate the broom) can easily cover half-a-mile of 5 or 6 feet wide pathway per day. I have employed it, and believe it to be a useful invention, as it has the advantage of being suitable for either roads or paths. The men are provided with pattens when manipulating the brooms. The attachment can be fitted to any size of tank-boiler, and any reasonable number of brooms can be put on to large boilers for painting wide roads.

The foregoing particulars refer chiefly to drives, footpaths, &c.; but they will also apply to tar-painting main roads, especially newly made-up macadamized roads. I am convinced that tar-painting new roads will greatly prolong their lifetime. A coating every year at a cost of about 1d. per superficial yard on county roads would eventually effect a great saving in the rates, and, in a great measure, cure the dust nuisance. A road coated annually in the manner described becomes more effectually waterproofed each succeeding year, and, consequently, more strongly resists the wear and tear, while adding to the comfort of both users and residents. It is, however, useless to attempt to repair worn-out roads in this way. The best results are obtained on newly-made roads.

Mr. H. P. Maybury, the County Surveyor of Kent, is reported to have stated recently that: "Given another five years with the new methods of construction and repair, road engineers will have met the demands of motors and heavy commercial traffic, and the dust nuisance will be a thing of the past." This is a consummation devoutly to be wished; but I believe, if the experiments at present being carried out all over the country are persevered with, it will be found that tar will be the remedy, and that it will be much more largely used.

The result of the International Road Congress at Paris last year was to recommend tar as the best and most useful commodity for all road-making purposes and dust prevention. In a paper read on this subject, Mr. Maybury, who has had a long experience, is strongly of opinion that the best method of making and fitting up roads for the new traffic is as follows:—

1—Build them up as strongly as possible, reducing camber to a uniform 1 in 30.

2—Coat the surface with the best obtainable hard material, broken to a gauge of not less than 2 inches and not more than 2½ inches, well rolled and consolidated, only clean hard gravel and chippings being used as the binding material.

3—Well clean the surface and apply a dressing of heated tar or tar compound, covering same with hard, clean gravel or chippings well rolled with steam-roller.

A road made up as above costs about 1s. 6d. per superficial yard, against 3s. with tarred macadam.

There are many other systems of road making which I need not refer to; my object being to draw attention to the undoubted merits of tar as an important adjunct to all kinds of road and path making, and at the same time recommending gas authorities to do all they possibly can to encourage the use of tar for these purposes, by selling it at such a price as will induce county and local authorities to use more of it, and not drive them to the tar distillers to obtain it, as Mr. Maybury, in the paper that he read before the Institution of Gas Engineers in 1907, stated had been his experience.

In conclusion, I may say that I have used tar in very close proximity to all kinds of trees, shrubs, grass borders, &c., and I have never yet found it to interfere in the least with their growth, or to have any detrimental effect upon them.

Discussion.

The PRESIDENT, in inviting discussion, remarked that the paper with which Mr. Troughton had presented the members was a very useful one.

Mr. R. G. SHADBOLT (Grantham) observed that the Borough Surveyor of Stamford was present; and perhaps he might be able to enlighten the members on this matter.

Mr. T. F. R. RYMAN (Borough Surveyor of Stamford) said he had listened with a great deal of interest to the paper. He had used a lot of tar for painting local roads; and he found it very beneficial in reducing the dust nuisance. He could not agree that cold tar was at any time so effective as hot tar. He thought the better way was to boil it about two hours before it was applied; and then to use it and rub it in well. There were machines used in different parts of the country for tar-spraying; and he thought with these they could get a coating of tar for about ½d. per square yard. If the tar was put on by brushes, it cost about 1½d. Then, again, tar was coming to the front as a binding material for macadam roads. He had experimentally tried a length of road himself; and Mr. West would bear him out when he said that it had answered well. They put down the granite first and then tar and chippings on top, and finally a coating of tar. This made a very successful binding. He was in favour of tar binding; and, in fact, was a great believer in tar for road work generally.

Mr. S. SHADBOLT (Kirkby-in-Ashfield) observed that he had had no practical experience himself of the use of tar for road purposes; but he should like to ask a question or two based upon the experience of the local authorities in his district. In Nottinghamshire, they went in largely for tar macadam, both in the county and in his own immediate district. He was just recently in conversation with the Chairman of their Roads Committee on this topic; and both the Chairman and himself (Mr. Shadbolt) were curious as to how time would deal with the different methods of the county and the local surveyors. The county surveyor, in making tar macadam roads, built up the first section to the needed contour with fine tar macadam, over which, after a little painting, he put a rougher tar macadam about 2 inch mesh, and then again finished off with a finer material. The local surveyor preferred to build up with good rough stone, and cover with rough tar macadam, and top up with fine. In both cases, the surveyors used ready-mixed tar macadam, with a little tar for binding as it was put down, finally rolling well. In both cases, he had noticed that sunny weather would bring out the tar on the surface. It occurred to him that this might have something to do with the mixing. He believed the method generally practised was to boil the tar and heat the metal, and mix them on a heated floor, turning well before being laid.

Mr. JOHN BARTON (Peterborough) said that one novelty that appealed to him in the paper was advertising to do work in the making of private footpaths, garden walks, and such like. He had not heard of this sort of thing being done before by gas-works. With regard to road painting, this had been done in his district for several years past; and he was pleased to say it was growing. Last year they sold no less than 70,000 gallons of tar for road painting. He believed this had given great satisfaction. He did not know what the cost was of doing this work; but as the County Surveyors had continued the system for several years past, he took it that in their opinion it was a good system. Certainly the roads were very good indeed where covered with tar. Motorists would confirm him when he said that they found roads that had been tarred were much better than those that had not been so treated. In his district, the process had gained ground very considerably.

Mr. J. W. AUCHTERLONIE (Cambridge) said, if it was a fair question, he should like to know what price was obtained for tar for road purposes. Some time ago it was stated that 1½d. per gallon was a reasonable price. He had sold a considerable quantity of tar for the painting of roads; and he had had no trouble in getting 2d. a gallon for it. Mr. Troughton had done a good deal of work; and his balance-sheet showed that it had been a very remunerative way he had devised of selling this residual. In Cambridgeshire, some roads had been treated with tar. These roads were made in the old way with macadam, and afterwards covered with tar. In some places, they had tar tank-waggon, drawn by traction engines. The tar in the tanks was heated by a steam-coil, and a compressed-air pump—also driven by steam—sprayed the tar on to the roads. In this way, they were able to cover a large surface at a low price; and it appeared to him (Mr. Auchterlonie) to be very successful. These tar tank-waggon would take 2000 to 3000 gallons at a time.

The PRESIDENT said he had used tar on garden paths for many years past. They only employed ashes from the ash-pan. They laid these in the open to get thoroughly dry, and then mixed up with tar in the proportion of 10 to 12 gallons of boiled tar to about an ordinary load of ashes. This answered well for garden paths. He had not had any experience of the use of tar for road making. But for garden paths, it answered remarkably well; and they had had repeat orders for this work. They had a large one in hand at the present time. In mixing, the best way was to get 10 to 12 gallons of tar well heated, lay a load of ashes in a thin layer of about 2 to 3 inches thick, and then put on the tar, and mix well. In making paths, a great mistake was made in many instances in not mixing properly. It was necessary to give plenty of time to the mixing; and then with good rolling, an excellent path would result. Some of the members who visited the Leighton Buzzard Gas-Works six months ago would probably remember the long path down to the works. This was laid some 12 years since; and it was only made with the ordinary ashes out of the ash-pans, mixed with tar as he had described. The path had never had anything done to it since, though there was a great deal of traffic over it both summer and winter. It had not even been painted. There was a great deal being done with tar macadam in their district. In Bedford they were doing a lot of it now. Only the previous day when coming from the station, he sold to the County Surveyor 12,000 gallons for simply spraying on the roads. It was being used on the Great North Road; and he was told they would want many thousands of gallons for the purpose. He was sending tar to Fenny Stratford on the Great North Road. The County Surveyor was a great believer in tar; and he was using a considerable amount of it, and, what was of importance in his (the President's) opinion, was buying the tar from the Leighton Buzzard Company.

Mr. H. WIMHURST (Sleaford) said their County Surveyor did not believe in tar; but their late Urban Surveyor made some excellent footpaths outside the town, probably amounting to 6 or 7 miles in length. He made them in this way: He got slag, and heated it. He put up a small furnace for the purpose; and he then applied the tar. He used to make up the asphalt in the winter, and then let it lie four, five, or six months before putting it down. By this means, he obtained a more uniform footpath. If the ballast and tar were mixed and laid down "green," it was all alive; and one could not do anything with it for roads or paths. Neither in summer nor winter was there any trouble from tar exuding from the surfaces of the paths in Sleaford.

Mr. TROUGHTON, in reply, said he was pleased indeed the Borough Surveyor of Stamford was so thoroughly satisfied that tar was likely to become the chief agent in the making-up of roads, as well as for tar painting. In his own opinion, tar as a binding material could not be beaten. County surveyors and road engineers all over the country were experimenting to find the best and cheapest way of making roads. He was not a surveyor or a road maker; but he took up the matter of tar painting for footpaths and drives—chiefly garden paths; and he had found it remunerative work. There was money in it. It enabled one to sell tar at the ordinary sale price of the works; and if interest was taken in the work, a large amount of it could be obtained. Before giving a price for a job, it was necessary to view the ground, because if it was a newly macadamized road, built up in the ordinary way, it would be porous, and it would run away with a considerable amount of tar. In giving an estimate for this kind of work, they had to cover themselves for the first coating; but after a road had been once coated with tar, it did not take much to keep it in a first-class state of efficiency. He believed a well-made macadam road constructed of tar macadam cost practically 3s. per yard; whereas to coat it, it cost the small amount of about 1d. He believed the Borough Surveyor of Stamford put it at about 1½d. per yard; but he (Mr. Troughton) could do any amount of it for 1d. per yard, and make a good profit. To tar paint a garden path on a day like the one on which they were meeting when the sun was penetrating, and would drive in the tar, one coating (sprinkled with any of the ordinary materials for the purpose, which he believed could be obtained in any district at a reasonable price) could be done for 1½d. a yard, and 1d. for the second one, or 2½d. for the two coatings. Regarding Mr. Shadbolt's inquiry as to the different methods of making up ordinary roads, he (Mr. Troughton) was not, as he had said, thoroughly experienced in road making. He thought, however, Mr. Shadbolt was referring to a system which was described as the Gladwell. It was being carried out in different

parts of the country. A layer of small prepared stuff properly weathered was first put down; and this was just sufficiently sticky to bind fairly well. Ordinary clean macadam granite or slag was put on it, and then it was covered with a thin layer of tarred material of a finer nature. The whole was then rolled together, so that the dry middle mixture was driven into the wet bottom layer and into the top cover. This did not cost so much as the ordinary way of making up a heavy road. He believed the system could be carried out at about 1s. 6d. per yard, which was only half the price of an ordinary tar macadam road. But all this showed that tar for road-making purposes was fast coming to the front. Mr. Barton, for instance, could sell 70,000 gallons to his County Surveyor. This sort of thing—orders from county and urban surveyors—was becoming the usual experience. He (Mr. Troughton) charged 2d. per gallon to their county and local authorities; and he tried to encourage the use as much as he could by letting them have it at a reasonable rate. Twopence per gallon was better than selling it to the distillers at 1d. Gas managers should keep this point in view, and encourage the use of tar for road purposes by selling at a cheap rate. He had heard gas managers say they could get 12s. per barrel for their tar. This might be all very well for the time being; but it did not encourage the use of tar for road-making in that particular district. He agreed it was advisable to prepare the material in the winter time if possible, and let it become thoroughly weathered or seasoned. But if they could mix the tar and material up in the shade in the open in the summer, the warm weather would make the tar quickly penetrate the slag. In this condition it was far better for road making. If the stuff was prepared precisely as it was going to be put on to the road, the tar did not get its proper degree of penetration into the material, and it then oozed out in the summer. It was the right thing to have the materials for road making properly weathered. Clean, sharp engine ashes were very good indeed for tar work for garden and public paths. It was unnecessary to spend more than 2d. or 3d. per superficial yard for such paths provided they were made up with gravel beforehand. If frost got into them, the surface only required another coating and sprinkling with sand, and the path would again be waterproof. He did not agree as to the efficiency of the tar-painting machines. These were apt to go over the ground, and leave long stretches of bare patches; and if water got into the road it destroyed the work, more especially in frosty weather. Nothing could beat a hand-painted road, because the hand labour ensured a thoroughly good waterproof in every part.

At the ordinary meeting of the Royal Statistical Society this afternoon, Mr. R. W. Baldwin-Wiseman, M.Sc., will read a paper on the "Increase in the National Consumption of Water." After an historical introduction, the author will refer to the Roman and mediæval water-works, and trace the development of water supply in London, Liverpool, and Manchester, show how the consumption of water has increased with the growth of towns, and urge the necessity for the control of water sources by the State.

We have lately received from the Secretary to the Board of Agriculture and Fisheries an interesting volume of the memoirs of the Geological Survey of England and Wales dealing with the water supply of Kent, with records of sinkings and borings, by Mr. William Whitaker, B.A., F.R.S.; other contributors to the volume being Dr. H. Franklin Parsons, Dr. Hugh Robert Mill, and Dr. J. C. Thresh. After an introductory chapter, the author offers some observations on the geologic formations of the county. These are followed by a chapter on the rainfall of Kent, by Dr. Mill; and then the springs, swallow-holes, intermittent streams, springs, and wells in the county are successively considered. Details are given of various borings for water, and also analyses of spring and well waters. The text is followed by a bibliography, miscellanea, and addenda; and there is a useful index. The book has been published by order of the Lords Commissioners of the Treasury, and it may be had from the Ordnance Survey Office, Southampton, at the price of 8s. 6d.

We have received from John Wright and Eagle Range, Limited, a pamphlet bearing the title of "Heating and Hygiene," which they have had prepared specially with the view of combating the prejudice that has existed among medical men against the use of gas for heating rooms, &c. The author considers the physical and chemical aspects of the question; and, having shown that the best means of warming rooms is radiant heat—in other words, open combustion—he proceeds to deal with the effect of this combustion on the atmosphere of the room and the health of the inmates. He points out that the source of radiant heat must not produce carbonic oxide, and that the heating apparatus used must convey out of the room the carbonic acid it generates. This, he says, is done by the gas-fire, which burns purified gas under perfect conditions of oxygenation and ventilation. The rest of the pamphlet is occupied with observations upon the firm's patent "Simplex" gas-fire interior and "Thermo" gas-fire front, with the introduction of which, it is claimed, "an entirely new departure in domestic heating began." Extracts from speeches, &c., are given to show the favourable opinion now entertained by the medical profession and others in regard to gas-fires; and the pamphlet closes with illustrated particulars of some of those which have been constructed by the firm on the hygienic principles laid down by the author, and fitted with the above-named appliances.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association took place last Friday, at the Cripplegate Institute, Golden Lane, E.C.—the PRESIDENT (Mr. W. J. Liberty) in the chair—when a profitable time was spent in listening to the reading of, and discussing, a paper entitled: "Gas Consumers' Accounts: Avoiding and Settling Disputes." The author was Mr. T. V. FENN, the Deputy Chief Inspector of the Gaslight and Coke Company; and the subject, of course, was one on which he was well qualified to speak. The following are the main portions of the contribution, together with some notes of the discussion to which it gave rise.

CONSUMERS' ACCOUNTS: AVOIDING AND SETTLING DISPUTES.

Mr. FENN, in the course of his paper, made the following remarks:

The subject of my paper is gas accounts disputed by consumers, and how, if possible, to avoid and settle them. The settlement is, as a rule, a very knotty and difficult subject, and is not looked forward to with any degree of pleasure by the officer whose province it is to undertake it to the satisfaction of the company he represents and the customer. There are, of course, a goodly number of instances where the settlement is concluded to the entire satisfaction of the customer; but, on the other hand, there are a great many where the account is paid under protest—thus leaving the customer dissatisfied, which is much to be deplored. I will endeavour to do my best to explain how I deal with customers in this particular branch of a gas officer's duties, with the hope that something I say may assist a brother officer to attain the object he so much desires—viz., the satisfactory termination of a disputed gas account. Perfect harmony should always exist among the staff. This you will always find a most valuable asset both to the officers and company. An inspector must always work hand and glove with the collector, who is more frequently in contact with the customer, and, in consequence, can often offer and give useful hints with regard to his requirements and disposition, and assist in many ways to the ultimate advantage of both.

Now with regard to gas for heating, my opinion is that it is far better to avoid the extravagant use of it than to allow a customer, who perhaps has had no experience of how to obtain the maximum amount of heat for the least possible consumption, to go ahead and use his fires in such a manner that when the first winter account is rendered—particularly if the quarter in question has been a dark, dreary, and cold one—it is almost sure to be disputed, and it may follow that no amount of explanation or persuasion will satisfy him. When an order is being taken for a stove, you should use every endeavour to induce your customer to have a regulator fixed, passing just the proper amount of gas required at its fullest capacity—pointing out the amount of waste that may follow, unless one is fixed, if the stove is left to a person who will not take an interest in it, and is heedless as to the surplus quantity of gas used.

In cases where you know your customer's experience with gas-fires is very limited (if any), you should, after they have been in use for (say) a week or two, give him a call, take a reading of the meter, carefully note the consumption, and then make it your business to see the customer, politely ask if the fire or fires are working quite satisfactorily, and state how much gas has been used to date. If in your opinion the amount is excessive, you should inform the customer that the better way to reduce it is by checking the gas by means of the tap at the stove and the main-cock at the meter, or by fixing a regulator at the gas-fire, or any other method that may appeal to you. You must never lose sight of the fact that it is far better to have two satisfied customers of 60,000 cubic feet a year apiece than one dissatisfied at 120,000 feet. Again, a new hand in the use of gas-fires will perhaps have one fixed in a sitting-room used all day. You know what this means, unless a person can thoroughly afford it. It should be your duty to point out to customers that gas-fires, where used in bedrooms, drawing-rooms, and occasional rooms, are economical, and fairly so if used all day in a sitting-room when the saving in labour, &c., is taken into consideration; but if this is not, and the customer goes ahead and uses it constantly, the result at the end of the quarter is generally unsatisfactory both to the customer and the company. This you should in every way try to avoid. It may appear against a gas company's interests, but I assure you my experience is, and has always been, to advise a customer not to use gas-fires, when strict economy is studied, all day long; for as a rule it brings them into bad repute.

I am now speaking of the open gas-fires. By introducing such means of heating as duplex radiators, gas-steam radiators, &c., where all the calorific units are thrown into the room, a very much reduced consumption follows; but where these are fixed in a room, I have always found it better just to leave a window or door a little open and so save steam on the windows.

As you are doubtless aware, cookers and heaters are tested by the makers at about 15-roths pressure before leaving their works—this being the point at which they obtain the best result from a heating and economical point of view; and you can imagine what follows when the stoves are fixed in districts where the pressure may run up to 45-roths. Pressures now are generally not lower than 25-roths, for which we offer up thanks. I consider low pressures are much to be deplored, and should not, if it can

possibly be avoided, exist. An inspector can always arrange to reduce pressure by means of the main-tap, &c. I recollect a case where a customer had two canopied gas-stoves fixed, of the old type; and when the account was rendered for the quarter, he asked me to call and explain the large registration. I found the stoves going full-speed ahead, with the main-tap full on, and the consumption per stove about 70 cubic feet per hour. They were canopied stoves, and the waste was not noticeable unless you went on your knees and looked for it. This is a form of stove that you should pay particular attention to in seeing that regulators are fixed. Gas-fires in grates are not quite so liable to extravagant use, as the flames can easily be seen above the fuel. To this the customer's attention should always be drawn, with advice to turn down the tap, after the asbestos appears incandescent, to such an extent as to just keep it so. I have always found the "Blenheim" type of fire give good results, particularly where a special back is fitted, and the duplex arrangement. The former gives great economy by saving and deflecting a large amount of radiated heat into the room which otherwise would disappear up the flue. When fitting up apparatus, at all times make quite certain that the gas supply is sufficient to render it thoroughly efficient; and also see that the apparatus selected is quite suitable for the work required of it.

Governors on cooking-stoves, particularly in private houses, I do not consider so necessary, because an excess of gas, and consequent waste, are easily detected, because an excess in the oven spoils the goods therein, and an excess on the hot-plate spoils the boil and causes an unpleasant smell through the flames burning outside the saucepans. All this should be explained to the person who uses the stove. Of course, a good governor with an outlet pressure of (say) 16-roths to 18-roths fixed on the feed-bar is a grand economizer; but the great difficulty is to get a customer to go in for the extra expense, though the governor soon pays for itself. A similar result is brought about by a careful customer turning on the gas to the required height. But, unfortunately for themselves and the company, they are few, and the stove gets blamed as an extravagant means of cooking, whereas it is really miles in front of a kitchen-range for economy.

In cases where in large establishments there appears to be a likelihood of gas being turned out on account of the wastefulness of the cook, by all means at once arrange to fix a governor; but be careful not to reduce the pressure on the outlet too much at first. Drop down gradually to 16-roths or 18-roths; for where the cook has been in the habit of using gas at a pressure of 25-roths to 30-roths, or perhaps more, the difference in the rapidity of heating, &c., is very marked.

The use of gas for hot-water circulation should be carefully thought out; and great care should be exercised in studying how to produce a cheap hot-water supply. In many large houses I have been successful in introducing gas entirely for cooking, solely on account of fixing a cheap and effective hot-water supply by means of a coke circulating-boiler attached to the existing flow and return. This may seem contradictory to our interests, though we supply coke; but I can assure you that in every case except one a coke-circulator has brought about the use of gas entirely for cooking, and the subsequent abolition of the kitchen-range. You will very likely think to yourselves, "Why not have introduced a gas hot-water circulator?" Well, in large and very lofty houses, and where an immense amount of hot water is required, gas is too expensive. Besides, the loss of radiated heat through the flow and return pipes being such a length is enormous; and in these cases it means a coke-circulator and a gas-cooker, or else a continuance of the old system. Gas for the modern flat and a two storey house, for hot-water circulation, is effective and economical, and should be pushed for all it is worth. But the customer should in every case be advised how to use it with economy; and where an installation is in its infancy, a call now and then should be made, a reading taken, and, if the amount is excessive, the user should have his or her attention drawn to the fact, and every means be employed to have the circulator used with discretion—such as governing the supply to the correct amount required, fixing a thermostat, &c. A little extra trouble about this time will save you a heap later on, and often a customer. The automatic shut-off is an excellent means of effecting a saving in cases where a customer cannot, or does not, give personal supervision; but even this wants explaining, because a reduction to (say) 10 feet per hour going 24 hours a day means a good amount at the end of the quarter.

In cases where a customer is dissatisfied with a gas-circulator, and suggests going back to the range, which means a loss of consumption on account of the cooking-stove being partially thrown out of use, my advice is to fix a small coke-circulator, effecting economy at once and saving the situation. If the customer has doubts of its efficiency, fix it up on approval; it is worth the risk. Tell the consumer how nice it is to be able to burn up all the refuse, and that the outside cost for fuel will be about 2s. to 2s. 6d. per week, which is a fact. Do not fix up a gas-circulator where you feel instinctively that the cost of producing hot water will bring gas into discredit; but go for a coke-circulator and a gas cooking-stove. Some large gas hot-water installations have been fitted up with Potterton's gas-boilers; and for producing hot water under certain conditions califants are satisfactory and economical. We have also had considerable success with the Wilson's circulator, but find it most useful in flats or houses of one or two storeys, where the head of water is not excessive.

While I am on the subject of hot water, I should just like to

point out how, with a reduction of pressure, the quantity of gas consumed is reduced also.

Two Quarts of Water in an Ordinary Kettle on a Cooking-Stove Starting at 56° Raised to Boiling Point at the Following Pressures.

18-10ths.	..	5'30 feet.	..	18½ minutes.
10-10ths.	..	5'09 "	..	24 "
6-10ths.	..	5'07 "	..	29½ "

This goes to show that where water is not required to be heated suddenly, it is, within reasonable limits, much more economical, as far as gas is concerned, to boil it slowly; but where you have a case in which a burner passes 150 feet per hour at (say) about 30-10ths, and is adjusted to pass 80 feet at 10-10ths, the waste would be much more apparent.

While we are on this subject, another case may interest you, which illustrates the wastefulness of long tongues of flame for heating water, &c. A badly-constructed imperfectly-adjusted gas-burner, consisting of a piece of barrel with an elbow turned up at the end, was found to consume 63 feet per hour and take 25½ minutes to do certain work; with the tap turned down, the time was reduced by one minute, and the consumption by 8½ feet; and with a Fletcher concentric burner of the "Standard" variety, full on, the time was reduced to 20½ minutes, and the consumption 50½ feet, which would have been reduced still further if the pressure had been broken down from 23-10ths to 10-10ths—the latter being the pressure Fletcher burners are regulated to. There is no doubt that the proper way is to cut up a flame into a multitude of units, and for the blue points to be just in contact with the bottom of the vessel, without breaking up the inner cone. In a similar case I found there were being used about a dozen Fletcher drip-proof burners for melting purposes, with very poor results and a large gas consumption. I suggested special burners with small gaps to them, and was asked to get some made. Fletcher's made them, and the result was splendid. They reduced both the time and quantity of gas used very considerably; and they were introduced to the firm's other factories.

The system of employing lady demonstrators to visit houses where cooking-stoves have been newly fixed is a very excellent one; and I am pleased to say that the public appear now to fully appreciate it. Means are afforded thereby to give the household a practical demonstration of how to use the cooking-stove with economy and ease, and to the very best advantage. I feel sure that a visit from the lady demonstrators often saves a disputed account at the end of the quarter. With regard to the settlement of disputed accounts, the personality of the officer is, and always will be, a very big factor. He should have a forcible and convincing manner, plenty of energy, resourcefulness, perseverance, and patience; and joined to these qualities there should be unfailing and invariable courtesy. He should be capable of explaining and addressing customers on all questions appertaining to gas-meters and gas affairs, which can only be brought about by constant practice and his always taking great interest and pleasure in his business. In fact, he should have just those qualities that go to make an excellent commercial traveller, without which it is very difficult for an outside man to be a success. An inspector should cultivate the art of how to please his customer and how to favourably impress him with his desire to be fair and just, and endeavour to let him see that he is taking every possible interest in the question of the moment—that is, the disputed gas account.

We will take it that a complaint has arisen when the customer cannot, so he says, account for the registration; and the question arises, What is the best way to go about the settlement to the satisfaction of the customer? You should first go carefully through your index-book, see if he has made any additions to his account, such as heating or cooking stoves, compare the account quarter by quarter, and note all increases or decreases. In the event of a change of meter having taken place recently, since when, without any apparent reason, the account has increased to a large extent, you should inquire if the starting-index has been correctly recorded; and, if this is so, find out the result of testing the old meter. If slow, it will at once give you something to work upon. You will see the head of the house, and listen attentively to his statements, and then exhaust all possible means of obtaining a reason for the increased consumption. Firstly, it will be advisable to read the meter and check it with the meter-card and book, and work out the consumption per day during the quarter, pointing out (if it is so) that the consumption since has gone down to normal, and that he will probably find his account for the next quarter almost the same as the corresponding one. Then ascertain if there are any outside pipes that may at times be turned off from the house, but at others on; and, if decayed, a leak during the time may be the cause of the increase. After this, test the fittings by a test dial, first ascertaining if all the lights, &c., are turned off. This will readily tell you if the fittings are sound. After this, carefully go through the house, and should you find extravagant flat-flame burners in passages, advise No. 2 incandescents with regulators; or if the consumer objects, as he sometimes will, on account of draughts, get him to let you fix regulated flat-flame burners. In fact, go through the premises generally, and advise him, wherever you see waste going on, to let you make an alteration. Explain the exact amount of gas to use in oven and on hot-plate; get him to let you fix regulators to the heating-stoves; and do everything that is possible to effect a saving without causing any discontent. But do not in any way question the correctness of the meter, unless you feel that the consumption

cannot be satisfactorily accounted for. The inspector should post himself up with figures referring to the temperature during the quarter in question and corresponding ones, and show the consumer how the output has increased whenever the temperature has fallen, and bear in mind the difference in the atmospheric conditions generally. In fact, he should be tactful and watch for a fitting opportunity to get a few words in that may throw some light on the increase.

A man who just reads the index to verify the quarter's reading, tells the customer that it has been correctly read, and suggests that the only course for him to pursue is to get it tested, makes a great mistake, and should at once be put into the right way of going about this very important part of the company's business. The inspector should bear in mind how very few meters that are tested prove fast, and those only a little over the amount allowed by the Act—viz., 2 per cent.—which proves very unsatisfactory to the customer. He is generally disappointed with the allowance, and in consequence more than ever prejudiced against the company. Of course, there are times when it would be necessary for you to advise the consumer to have the meter examined; but this seldom happens. Some very curious mistakes have occurred at times, but fortunately very seldom; and where no possible reason can be assigned for an abnormal consumption, the index should be specially examined. If you will refer to the report of the Official Meter Tester published recently in the "JOURNAL OF GAS LIGHTING," you will find that defective meters are by no means in favour of gas companies.

Going back again to disputed accounts and how to effect a saving when rendered more than ever necessary on account of a consumer threatening to introduce electricity for lighting, I will tell you how I dealt with a case. A large block of flats had had a very tempting offer from a certain electric company to fit up free of charge and light at an amount which came to about half of what we were doing it for—i.e., staircases and corridors. I saw the secretary, who promised that if we could undertake to reduce the gas consumption to half, and light the place satisfactorily, he would make no change. I had pressures taken, and found them average between 35-10ths and 40-10ths. The "C" burners were passing about 7 feet of gas per hour each. I had these all done away with, and No. 2 Kern burners fitted instead, with injectors regulated to 35-10ths to 40-10ths. All the staircases were fitted with pneumatic distance lighters; and the corridor—150 yards long—was arranged with a bye-pass service and mercurial seals, so that at night time, whichever entrance a resident came in at, the porter could light up that section from his box, and the staircases at the foot of each staircase. This brought about the desired result, and we retained the account, though in a reduced form.

In conclusion, it is a good plan to listen very carefully to the consumer's story if he is inclined to talk. In all probability he will contradict himself or give you a point or two to fasten on to. Where servants are kept, be careful not to throw blame indiscriminately on them. Sometimes a servant can be made use of to contradict her mistress in a perfectly innocent manner. Advise your customers, where you consider the meter too small, to have a larger one fixed. Tell them that the meter is over-worked, and it will certainly be to their advantage to have one of larger capacity.

Discussion.

The PRESIDENT remarked that they had the privilege of the presence of one of their patrons—Mr. Pilbrow; and they would like to hear a few words from him. He had had a very large experience, following on the same lines as that of Mr. Fenn.

Mr. E. PILBROW said he did not think he could add anything to what the author had told them. He himself had had many years' experience with the Gaslight and Coke Company, and this agreed entirely with the views put forward by Mr. Fenn.

Mr. F. AINSWORTH remarked that no one could have written such a paper as that they had just listened to, unless he had had a great amount of experience. The author had touched upon almost every phase of the question of disputed accounts. There was no doubt that a great deal of care and skill was needed in dealing with these complaints. Often difficulties arose that were not easily put on one side; and in some cases weeks expired before they could be satisfactorily adjusted. The paper was out of the ordinary line; but it dealt with a subject that was of the greatest importance to every gas company. Mr. Fenn had made some remarks with reference to pressures—saying they ought to be kept up. Take a place where competition was very keen, there was no doubt that if they only had the pressure gas would stand a fair chance; but there was no inspector who could give the satisfaction he would like to, unless he had the pressure at his command—especially when there were houses with perhaps nothing larger than ½-inch pipe. On the other hand, they would find that, if the pressure was too great, heating stoves were in most cases too expensive, unless they were fortunate enough to come across consumers who knew well how to look after the tap. Mr. Fenn was careful to recommend that every endeavour should be made, when taking an order for a gas-stove, to induce the customer to have a regulator fixed. He (the speaker) had yet to be converted to governors for general use, though there were certain places where he did recommend them. But whatever was done, they wanted a simple means by which a consumer would know at once what to do to keep his consumption down. Perhaps Mr. Fenn would give his definition of governors. A case had come under his notice in which the electric light people were

offering to supply a large building at 2d. per unit, though they were charging generally 3½d. But in spite of competition of this character, gas was holding its own, and the electricity people would have to do much more than they had already done before they would keep it out altogether. He had not had a great deal of experience with regard to circulators; but he was sure Mr. Fenn was right in the advice he gave on this subject.

The PRESIDENT remarked that the author had given them his life experience of the working outdoors of a great gas company. He had touched on most of the things it was necessary for them to know if they wanted to see their output go up. In addition to this, he had given them valuable information with reference to fires, cookers, radiators, hot water supply with coke circulators and other kinds of apparatus. He had devoted quite a long time to the question of pressures; and he had given them any amount of information which would enable them to speak intelligently to their consumers when they called upon them. Then he had given them his experience of escapes, and how to detect them; and his instructions to inspectors might be called a complete guide to the outdoor man. Very helpful were his remarks on how to retain customers under keen competition, and his advice with regard to calling on consumers and teaching them something of the uses and misuses of gas. He referred to the lady demonstrator doing this; but she had only a limited amount of time at her disposal, and an unlimited number of consumers to call upon. Consumers rarely saw a lady demonstrator, because there were so few of them appointed. Therefore the inspector had in a great measure to take her place; and if he could put in a pithy and intelligent way all the points with regard to gas heating and cooking, he would do much good. For many years, he (the speaker) had been advocating the use of higher pressures for gas; and he was very pleased to see the author of the paper was of the same opinion. This was not merely coming, but had come about; and they were now getting gas at very much higher pressures than was the case formerly. There were some who thought this was a bad thing; but Mr. Fenn had pointed out to them that an inspector could always arrange to reduce the pressure by means of the main-cock, &c., while the consumer could turn the taps partly off when a full supply of gas was not needed. Therefore, he felt convinced that they were right in asking for these higher pressures. He had been very pleased to see the Deputy Chief Inspector of the Gaslight and Coke Company with them that evening. They had expected a treat; and they had not been disappointed.

Mr. P. E. CULLING said it appeared to him that inspectors were already working very hard indeed; and considering that they had such a large number of consumers to look after, and that as each week went by so many new appliances were being fixed, it seemed almost impossible to him for them to carry out their work in the manner Mr. Fenn had mentioned. He thought that if companies kept in close touch with their consumers, in the same way as the electricity people did, by means of correspondence, showing the advantages that could be gained by using appliances in a certain way, this would prove of great assistance to the inspectors. As to a meter in use that was considered too small, was it a fact that it was to the advantage of the consumer to have it changed for a larger one?

Mr. FENN, in replying to questions that had been put, said that when he was speaking about a regulator, he did not, of course, mean a governor. He referred to the regulator which was fixed by the stove for the purpose of regulating the amount of gas passed. That was to say, supposing a stove should pass 14 cubic feet per hour at a pressure of 2 inches, the regulator would not allow it to pass more than this quantity. This was his idea of a regulator. They had found in many instances where accounts had been excessive that first-class results were brought about by the introduction of a governor at the meter and a regulator at the stove. He had a case on hand now, where, by the introduction of a Stott's governor, and a regulator here and there, and also a check meter for the cooking-stove (which was a regulator against the servant), they had brought the consumption down by just one-half. Mr. Culling had referred to inspectors having already such a superabundance of work that it would be impossible, however much they tried, for them to bring about the results he had spoken about in his paper. Well, if the inspectors had already so much to do, it was, of course, impossible for them to do as he had recommended, and he had no more to say on the matter. But every inspector should to a certain extent work "off his own bat." He had a district given to him, and he did not want to wait for instructions right and left. He should regard his district in a sense as his own shop; and the best thing for him to do was to get hand and glove with his customers. When he was in charge of a particular district, he always found it the proper thing, wherever he could, to wait on the consumers—at any rate, those who had appliances of any size. Where a district was increasing by leaps and bounds, it would be impossible to do this; but in a place like London, where the areas were to an extent already filled up, it was different. If a man had a district, and he found he could not work it to the satisfaction of the consumers and the company he served, he should go to his superior officer and put the matter fairly before him, when he would always get the necessary assistance. As to whether it was to the advantage of the consumer to have a meter changed that was too small, he could only remark that it gave a customer satisfaction to have one which was the right size for his requirements.

Mr. J. HEWETT, in proposing a vote of thanks to Mr. Fenn, said the paper had been extremely instructive to them. Anyone who

required a lesson in fact (which was one of the most necessary qualities to possess nowadays), should certainly call upon the author. In the paper there was a reference to some "C" burners consuming 7 cubic feet per hour. He had been surprised to hear that any such burners should have been fitted up and allowed to be in use. They knew, however, that people did tinker about with these things occasionally, and one could not always be behind their backs; so probably in the instance alluded to, someone had been trying to make the burners do better than they were really intended to. He was sure they would all be glad to see Mr. Fenn again on some future occasion.

Mr. T. F. CANNING, in seconding the proposal, said they had all been impressed by the paper. Twenty years ago, before electricity became such a severe rival, managers easily settled their disputes by cutting off the supply of gas; but Mr. Fenn advocated the more modern method of dealing with the consumer with tact and judgment and courtesy. This was the plan that was successful in the present day; and the old system of cutting off the supply was obsolete. They were all deeply indebted to Mr. Fenn for the generous manner in which he had given the members of the Association the benefit of his long experience.

The vote of thanks was carried with applause; and Mr. FENN briefly acknowledged it, remarking that it had been a pleasure to him to read his paper.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

The Annual General Business Meeting of the Western Division of the Association was held in Glasgow on Saturday—the PRESIDENT (Mr. A. H. Whitelaw) in the chair.

ELECTION OF OFFICE-BEARERS.

The first business was the election of office-bearers, with the following result:—

President.—Mr. D. Currie, of Stirling.

Vice-President.—Mr. J. Fraser, of Provan.

Hon. Secretary and Treasurer.—Mr. D. Fulton, of Dawsholm.

Members of Council.—Messrs. R. Smith, of Dawsholm, W. M. Mason, of Glasgow, J. Mann, of Glasgow, D. Irvine, of Kirkintollock, and F. L. McLaren, of Dumbarton.

HONORARY MEMBERS.

The PRESIDENT intimated that the Council had elected as honorary members of the Association Messrs. G. R. Hislop, of Paisley, James Lowe, of Auckland, and J. W. Napier, of Alloa.

Mr. J. FRASER moved a vote of thanks to Mr. R. A. Campbell for the manner in which he had performed the duties of Hon. Secretary and Treasurer during the latter part of the session.

This having been agreed to, Mr. CAMPBELL briefly acknowledged the vote.

LECTURE BY MR. O'CONNOR ON SUCTION-GAS PLANTS.

The PRESIDENT, in calling upon Mr. Henry O'Connor, F.R.S.E., of Edinburgh, to deliver a lecture on "Suction-Gas Plants," said Mr. O'Connor did not need any introduction to the members, as he was known over the length and breadth of the land, and most of them would have seen that he had recently been delivering a series of lectures in Edinburgh.

Mr. O'CONNOR said: That suction-gas plants have proved a strong competitor of the older method of supplying internal combustion engines with coal gas is most certain, and therefore the few notes I have put down regarding this, and propose to give you, may not prove uninteresting. The gas-engine is generally required during the day, when there is the lowest consumption for other purposes; and consequently the gas-mains are lying comparatively unused, and any apparatus which gives them employment is to be encouraged. On this account, many companies and corporations are prepared to supply the gas so required at considerably reduced rates. The Commercial Gas Company, of London, offer the following discounts from their standard prices, per 1000 cubic feet: When the accounts exceed £100 per annum, 10 per cent.; above £100 and not above £150, 12½ per cent.; above £150 and not above £200, 15 per cent.; above £200 and not above £250, 17½ per cent.; and above £250, 20 per cent. In this way, they have built up a business which is equal to a million cubic feet per day for such power purposes only. The cost of collection per 1000 cubic feet is reduced when such large accounts are obtainable; and in every respect there are advantages which fully warrant the reduction in price. Many small gas-works can, with advantage, offer such inducements, especially where there is a reserve of manufacturing plant, even though the holder room is not excessive, as such gas goes out practically as it is made—merely passing through the holders. There are many advantages to the consumers in the use of the richer gases, with their higher calorific value, as, of course, it is the latter which is of interest for such purposes. Not the least of these is that the gas is better purified, and will not therefore foul the inside of the cylinder, nor, if magnetic ignition be used, the sparking points. The engine will also have more power with coal gas, owing to the fact that the gas is under pressure, and not suction, as it enters the cylinder. This alone equals a loss of 10 per cent. in the power given by a suction-gas engine, as against one using pressure gas. The smaller area of the air-inlets with-

draws the air when the governor has closed the gas-port; and thus a further 4 lbs. suction is made in the cylinder, which means a loss of some 5 per cent. more as against the coal-gas supply. With coal gas, the engine will start away at any time; and, in fact, this is frequently taken advantage of, as coal gas is generally connected to the engine, for starting or breakdown purposes. This has been done so frequently in Edinburgh, that the Gas Commissioners will not supply meters where a suction plant is installed; and if coal gas is required for the purpose, the consumer has to provide his own meter.

The nature of the gases is also of importance. As certain combustible gases, such as CO, will allow of higher compressions in the cylinder, without pre-ignition, than will H and O, the proportions of these two gases are of much more importance. The compression pressure in a gas-engine governs the explosion pressure, as the latter is in direct proportion to the former. If we consider that there is 18 per cent. of H in suction gas, as compared with 53 per cent. in coal gas, we shall have in the cylinder, when the due proportion of air has been mixed with each, a larger proportion of H in the suction gas—viz., 12 per cent.—as compared with only 5·3 per cent. with coal gas. This causes a reduction in the power obtainable from the engines of from 20 to 25 per cent.

The question of the incombustibles in the two gases, as mixed with air in the cylinder of the engine, must also be considered, though this is not a very large matter. With producer gas we shall have (say) 68·7 per cent. of CO₂ and N; and the amount required with this gas will bring with it its proportion of incombustible nitrogen, so that there will be some 72·7 per cent. of incombustibles in the mixture. With coal gas, with 4·3 per cent. of CO₂ and N, 9·25 times as much air can be employed; and the nitrogen in this only brings the percentage of incombustibles to 70·2. With some gases, however, the difference in the proportions would be greater.

We may profitably compare the making of gas by different processes, and we shall thereby learn some useful lessons. We should, perhaps, best take them in the following order: Producer gas, as made in the Siemens producer; mixed producer and water gas, by the Dowson and suction-gas plants; and water gas, by the Dellwik-Fleischer blue water-gas plants and also by the carburetted water-gas plants on the Lowe system.

We may at this point look into the methods of manufacture of the various gases used for power purposes. I need hardly go into the making of coal gas, as I take it you are all familiar with at least the general routine followed. We may, however, consider it as consisting of (say)—H, 53 per cent.; CH₄, 37 per cent.; CO, 5 per cent.; CO₂, 0·7 per cent.; N, 4 per cent.; and O, 0·3 per cent. I will therefore commence with the manufacture of producer gas proper. This consists of the partial burning of the fuel in the producer furnace, so that the carbon is only converted into carbon monoxide by the limitation of the primary ingoing air. This is exactly the same as is done in a regenerative furnace for heating gas-retorts. A small quantity of CO₂ is made at the bottom of the bed of fuel, which serves to keep this hot, but is converted into CO by the addition of a further proportion of C—thus: CO₂ + C = 2CO—as the gas passes up among the deep bed of hot fuel. The gas issuing from the producer thus consists of CO and N. This CO combines in the engine with a further proportion of O, and when compressed and exploded yields CO₂ and N. In this producer plant, without steam, the theoretical composition would be CO 34·7 per cent. and N 65·3 per cent. by volume; and this would have a thermal value of 118·8 B.Th.U. A practical test with coke containing 92·7 per cent. C gives a composition of the gas as follows: CO₂, 2 per cent.; CO, 29·4 per cent.; H, 1·90 per cent.; N, 66·7 per cent. A pound of carbon thus produces, theoretically, 10,190 B.Th.U.

The next gas is the producer gas and water gas from steam, both made together in one producer. In this case, the air, passed up through the bed of fuel, is accompanied by a quantity of steam, made in a separate boiler, and generally used to inject the correct amount of air at the required pressure. In this way the products consist of CO₂ from the gas used to keep the fuel hot; CO from the combination C and O; H from the steam; CH₄; and N. The plant consists of a producer, seal-pot, coke scrubber, sawdust scrubber, and gasholder, together with a boiler to generate the necessary steam. The mixed products would, theoretically, have a composition of: CO, 39·9 per cent.; H, 17 per cent.; and N, 43·1 per cent., with a calorific value of 195·6 B.Th.U. per cubic foot. The Dowson pressure plant, when using anthracite, gives a gas containing CO, 27·6 per cent.; H, 15·3 per cent.; CH₄, 1·4 per cent.; CO₂, 3·9 per cent.; and N, 51·8 per cent. The theoretical produce of 1 lb. of carbon by this process is 14,580 B.Th.U.; while the practical result with gas, as above, is 13,285 B.Th.U.

Suction gas is very much of the same nature, as it results from the use of steam and air; but the proportion of the former is less. The plant consists of a producer, which contains a vessel for water which is heated by the fuel in the producer, a seal-pot to prevent the return of the gas, and a coke-filled scrubber. The air, drawn in by the partial vacuum in the gas-engine cylinder, passes over the heated water, and is thus saturated with the quantity of water vapour which it can carry at the temperature to which it is raised. The making of the gas is thus intermittent, as it only takes place for a fourth of the period, as with the Otto cycle the suction stroke forms only a fourth of the complete cycle—in other words, for half-a-turn of the axle every second revolution of the same. Suction gas does not give such a high heat

value as pressure gas, as it only shows, theoretically, 12,565 B.Th.U. per pound of carbon, and has a composition of (say) CO, 25 per cent.; H, 8·4 per cent.; CO₂, 4·4 per cent.; N, 61·8 per cent.; and a calorific value of 129·83 B.Th.U. per cubic foot. When made on a practical scale, the composition is CO, 19·97 per cent.; H, 15·93 per cent.; CO₂, 7·16 per cent.; O, 0·51 per cent.; and N, 55·14 per cent.

When we make water gas alone, as in the Dellwik-Fleischer system, we have a periodical forcing in of air to convert the fuel to CO₂ for the purpose of bringing it to the proper heat (say, 1000 C.) for dissociating the H and O of the steam, and then the closing off of the air and the steaming of the fuel to make water gas. By converting the fuel to CO₂, we get a shorter period of blowing and a longer one of steaming, and a conservation of the heat contained in the coke or other fuel used to provide the carbon. Thus during the "blow" the gases made are usually CO and N, with the heat retained in the producer, except that which passes away with the products of combustion and the N. If an illuminating gas is required, it is usually obtained by the evaporation of benzol, which gives the otherwise blue flame its illuminating effect by the addition to it of the necessary hydrocarbons without much heat for the evaporation. Taking the blue water gas as made in the Dellwik-Fleischer plant, we have a theoretical product of 14,301 B.Th.U. per pound of C, if no heat were required in the formation; while the practical result is only 10,990 B.Th.U. The theoretical composition is: CO, 50 per cent.; H, 50 per cent., or 344·5 B.Th.U. per cubic foot. The practical result, in working, gives a composition of about H, 51 per cent.; CO, 42 per cent.; CH₄, 0·5 per cent.; CO₂, 4 per cent.; and N, 2·5 per cent.—with a heating value of 318·7 B.Th.U. per foot.

Mond gas is made in its complete form only when some 4000 H.P. and upwards is required, as the full process is only economical on a large scale. This process uses a much greater quantity of superheated steam than other water-gas plants, so as to prevent the ammonia becoming decomposed. The ingoing air and steam are both warmed by the heat of the gas made. The plant consists of a producer, a superheater of the steam and air, a water-scrubber, and an acid-tower, which serves to remove all traces of ammonia, and is usually supplied with 4 per cent. acid, afterwards used for the manufacture of sulphate of ammonia, of which 1 ton is obtained from each 28·5 tons of coal used (this includes the coal used in the providing of the necessary heat). About one-fifth of the heat is obtained by the regenerative principle above described, so that there is not so much loss of fuel as might be supposed. Taking Mond gas as having a composition of: H, 24·8 per cent.; CH₄, 2·3 per cent.; CO, 13·2 per cent.; CO₂, 12·9 per cent.; and N, 46·8 per cent., we have a calorific value of 154·6 B.Th.U. per cubic foot, with a percentage of combustible gas of 40·3.

Coming to the water-gas plants, the one best known in this country is the Lowe, in which the first operation is the blowing-up of the fuel by the forcing in of air at about 9 inches pressure, through the fuel; only such an amount of air being admitted as will form enough CO to be used in the next two vessels, with a further supply of air to each to form CO₂, and thus heat the chequer brickwork contained in the vessels. It will be easily seen where the great difference lies between the blue water-gas production and that where oil has to be carburetted, as the heat generated in the producer is used only to heat the fuel itself. In the carburetting plant it has to heat the carburettor and superheater contents, and make these of a cherry-red heat, for the purpose of converting the oil into gas in the former, and of fixing the same, in combination with the blue water gas made in the producer. The plant has a producer, carburettor, superheater, oil-heater, seal-pot, scrubber, and condenser. When the air is shut off at the end of the "blow," steam is injected under the fuel bed and forms water gas, which then passes to the carburettor and superheater, and thence to the oil-heater, seal, scrubber, and condenser. Such a gas has a net result, theoretically (when making blue water gas only, without taking into account the heating value of the oil), of 877·8 B.Th.U. per pound of carbon; but practically only 848·9 B.Th.U. are obtainable, with a composition of: H, 48·6 per cent.; CO, 44 per cent.; CH₄, 0·4 per cent.; CO₂, 3·3 per cent.; and N, 3·7 per cent. It should be mentioned that the theoretical B.Th.U. have all been calculated without taking into consideration the heat losses by radiation, convection, and heat of exit gases.

We might also examine into the quantity of air which each of these gases will require for complete combustion, though when used in a gas-engine more than this proportion will be required to ensure that all the gases are utilized during the short time the explosion is taking place, as I need not remind you this occurs only during one-fourth of the time the engine is running.

With one cubic foot of the following gases, the quantity of air required is—

	Cubic Feet.
Producer gas	0'74
Dowson gas	1'15
Suction gas	0'84
Mond gas	1'11
Dellwik gas	2'26
Blue water gas from carburetting plant	2'24
Coal gas	4'90

As a matter of fact, whatever gas is being made, the number of heat units in the mixture in the cylinder is practically the same—viz., 70 B.Th.U. per cubic foot—the remainder of the gases being non-combustible. Of course, with a pure gas, such as H or

CO, and a diluent of pure oxygen, we should get the maximum efficiency from our engine, as then the products would be H_2O and CO_2 ; and there would be no N in them to be heated up and to carry away this heat without any useful effect. Where air is used, this N will accompany the O in the proportion of 79 per cent. by volume of the whole. Therefore we shall always have this proportion of non-combustible gas in our cylinders; but the less of it there is and also of CO_2 , the better for the heat and efficiency of the engine.

We can therefore compare our fuel gases on the basis of the proportion of combustible and non-combustible gases in the absolute mixtures found in the gas-engine cylinders; and we shall find as follows:—

Gases.	B.Th.U.	Air Required to equal 70 B.Th.U.	Percentage of N ₂ and CO ₂ .
Producer	115.0	0.64 × 68.7	72.7
Dowson	163.0	1.33 × 55.7	69.0
Suction	129.8	0.85 × 62.3	70.0
Dellwik	318.7	3.55 × 6.5	63.0
Mond	154.6	1.21 × 59.7	60.2
Carburetted water gas	323.5	3.62 × 7.0	63.4
Coal gas	600.0	7.57 × 4.3	70.2

Some notes as to the practical working of two 60 H.P. suction plants I have had under observation for some time may be of interest.

First, as to the starting. This is frequently a difficulty, unless coal gas is connected up; though it is generally stated that the engines can be started within twenty minutes of the fire being lighted. I have known many occasions when the men have had to be sent home until after breakfast time, owing to the delays in starting. The trouble is largely due to the fouling of the points where the spark is made by the magnets; and these always require heating before starting. To obviate this trouble of starting, it has been found necessary to keep the engines running light during all meal hours. Although there is little work to do in charging the producer, it is found necessary to keep one man in constant attendance. The amount of fuel required is 1 lb. of anthracite—at, say, 17s. 6d. per ton in Edinburgh—for each horse power. For a period of 1235 hours, this equals 61 lbs. per hour for a 60 H.P. gas-engine.

Water is required for the generation of steam. It is important that there should be sufficient of this, but not too much, or heat will be wasted in heating it to bring it to the temperature of the ingoing air to saturate it. There is also required a constant supply to the coke-scrubber; and the overflow of both runs into the seal-pot, and thence to the drain. In nearly all works water is being used in varying quantities for other purposes. This causes a variation in the rate of supply to the suction plant; hence the need of the man's constant attendance to regulate the flow of water to it.

The scrubber, which is filled with ordinary gas coke to pass through a 2-inch ring, is a cause of trouble in a short time, as every month, or perhaps every two months, it has to be emptied, owing to a heavy deposit of tar all over the surface of the pieces of coke. It is curious that this material (coke) is used for the filling of the scrubbers, when it has been long proved that it is unsuitable for scrubbing gas, and other fillings, such as boards on edge, have been adopted in nearly all gas-works, owing to the clogging of the coke if any tar came forward. Probably the desire for cheapness of first cost, and the competition among makers, prevents the adoption of boards, which would undoubtedly be more expensive than coke. This question of the competition between manufacturers and the cutting of prices makes it very important that the public should have the advice of engineers with the right experience, and who would be disinterested in the choice of a plant, to enable them to choose the one most suitable for the work required. Some which have been fixed recently will, I fear, not be of much use in a very few years' time, owing to their flimsy construction in vital parts of the apparatus.

Discussion.

The PRESIDENT said that Mr. O'Connor had very kindly thrown his lecture open to discussion; and he would be pleased to answer any questions which might be put.

Mr. P. M'DOUGALL (Helensburgh) said it would be difficult for anyone to endeavour extemporaneously to criticize the figures that Mr. O'Connor had given them. The subject of town gas in competition with suction gas, electricity, &c., had been foremost in the minds of gas managers in recent years. Of the numerous rivals on the market, he believed that suction gas was the only competitor which would prove, and was proving itself, formidable to gas managers, so far as the power business was concerned. Therefore it behoved those interested in the welfare of the gas industry to go thoroughly into the question, and satisfy themselves of the advantages, if any, that producer gas possessed over town gas as a prime mover. They sometimes heard such statements as "100 per cent. cheaper than town gas," and so on. Gas managers would require to examine the veracity of those statements, and determine if these collateral advantages were actually obtained under the ordinary working conditions, taking all things into consideration. He believed a comparison on a fair basis between town and suction gas would show that suction gas was not nearly so serious a competitor as the manufacturers of the plants advertised it. They must keep in mind that fuel was not all that was to be considered. Some-

thing must be allowed for cleaning, and for water, oil, and maintenance; and to this must be added the cost of providing duplicate plant or installing town gas. In future, he believed, the attention of engineers would be concentrated more on the efficient utilization of heat, and in devising ways and means for making it possible to have the fuel burned on the piston, which would give a higher range of power. In his opinion, the time was coming when the internal combustion engine would entirely supersede all other forms of prime mover.

Mr. J. M'GHEE (Glasgow) believed that every one of them would go away with much clearer ideas of the various methods by which those gases were manufactured. Some time ago, he saw the Dellwik process in operation in Messrs. Dempster's works at Elland; and he formed a high opinion of its capabilities. Mr. O'Connor had, he might say, confirmed this opinion. In one or two towns in Scotland the use of suction gas was a matter of serious consideration. He believed there would be startling developments in the price of coal gas in the near future.

Mr. F. L. M'LAREN (Dumbarton) thought they had all enjoyed the lecture. They had received much information about the different types of producers—not in an off-hand manner, but with facts and figures to support every point. As he was anxious to stick up for the producer-gas engine, there were one or two minor points he would refer to. One of these was the difficulty in starting. It seemed strange to him that, in spite of all the competition among makers, engines were sent out, and the purchasers were allowed to discover what was the best thing to do to make them reliable and useful. He knew of a 60-H.P. plant in which town gas could not be done without for starting, on account of moisture gathering in the plug. The works manager got a spare plug; and the man in charge of the engine had orders that this spare plug was to lie clean and polished, on the top of a warm part of the engine, ready for use every morning, and was to be put in regularly each morning, whether the old plug was likely to give trouble or not. By doing this, they had been able to dispense with the use of town gas in starting; and they had no trouble now. With the clean, dry plug, ignition difficulties were done away with; but, so far as he knew, the manufacturers of the engine did not make a point of supplying spare plugs to their customers. Reference was made to the collection of tar in coke-scrubbers. He did not know if he was right or not, but he thought that the collection of tar in the scrubbers was surely due, to a certain degree, to the scarcity of water for cleaning. But there was the point that when they supplied a liberal amount of water, there was the objection of the moistening of the gas; while the drying of the gas again was obtained by passing it through a sawdust scrubber. He would like to ask if no trouble was experienced with those sawdust scrubbers, by the sawdust being carried over by the gas into the valves, and causing them not to get down to their seats properly. The efficiencies which had been given them, he thought, were very favourable for producer-gas engines; and he believed they were very modest. He thought the efficiencies given in the comparisons between the gas-engine and the steam-engine were being superseded now. It was a feature of Mr. O'Connor's lecture that in it there was no exaggeration, but solid figures; and he was sure he expressed the views of everyone in the meeting, when he tendered his thanks to Mr. O'Connor for the information he had given them.

Mr. W. M. MASON (Glasgow) said they must look upon the gas-producer as a very serious competitor; and it would be wise on their part not to criticize it too strongly, but to endeavour to find methods of improving their own working. Of course, the principal method of improving was the reducing of the cost. If corporations and gas companies could make a special bid for gas for power, he thought they would be taking a step in the right direction. Mr. O'Connor referred to one of the troubles they had with producer plants—that of the difficulty of starting the engine. It might be interesting to know that in Glasgow there were so many stand-by meters that the Gas Committee had to make special rates for them. He supposed that all the large installations in Glasgow were supplied with a stand-by. Within the past year, at least three producer plants had been cleared away because they were not reliable, and town gas introduced.

The PRESIDENT proposed a very hearty vote of thanks to Mr. O'Connor for his most interesting lecture. He would look forward to seeing the lecture in print, because there were a great many figures given them which he would like to see again. Those who had made the subject a study knew that the number of calculations which were required to prove the facts was enormous; and he would not like to say much upon the figures that night. He might say that the one which surprised him most was the result of the Dellwik blue water gas—its comparison against carburetted water gas. He had no idea that there was such a big balance in favour of Dellwik blue water gas. There was no doubt that the question of suction gas had to be faced. Suction gas had come to stay, much as they disliked it; and anyone in the gas industry who would turn his back upon it, or sneer at it, or throw cold water on it as it were, would be no friend to the industry. The gentleman who said that night that the internal combustion engine was the thing of the future spoke a great truth. So far as efficiency was concerned, the internal combustion engine held the first place. On the question of which gas was the best, there were only, so far as they were concerned, two kinds of gas—town gas and suction gas; and for thermal efficiency—he would be very glad to be contradicted—he thought the suction producer had the best of it, for the reason that suction gas was a lean gas, and town

gas was a rich one. Suction gas, being a one constituent gas, did its work better than a gas which contained a high percentage of hydrocarbons.

Mr. O'CONNOR thanked the members very cordially for their vote, and also for the attention which they had given to the lecture. He knew there were a number of very hard figures in it, and very elaborate formulæ, which they could hardly follow in the course of listening to the lecture. He considered it was necessary to give them some figures which perhaps had not been usually given in discussions and in papers that were being read upon suction and other producer gases. He also thought it might be interesting to them to have a comparison between suction gas and coal gas—comparison not upon cost, but upon efficiencies. The efficiencies of any plant for the provision of power, no matter what it might be, must first be brought back to the fundamental source of power, which, in all these cases, was coal; but to speak of coal alone would not do, because they knew that every different coal, or every different colliery, varied in nature from others, and the proportions of the coal they had principally to deal with in the matter of producer plants or water-gas plants was the carbon. Consequently he made a number of calculations; and, as the President very wisely said, these calculations involved a large number of figures. As to the comparative efficiency of (say) suction gas and coal gas, he did not think it was entirely a question of lean gas and rich gas. What it really consisted of was the proportion of carbon monoxide or of hydrogen which the mixture would have when it got into the cylinder of the engine. They could compress carbon monoxide much more than they could hydrogen. Consequently they got a greater amount of explosive power, because the more they could compress gas the more they multiplied the power which they obtained from the gas-engine. About four or five times was the compression power of the pressure they obtained in the cylinder; so that if they increased it in the compression period, it would be multiplied four or five times in the explosion period. He had not given comparative costs, but comparative efficiencies; but if they had efficiency, they would have cheapness. He was sorry to say that in one of the cases he referred to the use of two plugs did not effect the required remedy. Starting had been a continuous trouble until coal gas was applied to this purpose. Tar would always be deposited on coke. The very shape of coke, and its roughness, would always cause tar to be deposited in the scrubbers, if there were tar coming forward. He thought that smooth boards might be used in the scrubbers of producer gas plants with advantage. There was not much trouble in the use of sawdust, because it did not come forward into the engine itself. He did not remember seeing a sawdust scrubber used satisfactorily with a producer plant; and possibly that was for the very reason mentioned—that dust might get forward. As to reducing the price of gas for power purposes, he heard only the previous day of an offer by an electric light company or corporation to supply motive power at 1½d. per unit if it were taken during the day or night, excepting between the hours of four and six o'clock. As regarded being forced to supply coal gas whenever it was required, he might say that in Edinburgh Mr. Herring would not do it. He required a would-be consumer to agree to his having the right to close the supply completely at any time it suited his purpose. He did not know if Mr. McDougall was aware of a coal-dust engine, which, curiously, was invented by a townsman of his own—an Helensburgh man—in which the coal dust was introduced into the cylinder of the engine, and was there converted into gas. Once started, the heat of the explosion made it hot enough. This engine was worked for some considerable time; and he thought that if there had been more money at the back of it, it might have done very well indeed.

The President intimated that this closed the session; and he asked the members to endeavour to make next session as successful as the past one had been.

Manchester District Institution of Gas Engineers.—We are asked by the Hon. Secretary (Mr. W. Whatmough, of Heywood) to notify that the next meeting of the Manchester District Institution will be held on Saturday, the 22nd prox., instead of the 29th. Further particulars will be forthcoming. Meanwhile, it may be mentioned that a paper has been promised by Mr. E. A. Harman, of Huddersfield.

The Visit of the Cornish Gas Managers Association to Plymouth.—As mentioned in the "JOURNAL" last week, the members of the Cornish Association of Gas Managers went to Plymouth on the 15th inst., to inspect the plant of the British Coalite Company at the works of the Plymouth and Stonehouse Gas Company. After luncheon, the party (which included several ladies) proceeded to the offices and show-rooms of the Gas Company, and examined the various appliances on view there; among them being a new inverted mantle which gives a golden yellow light instead of the white light which characterizes the ordinary incandescent mantle. This mantle attracted considerable attention. From the show-rooms the party proceeded to the gas-works, where Professor Lewes explained in detail the working of the coalite apparatus. This was fully recorded last week (p. 146). At the conclusion of the visit, a vote of thanks was passed to him for coming down from London to describe the plant, and also to Mr. P. S. Hoyte, the Engineer and Manager of the Gas Company, for allowing the members to visit the works and inspect the Company's plant and offices. The party left Plymouth by the 6.40 p.m. train, after having spent a most interesting and pleasant day.

THE INSATIABLE CAPITAL RAISERS.

We have in our possession prospectuses of the East Sussex Gas and Water Company dated Jan. 16, Feb. 1, Sept. 19, and Sept. 29 last year; but, although the Directors have been so frequently and so recently urging the public to entrust more money to those guiding the fortunes of this concern, a fresh prospectus has been issued inviting applications for 483 ordinary shares (*unrestricted as to dividend*) of £5 each. This represents the balance of the original so-called "authorized" capital of £25,000. So that, without this new issue, the Company have a heavy capital burden to bear. Generously the Directors have decided that (this is the common finesse in connection with the 99, Cannon Street promotions) the shares shall rank for dividend as from March 25 last. It is nice perhaps to "rank" for dividend; but the ultimate satisfaction depends on whether there are profits with which to pay dividend. On the accounts issued last year, there was a debit balance on the working, so that there were no profits for distribution.

In the present prospectus, it is announced, in black type, that the increase in the gas output for the December quarter of last year was nearly ½ million cubic feet over the corresponding period of 1907; and for the past quarter, 186,500 cubic feet over the first quarter of last year. The increase of water revenue in the past March quarter is said to be 30 per cent. The Directors would give a little more solid and reliable information by quoting the total figures of the sales. Considering the debit balance on the working a year ago, these increases of business will not go far towards paying dividend on the Company's heavy capital. Supposing 5s. per 1000 cubic feet is the charge for gas, an increase of ½ million cubic feet would only represent a revenue of £125, out of which all expenses of manufacture and distribution have to be paid. The "Important" "Natural Gas Development," with the report of Mr. Heims on the subject, are made use of in the same terms as in the prospectus of September last, with a little more emphasis thrown in. These matters were commented upon at the time in our columns. There seems to have been a shuffling-up of the management of the concern. There has been a good deal of change since the Company originally started. At the meeting of the shareholders in August last—in the country, and on the Saturday before Bank Holiday!—Dr. Allan Maclean presided. Mr. Edmund Eaton was the other Director present. Mr. Alfred Schofield was absent owing to ill-health. On that occasion, Mr. Grimes was put on the Board in place of Mr. Schofield. When the prospectus was issued in September last, Dr. Maclean was Chairman, Captain F. Jenkins, D.S.O., appeared as Vice-Chairman, and H. P. Davies as Secretary. In the present prospectus, Captain Jenkins, D.S.O., has been promoted to Chairman; and Mr. W. J. E. White comes on to the scene as Secretary and Director. Where, we may ask, are the others?

Memorial to the late Sir George Livesey.

Readers of the "JOURNAL" will doubtless remember that after the great strike at the South Metropolitan Gas-Works a testimonial was presented to the late Sir George Livesey, and that the balance of the fund raised for the purpose was, in accordance with his expressed wish, expended in the provision of a recreation ground on Telegraph Hill, Hatcham. He also gave a drinking fountain, which stands in the ground, now St. Katharine Park; and shortly after his death it was suggested that this should bear some suitable inscription to associate it with its generous donor. This has recently been put upon the base of the fountain, and runs as follows: "The acquisition of this Park was largely due to Sir George Livesey (for many years Chairman of the South Metropolitan Gas Company), who, in order to secure it as an open space for the people, himself contributed £2000 to its purchase. He added to his generosity by erecting this Fountain."

"Transactions" of the Association of Water Engineers.—We have received the "Transactions" of this Association for the year 1908. The volume contains the reports of the proceedings at the thirteenth annual general meeting, held in Birmingham in June, and at the winter meeting, held in London in December, under the presidency of Mr. H. E. Stilgoe, M.Inst.C.E., the City Surveyor of Birmingham. The President's Inaugural Address and the papers, which are all of an instructive character, are accompanied by a number of folding plates, as well as by illustrations in the text. The subjects discussed at the two meetings were noticed in the "JOURNAL" at the time. In addition to the technical matter, which includes the interesting extempore lecture on the "Measurement of Rainfall" delivered by Dr. Hugh Mill, the President of the Royal Meteorological Society and Director of the British Rainfall Organization, at the winter meeting, abstracts of legal cases bearing upon water supply, a summary of the contents of the preceding twelve volumes of "Transactions," the useful subject-matter index brought up to date, and a catalogue of the library. As usual, a portrait of the President is given as a frontispiece to the volume, which has been produced under the editorship of the Secretary of the Association, Mr. Percy Griffith, M.Inst.C.E., F.G.S.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Edinburgh.

The Waverley Association of Gas Managers held their Ninety-Third Meeting on Friday in the rooms of Messrs. Ferguson and Forrester, in Princes Street, Edinburgh. There was a very gratifying attendance of members. The President (Mr. W. BROWN, of Lasswade), on taking the chair, extended a hearty welcome to all who were present.

THE PRESIDENTIAL ADDRESS.

The PRESIDENT, in his address, said: I beg to thank you for the honour you have conferred upon me by electing me your President for the past year. Following a long line of Past-Presidents, men of no mean degree, who have in the past, as well as in the present, taken a foremost place in the ranks of the profession, it is no light task that falls to my lot to-day. But it should be the aim and ambition of everyone to try worthily to follow in the steps of those who have gone before, and not be content with things as we find them, but try and improve ourselves and all with whom we come in contact. I am convinced that this can, to a certain extent, be attained by meetings such as these, when we can come together and exchange views on our daily work, and have the experience of others who, perhaps, are better able to give because of the magnitude of their works. And I am confident that such men are always willing to help their fellows. The ultimate result will be that the corporations and companies that we serve will get the benefit; and I am sure you will agree with me when I say that in many places these efforts are not so well supported as they should be by those who, in the long run, reap the benefit. For you find that very many of the managers have themselves to pay all their expenses in attending these meetings; and this cannot be very well managed out of the salaries that many corporations and companies pay. I see from the Technical Press that exception is taken to a salary offered for a certain position. But are we not ourselves to blame for this condition, by reason of the fact that for every situation advertised there is always a great demand? I have known cases, even, where certain men have offered their services for a smaller sum than was originally intended to be paid. Therefore corporations and companies are not always to blame.

We are reminded to-day that each year sees the disappearance from our midst of old and familiar faces. We have to record the retirement from ordinary membership of two of our old and valued friends—Mr. Fraser, of Gorebridge, and Mr. Bell, of Dalkeith. Mr. Fraser, though of a quiet disposition, possessed a warm heart, and always took a great interest in the welfare of the Association. It needs no word of mine to tell you of Mr. Bell's worth. Suffice it to say that he is the "Grand Old Man" of our Association. He has been always willing to help any who sought his advice, and no one was ever turned away who did so in times of difficulty. I know that he has, on several occasions, come to the help of the Association, when needed. During this day's proceedings, we will show, in a more tangible way, our appreciation of his services to us. Our best respects go with him, and may he long enjoy his well-earned rest.

Our industry continues as prosperous as ever. If one is in doubt, just look at any of the technical papers, and you will be convinced at once; and more so when we see so many attempts made to float companies in almost every part of the globe, some of which will not be anything but gas-works in name. Then there is evidently a strong desire for many to get into the ranks of the gas profession, as is evidenced by the fact that one occasionally sees that £10 will be paid to anyone getting the advertiser a situation as gas manager. It seems to me there is a feeling abroad that anyone can be a gas manager; and I think it would be well for our Association to look into the matter, for evidently men who have by their ability shown their worth are not wanted, and are being set aside for those who are technically trained. Not that I would say anything against such a training. But this is not everything. There should be alongside such a training an apprenticeship served; and the aspirant for a gas managership should learn everything from the bottom of the ladder to the top. Then, in the language of Mr. Wilson, of Glasgow, they would know when men were really doing a day's work. We have also before us the fact that many situations advertised at the present time are advertised without a salary—that is to say, that the applicant has to state his remuneration. This often leads to unduly decreasing salaries, rather than the keeping of them up. I would suggest that here our Commercial Section might help us, or representatives from all our Associations. We might have an inquiry office where, in cases of this kind, the applicant could apply for help and advice, and so prevent, to a certain extent, the cutting of salaries that goes on.

There has been quite a stir lately in the gas profession as to the best method of increasing the sales of gas. Many and varied are the means suggested—among others, a differential price. I think the better way would be that, instead of having different prices for different consumers, we should have a uniform rate for all parties; and to encourage business, liberal discounts should be given to parties who use a given quantity, as well as some

rebate for quick payment. For remember that, whatever may be said to the contrary, it is to the middle and working classes that we have to look in the future, as in the past, for our best customers. I do not think it is consistent that we should give a person who uses gas for power and heat gas at (say) 1s. 6d. per 1000 cubic feet, while to another person we charge the uniform rate, simply because he uses it for light only—the one consumer using as much as the other, and sometimes more. To explain what I mean, in Lasswade we have several gas-engines working, the users getting gas at the uniform rate, less discount; their yearly bills being, on an average, about £20. We have several other consumers who actually use as much, and sometimes more; but because they use it for light alone, they are charged the uniform rate. I think it would stimulate business if we had a fixed quantity for the uniform rate, and arranged for all who used more to get a liberal discount, whether they used the gas for power or for light.

We have also a good field before us in the prepayment consumer; and I cannot understand why these poor people, who, upon the whole, are very good customers, have to pay more. I know objection will be taken to this on the grounds that the meters cost more, that it takes more time to survey them, and that their life is not so long. But this is not the people's fault. Remember, we are the merchants; and possibly a good few of these people would be quite content to jog along in their own way. But not being content with what we have done, we look around for pastures new, and we offer to put in a prepayment meter, and possibly fittings and a boiling-ring, or perhaps a gas-griller; and instead of trusting to the increased consumption, which naturally follows, to repay us, we charge them more than ordinary consumers. In some cases, the difference in price is over 1s. Why this should be, I cannot understand; for my experience has been that the people who have such meters generally burn more gas than those with ordinary meters. Then you have no trouble with bad debts. I submit these customers are a source of revenue to the company or corporation. I understand the difference in price of a two-light meter is only 13s. The time taken to survey prepayment gas-meters varies; but I should say a fair average would be about 50 per day, while for ordinary a fair average would be 150. Then I do not see that there should be much difference in the life of the meters. I remember, some time ago, Mr. Ballantyne, of Hamilton, preparing an exhaustive report on the extra charge for prepayment consumers; and among other items were the following:—

Interest and sinking fund on extra cost of meter.	s. d. 1 0½
To survey ordinary meters, cost 0·26d. each time = 0·78d. per annum.	
To survey prepayment meters costs 1·93d. each time = 7·72d. per annum—a difference of	0 7
(Ordinary meters are surveyed three times a year and prepayment meters four times; a man being able to do fully 200 ordinary meters in a day, and less than 30 prepayment meters.)	
Attendance to meters by plumber costs for one year, for ordinary meters, 3d. each, and prepayment meters 8½d.—a difference of	0 7½
Damage to meters and robberies for one year	0 1½
Difference between repairing ordinary meters and prepayment meters, calculated at	1 6
Total extra	3 10½
There falls to be deducted from this the bad debts on ordinary meters, amounting to	0 6½
Net extra cost for each prepayment meter as compared with ordinary meters	3 4

Suppose the extra cost be 3s. 6d., as compared with 3s. 4d. by Mr. Ballantyne, I submit that we have (in the extra consumption, the benefit of ready money, and of the consumers that we would not otherwise have) all the extra to cover the price of meter, &c. Mr. Ballantyne finishes his report by saying that to cover the extra cost of meter would require an additional consumption of 8000 cubic feet at 5d. per 1000 extra. But I would urge, if it can be proved that a person uses (say) 1000 cubic feet extra at 3s. 6d. per 1000 feet, then you have your requirements met. And my experience has been that, instead of 1000 cubic feet extra a year, you very often get anything between 2000 and 3000 feet.

Commercial Sections have been in operation for some time in connection with the North British Association; and I am hopeful that before long we shall have one in full working order in connection with our Association. Personally, I am convinced that the benefits to be derived from such sections are of immense importance—more particularly to those of us who are in charge of small works.

I expect that our companies and corporations will be able to get their coal on more favourable terms this year than last; and I may here say, in passing, that I do not think we have much to fear from the operation of the Miners' Eight-Hours Act. Certainly, there may be a little trouble at the start; but once it is in actual operation, I think it will ultimately come that coal will not be any dearer than at the present time.

I do not think I can tell you much about Lasswade to interest you. Some two years ago we put up a new set of condensers, which I will briefly describe. Being very much hampered for want of room, we had to place our condensers and scrubber in the garden on the opposite side of the road from the works; and some objection was raised to them standing very high. So, after making some inquiries, it was decided to put up a set of inclined condensers; and the following is the specification: Cast-iron chest 12 ft. by 2 ft. broad by 3 ft. 6 in. high, 14 flange and faucet saddles to suit the slope of the ground, 14 Mannesmann 9-inch steel spigot and faucet tubes, seven of them about 20 feet long and the other seven of a length to suit the slope, with cleaning bonnets, &c. My reason for adopting these was that, in the event of any enlargement, we can take off the bridge-pipes, put in another length, and increase our condensing power at a trifling cost. We have also put up a new holder; and during the summer there was laid about a mile of Mannesmann tubes, 4 inches in diameter, with lead-wool joints. As there was no connection to come off this, I can tell you it was a great advantage. Certainly, there was a little more elbow grease required in making the joints, but the benefits otherwise more than repaid the extra labour; and the ease with which one could get round a corner was a source of wonder to many who had not seen the like before.

Discussion.

Mr. W. BLAIR (Helensburgh) thanked the President for his address. The subjects he had dealt with were of interest to all who were connected with the management of gas-works. The question of the filling of vacant situations in connection with the management of gas-works was a pretty old bogey, and had been before them for a good many years. It changed from time to time. Sometimes it seemed to be that almost boys from the fourth standard were selected to fill important situations. At other times old men, getting on to the sere and yellow leaf, were selected to fill situations—such as he had himself. But it was a pity that Associations such as theirs should not form themselves into a sort of Trade Union, and endeavour to see that situations were filled up by men of ability. He did not discredit technical education in the least. Still, after all technical education, it was practice which paid—it was practice which was the mother of technical education. It was in practical experience that all technicalities were produced. They had seen situations filled in which, if a committee of gas managers had been consulted, the appointment would have been different. It was a thing he would like very well to see taken up by the Institution of Gas Engineers, and other bodies, if at all possible, because corporations and companies were trying to get officials at the cheapest possible rate. He knew that technical education might give a groundwork; but with all the technicalities possible, a manager, on going into a gas-works, was simply entering upon the beginning of his education. He did not think there was much to be gained by differential charges for gas, particularly in residential localities, such as Helensburgh was. They had differential charges; but he induced his Council to reduce the price of gas to the lowest possible, with one figure for all. This seemed to suit the community very well. They should not forget that it was the lighting customer who had brought them to their present state, and who had been their supporter all along. He thought that many were making too much of a reduction to those other people, who might throw off their supply at any time. However, the question was one for everyone to deal with for himself. He did not know that it would not be better if, as the President stated, discount were given to all consuming over a certain quantity of gas. The President referred to the prepayment consumer. If it had not been for the prepayment consumer, he (Mr. Blair) was afraid some of them would have been at a standstill. In the majority of cases, he was persuaded, nearly 50 per cent. of the increase in gas-works output, during the last fifteen or twenty years, was due solely to the development of the sale of gas by prepayment meters. In many cases the prepayment consumer was being overcharged. They were taxing him really for becoming a customer, when they charged him more than 5d. per 1000 cubic feet extra. He thought the prepayment consumer should be encouraged. There was only an extra 13s. expended upon the meter; and in some cases the additional consumption would run up to even 10,000 cubic feet. In large cities it might cost something to survey the meters and collect the coin; but in a district like the Waverley, there was sufficient time for the manager to do the work without any extra expense. They had about 350 prepayment meter consumers in Helensburgh. The extra charge was 10d. per 1000 cubic feet; but he was quite prepared to advise that it be reduced to 5d. He was convinced that this would meet all their extra cost. Seeing that they were giving meters free to other customers, he did not think they should charge prepayment consumers all the cost of supplying their meters. In the majority of cases, he found they got more from a prepayment consumer than from an ordinary one. He did not think that the Miners' Eight Hours Act was going to affect them very much. A great many miners had been voluntarily working no more than eight hours a day. He must compliment the President on adopting inclined condensers. This was a form of condenser that he had a special love for. They could be easily extended; they were easy of access; and condensers of this sort would assist their scrubbing arrangements to a great extent. He had no doubt the President would find that his liquor would be 2° or 3° Twaddell greater in strength than with an ordinary condenser.

Mr. H. O'CONNOR, F.R.S.E. (Edinburgh), said he supposed they would expect him to make some remarks on the question of the training of the gas manager. He had had a good many of the younger gas managers through his hands, in attending his lectures; and he quite agreed that mere technical knowledge was not in any way sufficient to enable a man to take up the work of a gas manager. He must at the same time have his own practical experience. But he considered that gas managers should have technical knowledge as well; and it was only by attending the classes which were now being held all over the country that a man could make himself really efficient on the technical side, so as to be able to carry on the work satisfactorily, both for himself and for the people he served. He thought the suggestion Mr. Blair had made—that a committee of gas managers might be called in by corporations and companies when they were appointing a new manager—was really a most excellent one, and one which would be of great assistance and benefit to the companies and corporations. At least a committee might go so far as recommending (say) two or three of the candidates as being the most suitable to choose from, and allow the company or corporation to select finally for themselves. As regarded the question of differential prices for motive power and for lighting, the Commercial Gas Company (London) gave a discount, for the first £100 worth of gas used for power, of 10 per cent.; for £150, of 12½ per cent.; for £175, of 15 per cent.; for £200, of 17½ per cent.; and for £250, of 20 per cent.—if the gas were used for power only. If power were required principally during the day, the mains through which the gas was supplied—more especially in the case of smaller companies—were practically lying idle, except for the few hours when gas for cooking would be required. Consequently, the cost to them would not be so great as it was in the case of the ordinary consumer, who took gas at the peak of the load. Gas supplied during the day practically did not require a holder at all. The gas as it was made simply passed through the holder to the mains, and direct to the gas-engine; and then, again, they could supply a much increased quantity of gas during the day without extending their retort power. They would be merely keeping their retorts going at full stretch during the day instead of having them lying off waiting for the night. So that, he thought, a reduced price for power was well worth consideration, especially when they looked into the question of suction and producer gas. When they did this, they found that, unless they could reduce the price of coal gas, it would pay the consumer to put down plant for himself, and manufacture producer or suction gas, and provide power which otherwise he might be able to do with coal gas. They had thus several reasons for reducing the price of gas for power, especially when this was required during the day. As to the charge for gas used through prepayment meters, the President mentioned that 3s. 4d. per 1000 cubic feet extra would be required. If they had 4000 cubic feet of gas consumed per annum through a prepayment meter, and they distributed the 40d. over this quantity, it came to 10d. per 1000 feet as the amount of the extra cost for wear and tear, collection, and so on. That was to say, with a consumption of 2000 cubic feet they should put on about 20d. to make it equal to the charge to an ordinary consumer. In small towns, therefore, where the consumption would be about 2000 cubic feet per annum, an extra charge of 10d., which was a usual one, did not seem to him to be too high to bring a prepayment meter consumer into line with one using an ordinary meter. He had not had the opportunity of seeing the sloping condensers since they were put up; but he saw the drawings, and he must say that the plan was a most admirable one for obtaining the necessary area without raising the condensers up into the air, and making them an eyesore in the place.

Mr. D. MACFIE (Edinburgh) thought the President made a very sensible protest against the ridiculously small salaries that were being paid to gas managers in Scotland. He had recently to do with the appointment of a manager for a Continental gas-works, and he was surprised at the number of applications, and at the experience which many of the applicants had had—being men who had spent a good deal of time in connection with gas-works, and who were willing to give their services for a very small sum. With regard to the point raised about a committee of gas managers assisting in the selection of officers, he was afraid it would not work very well. It would open the door to a good deal of backstairs influence; and he thought there were few who would care to act upon such a committee. He considered that the proper plan would be for corporations and directors to make a point of visiting the works of those who were put upon the short list. He was sure they all heartily endorsed the President's remarks about Mr. Bell, who had been so long connected with the Association, and who had also done such excellent work in connection with the North British Association. He was a man of unique and large experience, and in connection with his friend the late Mr. Young, of Peebles, was kept in touch at all times with the latest results in the manufacture of gas. The question of the supply of gas was very different now from what it was fifty years ago. Then they were all gas lighting companies; but now they were not simply makers of gas for lighting, but for cooking, heating, and power as well. The change was such that he thought differential prices were fully justified; but all companies and corporations must decide this question for themselves. He had a case in point which might illustrate what he meant. He knew of a corporation who were supplying gas through a 3-inch main to a manufacturing works. They had no power to make differential rates, and were charging about 3s. per 1000

cubic feet to all consumers. The manufacturer consequently set about seeing what he could do with a suction-gas plant. He had seen a large consumer lost to a corporation because they had not the power to charge differential rates. They were aware that the prepayment meter was introduced largely to tap a new source of supply—the supply of gas to those whose credit was not good, or who had not the thrift to save 10s. for the quarterly bill. The prepayment meter was so successful that he believed, in many towns, a larger number of these meters was being used than was really justified, because, so long as a customer paid his account regularly, and his credit was good, it did not appear to him that he should get a prepayment meter. When they came to the question of how much extra they should charge, they must remember that in some towns meter-rents were still charged; and if this were so, a larger charge must be made for prepayment meters. In towns where meter-rents were abolished, one felt it was time that all meters should be on the same footing.

Mr. W. CARMICHAEL PEEBLES (Edinburgh) joined with the other speakers in congratulating the President upon his address. He did not think that because gas was to be used during the night, consumers should be charged more for it. Suppose they were to put it the other way, the charge would not be agreed to at all. He thought the better plan was as had been introduced by Mr. McLusky at Perth, to make a certain charge for gas to all, and then reduce it according to the quantity consumed. The conditions were such that they should not only give a reduction to the consumer who used gas for power, but also to the one who used it for lighting. The President's arrangement of the condensers was one which would suit very well in small works. They could not do too much in the way of looking after the appearance of their works.

Mr. J. TULLOCH (Loanhead) considered that prepayment meter consumers should be charged about 10d. per 1000 cubic feet extra. Those who took 5000 cubic feet in a year would only pay 4s. 2d., which would pay for the meter. Meters were only guaranteed for five years, though they knew them to last longer.

Mr. D. VASS (Airdrie) said his experience was that the quantity of gas consumed by automatic lighting was very much below the average of that consumed in ordinary lighting—in fact, it was nearly half. If the automatic consumer used the same quantity as the ordinary consumer, the difference, in his case, to meet renewal charges and extra cost would be 3½d. or 3¾d. The slot consumer, in his case, using only about half the average quantity taken by the ordinary consumer, the extra cost worked out at about 6½d. They charged 5d. extra. A fair way to look at the matter was to consider what were the extra charges, and the repairing charges, on the respective consumers, and thus arrive at a figure to justify them making a difference in the rate.

Mr. J. M'LAREN (Duns) referred to the remark by Mr. Blair about the formation of a union. This was a thing they ought to have. Corporations and companies did not always know the value of their gas managers; and he thought it would be a very good thing for them to form themselves into a union, so that they could go together and assist anyone who might be in difficulties. When he went to Duns, ten or eleven years ago, there were no prepayment meters in use. He introduced them—he was sorry to say not many, about thirty; and he had had little trouble with them. They charged 2s. 6d. a year meter-rent, the same as for ordinary meters. He had never altered these meters. When he changed the price, he gave the consumer the extra cash back, after taking what the meter registered. The price of gas was the same for both classes of consumers—5s. 5d. per 1000 cubic feet.

Mr. VASS remarked that if anyone came after a certain hour at night, he had to pay the charge for a man going to attend to a prepayment meter. During the week, and on Saturday afternoon, the charge was 6d.; on Sunday, it was 1s. They had sometimes had trouble with ice-cream shopkeepers hunting up their men on Sundays, on account of their meter having stuck on the Saturday night. By making the charge, they had stopped a great many of the crooked pennies. The people were now more careful and did not seek to put in twisted coins.

Mr. A. MACKENZIE (Edinburgh) had no hesitation in saying, from information he had received from all over the country, that an excess charge of 3d. or 3½d. was quite sufficient, beyond the ordinary price of gas, for a prepayment meter.

Mr. W. YOUNG (Penicuik) stated that when he went to Penicuik, about eleven years ago, there were some 130 prepayment meters in use; while now he had 320. They charged 5d. per 1000 cubic feet more per meter. He had little trouble with them; and he was only sorry he could not see his way to put in another 320 of the meters. They had resulted in an addition to the sale of gas. In some cases he got from a consumer double what he did when an ordinary meter was being used.

Mr. CARMICHAEL PEEBLES was afraid that gas managers did not often appreciate what the value of a five years' guarantee of a meter was to them. A five years' guarantee for an instrument made up of leather, wires, small brass pieces, and so on, was a very good one. The meter was not in the hands of the maker. He did not control the quality of the gas supplied. He did not know whether it was to be water gas, ordinary coal gas, or gas from cannell; and the constituents of the gas which would affect the diaphragms, and would carry away the oils and preserving materials they put into them, would affect very materially the life of a meter. Under the guarantee, a meter might be sent back on account of all sorts of things—being fast or slow, or not registering—and the maker had to pay the carriage going and returning,

and to bear the cost of repairing and painting. This made a great hole in the profit to be derived from the meter. The condensation and other dirt they found in meters was sometimes so great that the men would not handle them. Yet the meter maker was responsible, during the five years, for all these things. He would give a longer guarantee with pleasure, if they allowed him to control the gas to be supplied, and the place where the meter was to be fixed.

The PRESIDENT thanked the meeting for the way in which they had received his address. In connection with automatic meters, his position was this: He had before him a list of three consumers who burnt about 10,000 cubic feet of gas a year. He sometimes had a tremendously long time to wait for his money; and he asked his Directors to be allowed to put in a few slot meters on trial. The result was that in all of those cases there was an increase of about 4000 cubic feet in a year. His argument was that if a consumer were burning 1000 feet with an ordinary meter, and he burnt 2000 cubic feet with a slot meter, the extra 1000 feet would earn for them what would repay the extra cost of the slot business. His point as to differential prices was that there should be a uniform rate for lighting and power, and that when a certain quantity of gas had been used, a liberal discount should be allowed, to encourage the consumption of gas. In Lasswade, there were two large factories in which gas was used for lighting only. They burnt, between them, about £200 worth a year. Alongside of them was a joiner, who had a gas-engine, and who consumed only £20 or £30 worth of gas per annum; and he said it was not fair that the joiner should get his gas cheaper simply because he used it in an engine.

ELECTION OF OFFICE-BEARERS, ETC.

The election of office-bearers resulted as follows:—

President.—Mr. H. Rutherford, of Aberlady.

Honorary Secretary.—Mr. W. Brown, of Lasswade.

Members of Committee.—Re-elected.

Auditor.—Mr. J. O'Halloran, of Edinburgh.

Mr. T. O'NEIL (Dunbar), the Past-President, presented Mr. Brown with the President's Medal; and Mr. BROWN returned thanks.

The members and friends, to the number of over 70, afterwards dined together—Mr. Rutherford in the chair. The toast of "The Waverley Association" was proposed by Provost SMITH, of Dunbar, who has been for many years Convener of the Corporation Gas Committee, and who said that if there was anything he took an interest in outside of his own business it was gas. He had a warm side for gas managers, and considered that corporations did not pay them as they ought to be paid. Mr. W. BROWN responded. Mr. W. YOUNG proposed "Kindred Associations," and Mr. W. BLAIR acknowledged. "The Traders" was proposed by Mr. D. VASS; and Mr. A. MACKENZIE acknowledged it.

PRESENTATION TO MR. A. BELL, SEN.

Mr. W. BROWN said that, unfortunately, Mr. A. Bell, sen., of Dalkeith, who was to have been the recipient of the gifts which had been subscribed for, was so unwell that he was unable to be with them. Mr. Bell felt very much his position in not being able to be with them; but, acting on his doctor's instructions, he was obliged to remain at home. In Mr. A. Bell, jun., of Peebles, however, they had a worthy son, who would accept the gifts on behalf of his father and mother. Before the presentation was made, an opportunity would be given to anyone who might wish to pay a tribute to Mr. Bell.

Mr. J. DENNIS, of Dalkeith, said he could say nothing approaching even bare justice to Mr. Bell, who had so efficiently and for so long performed such useful work for them. He had had the good fortune to be a member of the Dalkeith Gaslight Company for most of the nineteen years their friend had been Manager; and he knew him for several years before he took over the duties there. It was with the greatest pleasure that he testified to his rare gifts and his faithful and efficient management. As their honoured representative, he had "spread the light" in a thousand different ways, both by night and by day, during all those years. He had a thorough grasp of his profession; and he believed he was in public favour and esteem with those among whom his lot had been cast by a kind providence for so many years. His decisions usually carried considerable weight among the consumers as well as with the Directors; and he merited their appreciation and gratitude, having had all along a high sense of his responsibility to the Company and to the consumers. In a word, he might say they were proud of Mr. Bell as their Manager; and they cherished the hope that he might have renewed health, might live long, have much happiness, and thoroughly enjoy his well-earned rest. He might mention that the Directors were anxious to retain Mr. Bell's valuable services longer; and in order to secure this, they officially offered to get him an assistant who would have very much relieved him of at least many of the duties he had hitherto performed. After due consideration and further professional advice, he decided to retire, hence their taking advantage of this opportunity to pay tribute to his long and faithful services.

Mr. D. VASS, as a very old member of the Waverley Association, and, he thought, the oldest Past-President there, would like to pay a word of tribute to Mr. Bell. He could remember how kindly was his action when he came, quite a stripling, to the Waverley

district, twenty-two years ago; and he appreciated the fatherly feeling Mr. Bell showed towards him at that time. From that day to this he had cherished his friendship with Mr. Bell.

Mr. D. MACFIE wished to add his testimony to the worth of Mr. Bell. They all knew how earnest he had been in his work as a Manager, and how thoroughly intimate he had been with all that had been done in connection with the gas industry. They were perhaps apt to forget his earlier career, which was very creditable to him. Some weeks ago, when he saw him, he was full of reminiscences. He told him the story of his going to Gibraltar. They knew that Mr. Bell, when he returned to this country, found employment in connection with the Edinburgh Gas Company, and how he distinguished himself there; and it was a great gratification to his friends that he took up the position of Manager at Dalkeith. In this position he had fulfilled his duties with very great credit to himself. They rejoiced to see his son taking a worthy place in connection with the gas industry, and likely to take a higher place—if his modesty did not prevent him. They thought of Mr. Bell as one, not of the first generation of gas managers, but certainly of the second generation. He continued his work into the third generation; and they did themselves honour in honouring him. They regretted exceedingly that he was not with them that day. He was, however, worthily represented by his son; and they asked him to convey to his father their good wishes.

Mr. A. MACKENZIE recalled that the late Mr. William Young, of Peebles, was a pupil of Mr. Bell's. Later, on his return from Gibraltar, Mr. Bell was offered the position of Gas Manager at Kelso. He was under obligation to go to the oil-works at Clippens, which Mr. Young was then in charge of. He went to Mr. Young and asked to be relieved of his promise to go there. He said his heart had always been in gas-works, and he would like to take the post at Kelso. Mr. Young said, with the kindest feeling possible: "You blackguard, when I was a laddie with you, you kept me on the grindstone, and now that it's my turn to be top dog, I will keep you on the grindstone."

Mr. A. H. HAMILTON, of Glasgow, as one of the youngest men who had come into contact with the gas industry, would like to add his view of the esteem they all held Mr. Bell in. He looked back with the greatest pleasure to the visits he had paid to Mr. Bell. He spoke, not as one who had received great benefit from him in business, therefore he spoke with deeper feeling, and more as a friend. He never went into his place without feeling that he was going in to a father who could, and who did, give him good and sound advice, who was ready to inspire younger men like himself upon any subject in or of the gas trade. He had pleasure in being there to bear testimony to the worth of Mr. Bell, and his high appreciation of his work.

Mr. W. BROWN, having been closely associated with Mr. Bell and his son in the gas profession, said he had come to look upon Mr. Bell as a father. He took a kindly interest in any young man who was willing to learn; but if he told any such to do a thing, and he did not do it, woe betide him. He would never help that young man again.

The PRESIDENT said that, as had been remarked, they felt very sorry indeed that Mr. Bell was unable to be present. He was acquainted with Mr. Bell before he went to Gibraltar. During his membership of the Association, they had been greatly indebted to Mr. Bell for many kindnesses. Sometimes one who was to take part in their proceedings was prevented from attending; but with Mr. Bell present they were never afraid to go forward, and were always certain of having a good meeting. He had great pleasure in asking Mr. Bell, of Peebles, to accept of the small presents they offered as a token of respect from the members and friends of the Association. They hoped he would convey to his father and mother the kind and affectionate feelings of every member of the Waverley Association towards them.

[The gifts consisted of a purse of sovereigns, a blackthorn walking stick with silver mount bearing an inscription, for Mr. Bell, and a Shetland shawl and diamond mounted gold brooch with an inscription, for Mrs. Bell.]

Mr. A. BELL, jun., said, on behalf of his father, he had to express his very deep regret and disappointment at not being present; but he felt that the state of his health must be his excuse for being absent on this most interesting occasion. For himself and the other members of the family, he had also to express how sorry they were, seeing the Association had been so kind as to honour him in this way. He must thank the Association and other kind friends most cordially for the handsome gifts; and yet, handsome as they were, he was sure his father would value them still more highly on account of the hearty feelings of the members towards him, of which feelings the gifts were the outward tokens. There was no doubt a feeling of sadness in connection with the presentation, for it marked the end of the long and pleasant intercourse his father had had with the Association. At the same time, the gifts would in days to come be a pleasant reminder of the many happy days he spent in their company. He had also to thank them for so kindly and thoughtfully remembering his mother, who, he could assure them, had been a true helpmeet to his father. If anything could enhance the value of the presentation, it would be the kindly tributes which had accompanied it.

The proceedings were shortly afterwards brought to a close.

The late Lady Aird, the wife of Sir John Aird, Bart., whose death was recorded in the "JOURNAL" for the 6th inst., left £13,218.

EFFICIENCY OF VARIOUS GAS-LAMPS.

A few months ago, a paper on "The Comparative Practical Efficiency of Various Types of Gas-Lamps" was read by Mr. R. C. Ware before the New England Section of the Illuminating Engineering Society. It has since then been re-arranged, and published in the Society's "Transactions," from which it is here reproduced practically in its entirety.

Although there have been numerous and exhaustive researches regarding the practical efficiency of electric lamps in common use, there has not, to the author's knowledge, been similar work to determine the actual rating of the different types of gas-lamps, and of the same lamp with different glassware. That is, distribution curves have been worked out, and tables have been compiled for showing the comparative consumption and maximum candle power per cubic foot per hour, or mean spherical candle power per cubic foot per hour, &c. But regarding the practical application of the lamps there are few data. The author has accordingly worked out some rough calculations along this line which may be of interest. It should be explained that the results described are at best very rough, and, since they were reached purely by calculation and not by actual test, there is likely to be some variation from conditions obtained in actual practice.

There has been chosen for the problem a rectangular room 50 ft. by 30 ft. and 12 feet high. The area is sufficiently large to allow the lamps to be so placed, if desired, that where reflectors are used the main flux of light shall be directed entirely at the floor, and shall not reach the walls. The plane of illumination is 3 feet above the floor, and the average illumination to be secured is 3 foot-candles for the whole area. This intensity has been pretty generally agreed upon as being a mean which suits most ordinary purposes. There is, therefore, an area of 1500 square feet requiring a supply of 3 "lumens" per square foot, or 4500 lumens in all—a lumen being the amount of light required to give an intensity of one foot-candle over a surface of one square foot.

Applying the flux-of-light method of Messrs. Cravath and Lanning to determine the number of effective lumens given off by the various burners under consideration, the results shown in the accompanying table are obtained. The effective angle of illumination for general lighting purposes has been taken as 60° above the vertical. At the usual height of a chandelier—about 7 feet above the floor, or 4 feet above the plane of illumination—light given off at this angle will strike the plane at a distance of about 7 feet. This angle is possibly somewhat low for light sources of high candle power; but for the consideration of the lower power lamps, the light given off above 60° would not play a very important part in direct illumination.

It should be noted, however, that in the case of a large room it is not safe to disregard entirely the direct light given off above this angle, because the total amount of such light coming from many lamps at a distance adds materially to the illumination at any given spot. However, for the more common problem, of a room of only moderate proportions, the angle stated is probably sufficiently correct. It should be further noted that in all unshaded lamps, except the inverted mantle burner, the maximum intensity of light is given off at about the horizontal. Where the walls of a room are dark, so that reflection from them is missing, it is, of course, desirable to utilize the horizontal rays to as great an extent as may be possible.

In the table two cases are given. One shows the number of lamps required for the chosen room, where both the ceiling and the walls are dark, so that only the direct illumination is utilized. This condition, with absolutely no reflection, is, of course, almost purely theoretical, and is seldom met in actual practice. Under the second case are shown the number of lamps, &c., required for the same illumination in a room with light ceiling and walls.

As regards the various lamps studied, the open-flame burner gives an illumination singularly uniform in every direction; the only point where the intensity falls off materially being in the zone of 5° or 10° directly under the burner. In all other directions the light given off is almost uniform. The adoption of this burner for the dark room in the first case would ensure a moderately even illumination, provided outlets were arranged in sufficient number—preferably not more than five lamps to a fixture. It will be seen that the cost of installation will be high in this case, and the operating cost very high—69 burners being required.

The bare mantle has a well-defined shadow beneath it, and is objectionable on this account, but is more particularly so by reason of its great brilliancy; and it should, of course, never be employed unshaded. The number of burners in the chosen problem is only about one-half that of open-flame burners required; this somewhat unfavourable showing being due to the small proportion of light given off below 60°.

An installation of mantle burners equipped with a proper globe requires 33 lamps, the total light given off below 60° being somewhat more than that afforded by the bare mantle; while the distribution is better, there being no dense shadow beneath the lamp. It is interesting to note that the total absorption by this form of shade is about 47 per cent. for equal gas consumption. In spite, however, of the loss in efficiency, a burner equipped with this shade is in general far preferable to the open-mantle burner, owing to the great decrease experienced in the intrinsic brilliancy of the lamp.

TABLE showing Results of Tests of Various Types of Gas-Lamp.

[Room, 50 ft. by 30 ft., 12 ft. high; 1500 sq. ft.; plane of illumination, 3 feet above floor; intensity, 3 foot-candles; effective angle, 60°.]

Type of Burner.	Effective Light below 60° in Lumens.	Light above 60° in Lumens.	Mean Spherical Candle Power.	Consumption. Cubic Feet per Hour.	Case 1.—Dark Room.				Case 2.—Light Room.			
					Number of Lamps.	Total Cubic Feet per Hour.	Total Effective Lumens per Cubic Foot per Hour.	Consumption. Cubic Foot per Hour per Foot-Candle per Sq. Ft.	Number of Lamps.	Total Cubic Feet per Hour.	Total Effective Lumens per Cubic Foot per Hour.	Consumption. Cubic Foot per Hour per Foot-Candle per Sq. Ft.
Open burner	65	186	20°0	5°00	69	345	13°0	0°0767	40	200	22°2	0°0444
Upright Lamp.												
Bare mantle	119	672	63°0	3°70	38	140	32°2	0°0311	16	59	77°5	0°0131
Globe	137	430	45°0	5°00	33	165	27°4	0°0367	18	90	49°0	0°0200
Opal dome and bobesche	212	283	39°4	3°60	21	76	58°9	0°0169	16	57	78°6	0°0127
Fluted flat reflector	183	528	56°0	3°70	25	92	49°5	0°0204	14	52	85°1	0°0116
Inverted Lamp.												
Bare lamp	272	507	62°0	3°22	17	55	84°5	0°0122	11	35	123°9	0°0078
Ground glass	226	420	51°5	3°00	20	60	75°3	0°0133	13	39	110°3	0°0087
Prismatic distributor	446	200	51°5	3°22	10	32	138°5	0°0071	9	29	154°0	0°0064
Clusters.												
Four-burner upright	1090	1910	239°0	19°00	4	76	57°0	0°0169	3	57	82°5	0°0127
Three-burner inverted	890	1838	217°0	11°00	5	55	81°0	0°0122	3°3	36	123°0	0°0080

The prismatic shade for the upright mantle burner gives much the same distribution and candle power below the horizontal as the above-mentioned globe; but the absorption is considerably less. Moreover, the shade is more artistic, and is for this reason preferable. For general illuminating work, this is probably the most satisfactory of the upright mantle globes, and is worthy of more extended adoption.

The next lamp listed is the upright mantle, equipped with an opal dome and "bobesche." This lamp gives a powerful light throughout an angle of about 30° from the vertical, and even if hung high is sure to give a spotty illumination. It has been included in the list, however, as it is a very common type, and is still widely used for general illumination where some other form of shade might better be employed. For general purposes, the distribution would be aided by the omission of the bobesche. Unfortunately, however, the author has been unable to secure curves showing the distribution without the bobesche. Twenty-one lamps with this equipment will be needed to give the total of 4500 lumens required; but to secure an illumination reasonably even, more lamps would be necessary. It is noteworthy that the absorption of light by this equipment is about 36 per cent.

The last lamp of the upright mantle pattern to be considered is that equipped with the common flat fluted opal glass reflector. This equipment gives a fairly good distribution; the chief objection being that the mantle is left exposed to view. The number of lamps of this pattern required to secure fairly even illumination is 25.

It is unfortunate that no effective study of prismatic glassware has been made with a view to provide prismatic reflectors of the pagoda or inverted-bowl type, very similar, in general, to the bowl reflectors for electric lamps. A reflector of this type could be made to give a very satisfactory distribution curve for upright mantle burners at very much greater efficiency than is done by any of the reflectors for this type of burner now in use. Inasmuch as the upright burner will for many years have a very distinct field, it would seem that some investigations along this line might profitably be made by the manufacturers.

Turning to the inverted gas-burner, which during the past year has been proved thoroughly reliable and efficient, it is found that only 17 of the unshaded lamps are required to give the 4500 lumens specified. It should be noted here, however, that the inverted lamp ought, in general, to be hung somewhat higher than has been the custom with the ordinary burners previously in use. The height of about 8 feet will give very satisfactory and uniform results. The bare mantle, even if hung high, is open to the objection common to all incandescent lamps, that the high intrinsic brilliancy is distinctly uncomfortable, though, owing to the larger surface involved, this objection is not so strong as in the case of the electric incandescent lamp.

The inverted gas-burner equipped with a ground-glass globe shows an absorption of about 17 per cent. The distribution is not quite so good as in the case of the bare lamp; there being a small zone of high candle power at the nadir. Twenty of these lamps would be required; and though the illumination produced would be somewhat more spotty than in the case of the bare mantle, the general effect in the room would be preferable, owing to the diffusion of light at the lamp.

Beyond any question, however, the most satisfactory lamp of those in the table is the inverted mantle equipped with prismatic distributing reflector. The amount of absorption here is about the same as that of the ground-glass globe. The distribution, however, is vastly superior, and only 10 lamps are required for producing the specified 4500 lumens. It would, however, be inadvisable to hang these lamps at the usual height of 7 feet; better results being obtained at the height of 8 ft. 6 in.

The figures referred to thus far were calculated for a room with dark walls and ceiling. Such conditions are, however, extremely rare, and account should be taken of the reflection from ceiling and walls. If the amount of light given off above the chosen angle of 60° were the same in all cases, the figures already given would be sufficient to indicate the relative value of the lamps.

Inasmuch, however, as the light actually given off above 60° varies greatly, as shown in the table, the second case, where light walls and ceiling are specified, must be considered.

Messrs. Lansingh and Rolph presented a paper at the convention of the Illuminating Engineering Society last October, showing the increased horizontal illumination due to light ceiling, light walls, light floor, and the interaction of these different surfaces with one another.* The results were noteworthy. The effective angle in this case was about 50°; and an analysis of the light given off above this angle shows that the lumens reflected were between 40 and 50 per cent. of the total amount thrown against the walls and ceiling. Their paper, however, was based on purely laboratory conditions.

It may safely be assumed that, in ordinary practice, the reflection would not be so high as this. The reflection of ordinary foolscap paper is 70 per cent., and of chrome yellow paper about 62 per cent. In ordinary conditions, one would probably get a figure lower than this; the ordinary light buff walls and finish and the tinted ceilings which are commonly met with, probably giving a diffuse reflection of less than 60 per cent. This figure, of course, would apply for the first direct reflection, which would account for only a portion of the total light under consideration. The rest would have to be two, three, four, and more times reflected before it reached the plane of illumination, losing each time in amount. There would also be a loss in reflective efficiency due to the presence of goods, show-cases, doors, windows, &c., which would vary greatly with the different cases.

Assuming, therefore, 25 per cent. as a basis—probably high for the rough calculations in view—it is found that by adding 25 per cent. of the lumens given off above 60° to the effective lumens below this, the number of lamps required for the specified illumination of 3 foot-candles on the plane is reduced in the case of the open-flame burner from 69 to 40, and in the case of the bare mantle from 38 to 16. In this case most of the light is given off above 60°. In the case of the globe, where there is less proportional light given off above 60°, the number is reduced from 33 to 18. The same holds true in the case of the fluted opal reflector, where most of the light is given off below the horizontal. Here the reduction is from 25 to 14. With the opal dome and bobesche, the number is reduced from 21 to 16. It should be stated here that with this equipment the lamps should be hung high, as, owing to the powerful light immediately below the lamp, the distribution is greatly improved by the added height.

The figures bring out another important consideration—viz., that with light walls and ceiling a lamp may be hung higher than would be possible with dark walls and ceiling, for giving the same average illumination on the chosen plane; moreover, greater uniformity is obtained. With the inverted gas-burner unshaded, the number is reduced from 17 in the first case to 11 in the second. When the ground-glass shade is used, the number is reduced from 20 to 13. With the prismatic distributing reflector the reduction is from 10 in the case of a dark-walled room to 9 in a room with light walls and ceiling.

Referring to the paper of Messrs. Lansingh and Rolph, it is to be noted that the reflected light from the ceiling which represents the greater proportion of the increase due to the light colour mentioned has a marked effect on the uniformity of the illumination throughout the room; the strongest reflection being directed towards the centre of the room. This fact is worth noting in laying out installations; for lamps may be placed closer to the walls, and with more free space in the centre, than would theoretically be possible unless this fact were taken into consideration. This result will permit of higher illumination values being given to counters, shelves, desks, &c., than has perhaps been generally the case, at no appreciable loss to the lighting of the centre of the room. This condition still further accentuates the necessity of co-operation between architects, builders, and illuminating engineers to prevent waste of light by the use of colour schemes of low reflecting value.

* See "JOURNAL" for March 2 (p. 621).

It is likely that in practice the total amount of reflection from ceiling and walls may be reduced below the figure assumed; and for this reason the lamp giving the best downward distribution of light will prove more efficient. There is, further, the advantage of the major part of the light being direct in the case where the prismatic reflector is used; whereas in the case of the open lamp a very large part of the light falling upon the plane of illumination is complexly diffused. For purely general illumination, the latter case may be desirable; but for any definite work there should be a definite direction to the light, so that fairly distinct shadows may be utilized. It is found also that the purely diffused lighting system entails a serious strain upon the eye; there being practically no shadows on which the retina may be directed when fatigued. The light enters the eye from all directions—below as well as above. This is true to a less extent where the illumination is general and largely reflected from the walls and ceiling of the apartment lighted, as in the case of the bare lamp; but is greatly reduced by the use of the reflectors for directing the light downwards. The character of the surfaces constituting the plane of illumination, of course, has a very marked effect in this regard; a surface largely light-coloured reflecting a great deal of light directly into the eye.

In each case taken, there is given a column showing the consumption of gas per hour per square foot of the plane in question required to give an illumination of one foot-candle. These data may be found useful for rough determinations of the total amount of gas per hour required for lighting any specified area with a chosen type of burner. The results obtained in this way will not in all cases allow uniform illumination. In order to obtain this result, some variations from the number of lamps determined above would certainly be necessary in cases where a very strong light is concentrated immediately beneath the lamp. In general, however, by a suitable arrangement of the fittings employed, fairly uniform results can be obtained with a specified number of burners.

SULPHUR AS A CAUSE OF CORROSION IN STEEL.

At a recent Meeting of the London Section of the Society of Chemical Industry, a paper on the above subject was read by Mr. G. Nevill Huntly. We reproduce it from the current number of the Society's "Journal."

A considerable amount of work has been published during the last few years dealing with the corrosion of iron and steel; attention having been chiefly concentrated on the effect of the presence or absence of carbon dioxide. An investigation into the cause of pitting in a stand-by boiler at the generating station of the London Electric Supply Corporation proved that the sulphur in the metal is also a factor that must be taken into account. In these boilers, the pitting assumed serious proportions about two years ago, and an increase in the proportion of alkali, caustic soda, in the water proved to be useless in lessening the evil. On examining the boilers, numerous blisters were seen, varying in size up to 30 mm. in diameter; the bulk of them being in the neighbourhood of the water-level. On pricking the blisters, each was found to contain a liquid with a fine, black powder in suspension, and a pit was forming in the centre of each blister. As it appeared probable that the examination of this liquid might throw some light on the corrosion, a large number of the blisters were pricked, the fluid collected, and kept from contact with air. This liquid, which was strongly acid to litmus paper, was filtered in an atmosphere of carbon dioxide, and proved to consist of a solution of ferrous sulphate with a slight excess of sulphuric acid; the latter being either free acid or possibly ferric sulphate. The boiler water in which the blisters had been submerged was slightly alkaline, containing 0.635 lb. of caustic soda per 1000 gallons. As the blister fluid available only amounted to 25 grammes, its complete analysis was not possible. It contained 2.315 grammes per litre of ferrous sulphate, and within the limits of experimental error practically all the iron was present as ferrous salt. The total sulphate, expressed as sulphuric acid, was 1.92 grammes per litre; the total sulphate in the boiler water being 0.0608 gramme per litre—the ratio of the concentrations in sulphate inside and outside thus being 31.5 : 1. Assuming that the sodium sulphate was of the same strength both inside and outside the blister, the excess of sulphuric acid would still amount to 0.27 gramme per litre.

It is clear that the sulphur could only come from the steel, and the oxygen necessary for its oxidation from solution in the boiler water, and it seemed of interest to determine, if possible, how the oxidation takes place. It is well known that the sulphur in steel is present as manganese sulphide; ferrous sulphide only appearing when the quantity of manganese present is insufficient. If the sulphide is directly oxidized to sulphate by the oxygen in solution, and this is precipitated by the alkali in the boiler water, the substance of the blister and the black precipitate in suspension should consist mainly of oxides of manganese. If, on the other hand, the sulphide on oxidation gives rise to free sulphuric acid, the corresponding amount of oxide of manganese remaining attached to the plate, then this acid will act on the whole portion of the metal within the blister, and the precipitate will contain the various constituents of the metal in proportions roughly corre-

sponding to those existing in the boiler-plate. This would also be the case if, a little ferrous sulphate once formed, oxidation to ferric sulphate took place at the expense of the incoming oxygen. This ferric sulphate would be reduced by the metal of the plate, and the scale would have the same composition as in the attack by free acid.

The analysis of the scale gave the following figures (percentages): Iron, 65.92; manganese, 0.28; carbon, 0.50; sulphate (SO_4), 3.71; silica, 0.65; calcium, 1.10; moisture, 3.40; oxygen (by difference), 24.44. In spite of the precautions taken to exclude oxygen during the washing and drying, it is probable that some oxidation took place, increasing the proportion of ferric oxide. The above analytical figures are consistent with the following percentage composition for the scale: Mn_2O_3 , 0.39; CaSO_4 , 3.74; Fe_3C , 7.56; SiO_2 , 0.65; FeSO_4 , 1.70; Fe_2O_3 , 18.00; Fe_2O_3 , 64.56; water, 3.40. [The water represents the amount left after drying in a vacuum, at the ordinary temperature, over phosphorus pentoxide.]

The proportion of manganese does not correspond with what would be expected if manganese sulphate were the first oxidation product; but the figures agree fairly well with the hypothesis of the action of dilute sulphuric acid or ferric sulphate—the products being then precipitated by the alkali of the boiler water. As in a stand-by boiler the liquid has periods of rest, the oxides deposit on the spot where they are formed, giving a coherent membrane. Under these conditions, this acts as a sort of semi-permeable membrane, admitting oxygen but not alkali; and thus giving rise to the anomalous effect of an acid corrosion going on inside an alkaline boiler water.

The presence of streaks of sulphide in the steel thus gives a complete chemical explanation of pitting in the case of a stand-by boiler, and may also serve to explain the corrosion of steel plates along definite lines in experiments in which the liquid has not been kept agitated. It was formerly supposed that, provided the sulphur in steel was completely combined as manganese sulphide, the injurious effects on the strength of the steel were minimized. Metallographic evidence has lately been accumulating tending to prove that many fractures follow the lines of manganese sulphide. The facts noted above as to the chemical properties of manganese sulphide form an additional argument for excluding it from steel as far as possible.

It may be of interest to note that the substitution of an alkaline arsenite for caustic soda in these boilers completely stopped the trouble; no blisters having developed during the last two years—an effect possibly due to the oxidation of the arsenite by the dissolved oxygen.

Liability for a Water-Meter Damaged by Frost.

At the April sitting of the Windsor County Court, his Honour Judge Rowland Roberts had before him a case in which the Slough Water Company claimed damages from Mrs. Fisher, a consumer, for the destruction through frost of a meter which was rented by her. It was explained that, according to the regulations, consumers were held liable for damage to meters. In April, 1900, the defendant's attention was called to the bad state of the meter-box; and about Christmas last year, when the Company's servant went to take the meter-reading, he called the attention of Mrs. Fisher's caretaker to the fact that the box required packing with straw to preserve the meter from frost. This was not done; and as a result of the extreme frost, the meter was damaged. The defendant was written to in January this year calling attention to the fact; and in a reply she wrote denying neglect and repudiating responsibility. Upon this a sum was claimed of £5 15s., being less than the full value of a new meter. A reply was received that, as £12 had been paid annually for some years without the premises being occupied, she would resist the claim. Ultimately directions were given by the Company to discontinue the supply; and it was cut off. Defendant had paid the water-rent; and the only question was the damage to the meter. For defence, it was urged that the meter suffered from old age; and that the damage by frost was not due to the state of the box. His Honour, after a lengthy summing up, in which he criticized the Company's regulations, said the question was whether at common law there was evidence of negligence; and he came to the conclusion that the defendant was responsible for the condition of the meter chamber. He therefore gave judgment for the Company; but he thought the damages claimed were excessive, seeing that the meter was at least fifteen years old. He awarded the Company the sum of £3 10s., with costs on the ordinary scale.

Reduction in Price of Gas at Prescott.—The Directors of the Prescott Gas Company have, as from the commencement of the current quarter, reduced the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet, less 10 per cent. discount. The charge for gas used in engines is now 2s. 11d., less 10 per cent. In the case of fires, the Company have arranged to fix, on request, a "rebate indicator" for which a quarterly rental of 3d. will be charged. All gas passed through this indicator will be charged at the rate of 3s. per 1000 cubic feet, less 10 per cent. discount.

Gas and Water Profits at Coventry.—It was mentioned by Alderman J. Maycock, when presenting to the Coventry Town Council the half-yearly estimates, which provided for an increase of 3d. in the pound in the rates, making them 7s. 10d. for the year, that in the previous six months there had been a contribution of £1000 from the gas profits. The amount to be received out of the water-works profits was £2250, against £2000 last year. It was proposed to spend £1000 in tarpaulins and other chemical appliances, in addition to the ordinary expenditure on street watering.

REGISTER OF PATENTS.

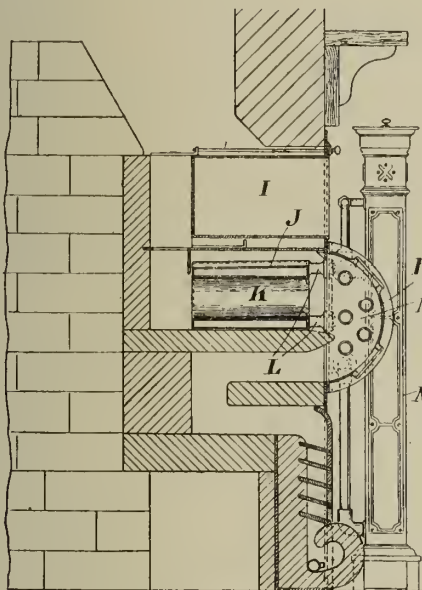
Heating Rooms by Combustion of Gas.

HISLOP, GEORGE R., of Paisley.

No. 4008; Feb. 22, 1908.

This invention has for its object the heating of rooms by combustion of gas in a fire-chamber comprising a grate or the like, placed at or near the floor, in which the gas is burned (preferably on the bunsen principle), and made to impinge upon artificial fuel in front of a curved, corrugated, or ribbed brick back, behind which is an air space to prevent the conduction of heat into the brickwork; or, instead of artificial fuel, fretted or perforated iron bars may be employed, "so as to give out the maximum amount of radiant heat."

This is one of three applications which were merged into one complete specification, under section 16 of the Patent Act of 1907. The illustration shows the arrangement in which readers will be more particularly interested.



Hislop's Gas Heating-Stove.

With the view of utilizing the heat hitherto lost with gas-fires beyond the area of combustion, the products of combustion are caused to return to, and pass or circulate through, a semi-cylindrical or other form of casing H, placed immediately over the fire opening, and made "preferably of a material that will take up and radiate the largest proportion of the heat in the waste gases." The casing is fitted with metallic tubes terminating in attached water-boxes or chambers at both ends of the casing, which is also provided with self-sealing doors that can be readily removed for inspection or cleaning purposes; or the projecting casing may itself be a boiler and radiator, with or without tubes. In addition to the casing, a water-boiler J, inserted in the flue adjacent to the chimney, may be provided with a flue K, through which the waste gases are passed; or the gases may be passed around the boiler, which is connected at L to the water-boxes M.

The boiler-chamber is preferably formed of tiles or metal plates (but for the crown of the chamber metal plates are preferably used), in order to provide a smooth and level bed and form a hot-air chamber or recess in the upper end of the grate under the fire-place lintel. In this chamber or recess is fitted a drawer-like casing I, having a flange forming a joint against the face of the grate, and capable of ready removal for inspection or chimney cleaning purposes.

The casing I is provided along the top and bottom with adjustable or closeable openings to permit circulation of hot air through the casing and into the room; or it may be adapted to contain articles of food to be cooked or heated. The back or inner end of the casing is formed of thin metal; and the waste gases, after leaving the projecting casing H and the boiler J, impart to the back of the casing a further and final portion of their heat before entering the chimney. A damper is introduced for controlling the exit of the waste gases.

The casing H is connected with a radiator N, or radiators conveniently placed (preferably) upon either side of the fire and in front of the grate, through which water is caused to pass. Provision is made for the evaporation of this water, and for drawing off hot water if required; and instead of, or in addition to, the radiators on the fire hearth, out-flow and return pipes may be laid around the room, or may be led to, and returned from, other radiators, or a drying coil or the like as desired.

Destructive Distillation of Coal.

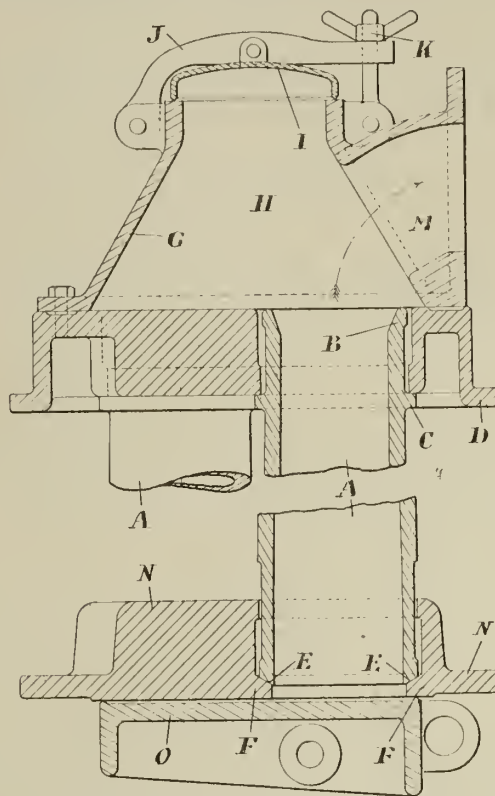
PARKER, T., of Coalbrookdale, Salop.

No. 4266; Feb. 25, 1908.

This invention relates to apparatus for the destructive distillation of coal, and is more especially intended for the partial destructive distillation of coal according to the process described in patent No. 14,365 of 1906. It has for its object "to provide apparatus of simple construction in which the process of distillation may be quickly carried on so as to yield a very considerable output of partially coked residue"—"coalite."

The inventor provides batteries of tubes vertically disposed and carried within common top and bottom fittings. The top fitting is provided with a series of apertures for the reception of the ends of the

tubes; and centrally above the series of tubes is the charging aperture within a surmounting hood, so that all the tubes may be filled from the same charging aperture. At the side of the hood or fitting is the outlet for the gas. A corresponding common bottom fitting receives the ends of the tubes, and there is mounted beneath a common discharging door, conveniently hinged to the fitting and provided with mechanical means to effect its opening and closure, so that the contents of all the tubes in the unit or battery may be discharged.



The Coalite "Battery" of Vertical Retorts.

The illustration shows (in section) the top and bottom fittings employed for a unit battery.

The upper extremity of the tubes A is provided with an outwardly extending shoulder B and a laterally extending flange C some little distance below the extremity, so as to engage the under side of the top fitting D. There is a clearance between the end of the tubes A and the aperture in the fitting D into which luting may be introduced so that the ends of the tubes may be secured in position.

The tubes are advantageously provided to taper, with a bore at their upper extremity of about 4 1/2 inches in diameter, to a diameter of about 1/2 inch more; and the lower extremity of the tubes is advantageously formed with a conical face E for the reception upon a corresponding conical face in an inwardly extending flange F provided in the aperture of the bottom fitting N.

Upon the top fitting is a hood G, which contracts inwardly towards its upper extremity, leaving an aperture H sufficiently large for the charging of the several tubes A. This aperture is closed by a door I securely clamped with a gas-tight closure by means of lever J and bolt and nut fitting K in the usual way. Laterally in the hood is formed an outlet M for the gas, which passes up from all the tubes of the unit.

A discharging door O is hinged to the bottom fitting N, which door O is common to all the tubes of the unit battery, and may be provided with mechanical means to effect its opening and closing as required.

The patentee claims: "Apparatus for the destructive distillation of coal and other carbonaceous substances, consisting in combination of a battery of taper tubes mounted in a common top and bottom fitting, with a single hood and charging aperture in the common top fitting for all the tubes in the unit or battery, as well as a common outlet for the gas therefrom, and a hinged discharging door as described and illustrated."

Coke-Ovens.

COKE OVENS AND BYE-PRODUCTS COMPANY, LIMITED, and WELLINGTON, S.N., of Palace Chambers, Westminster. S.W.

No. 6223; March 20, 1908.

This invention relates to regenerative inclined coke-ovens, arranged in a battery side by side with their discharge ends opening on to a bench or other receiver for the finished coke, and in which the opposite ends of the ovens are provided with doors for the purpose of charging. The object of the invention is to construct the ovens so that they shall "be particularly suitable for use for the production of gas from coal, as well as for the production of coke or smokeless fuel, so that greater control is obtained over the heating of the charges, so that one portion of a charge is not unduly heated while another portion is under heated, to effect great economy in the heating, and to make the greatest possible use of the heat of the waste gases, and to so construct the various portions of the ovens that unequal heating of the structure is prevented, and the various flues and chambers are readily accessible for inspection purposes, or for repairing when necessary."

The arrangement referred to, and the working results attained by its use, formed the subject of an article communicated to the "JOURNAL" on April 21 last year, pp. 152-53.

Supporting Grid Bars in Gas-Purifiers.

KIRKHAM, HULETT, AND CHANDLER, LIMITED, and HERSEY, S., of Palace Chambers, Westminster.

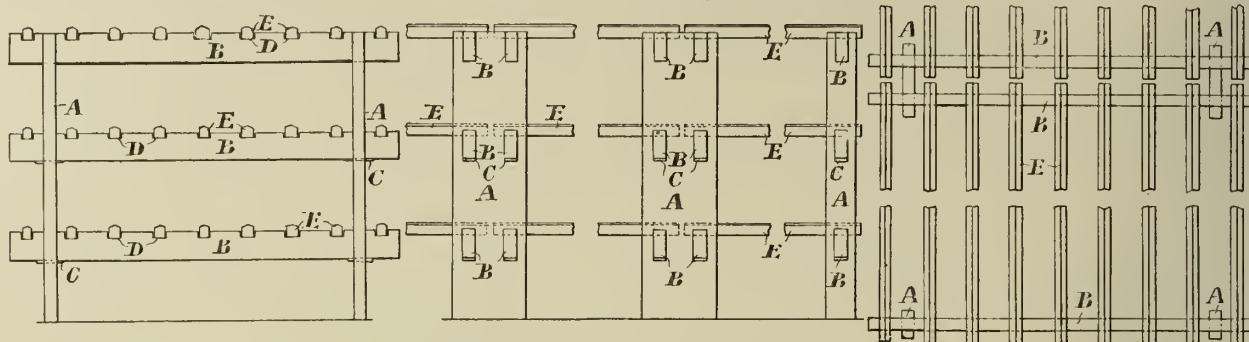
No. 9384; April 30, 1908.

The illustration shows an end view of a series of grids with their supports according to this invention; also a side view and a plan.

The invention consists of constructing trestles of wood or other suit-

able material, each consisting of two vertical supports A, which have passed through them at different levels supporting bars B (bearers), fixed in the vertical supports—for instance, by means of wedges C, and being notched as at D. In these notches are laid the bars E, advantageously also of wood, which form the grids. In some cases the notches may be wide enough to receive two grid-bars the ends of which overlap.

In practice, all or some of the grid-bars of the upper and lower tiers may be made deeper than those of the other tiers, and be provided on



Kirkham and Hersey's Purifier-Grid Supports.

the underside with notches, so that the bars are locked against movement in one direction by the notches in the bearers, and in the other direction by notches in the bars themselves—this arrangement serving to brace the series of trestles.

Recovering Ammonia from Gases Produced in Dry Distillation.

ACTIEN-GESELLSCHAFT FÜR KOHLENDISTILLATION, of Gelsenkirchen-Bulmke, Germany.

No. 26,027; Dec. 2, 1908. Date claimed under International Convention, July 10, 1908.

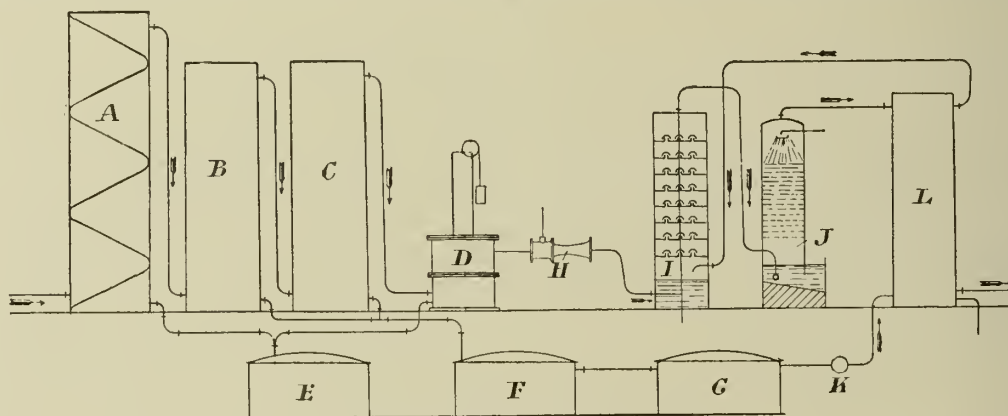
Referring to the accompanying diagram, the gas from the retort or oven passes into the helical condenser A, giving up the greater part of its tar in a condition free from water. The gas then traverses the water-tube condensers B and C and the tar-separator D. The tar from A and D is collected in the reservoir E, and the tar and ammoniacal

liquor from B and C pass to the reservoir F, whence the ammoniacal liquor flows to the reservoir G.

The steam-ejector H draws the gas through the condensers and tar-separator and forces it, in a condition free from tar, into the ammonia still I, and thence to the saturator J and its tower extension to the last condenser, whence it passes to the outlet pipe.

The ammoniacal liquor as collected in the reservoir G is lifted by the ejector pump K and forced through the condenser L and pipe to the ammonia still I. Here it is mixed with lime in the usual manner, and the ammonia is driven out of the water by the hot gases flowing through the still. The hot gases carry the ammonia into the saturator J, pass through the acid in the latter, and rise upwards through the tower extension, which is lined with lead and filled with an acid-proof material, down which the sulphuric acid flows. The ammonium sulphate which separates, collects at the bottom of the saturator, and is either fished-out or blown-out by the steam-ejector.

The advantages of this process are said to reside in the facts: (1) That scrubbing towers with their irrigating pumps, and large reservoirs are not required; (2) that space and buildings are economized;



A German Ammonia Recovering Plant.

(3) that, owing to there being no mechanical parts, no lubricant, &c., is required; (4) that by the use of the exhaust steam from the ejectors for heating the gases and ammoniacal liquor, and by not using fresh steam for the irrigating pumps, ammoniacal liquor pumps, rotary gas-exhausters, and still, only a small quantity of steam is required; (5) that by completely using the heat of the steam the cost thereof is minimized; (6) that the ammonia is completely expelled in I and absorbed in J; (7) that the demand for fresh water is diminished, and the amount of waste water is considerably reduced; and (8) that the number of attendants required is reduced by more than one-half.

Gas-Meters.

MERCER, A., of Longsight, Manchester, and METERS LIMITED, of Deansgate, Manchester.

No. 14,239; July 4, 1908.

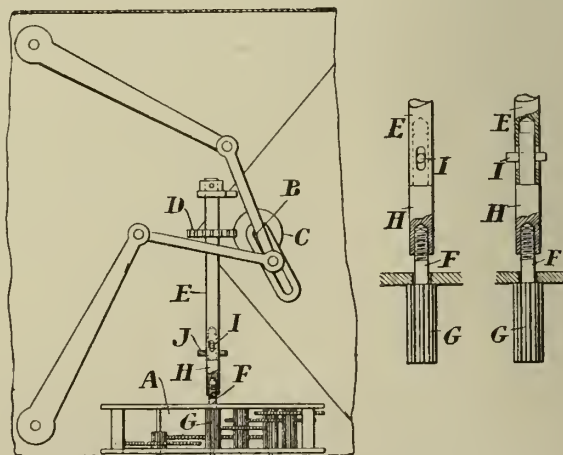
This invention, relating to dry gas-meters, refers to means for connecting the main actuating spindle of the registering mechanism to the meter mechanism, so that the former can be readily detached from the latter for testing or like purposes.

The illustration gives a sectional plan view of the upper portion of a meter with the invention applied thereto, and two detail views.

The registering mechanism A is arranged in the upper part of the casing, which is partitioned off from the portion containing the usual measuring mechanism; the spindle or equivalent part B of the latter, which drives the indicating mechanism, projecting through the partition. The spindle drives, by means of a worm C and worm-wheel D, an intermediate spindle E adapted to be detachably connected to the spindle F carrying the main pinion G of the indicating mechanism.

Heretofore the intermediate spindle has been detachably connected

to the main pinion by a pin upon the main pinion entering a cross cut or slot in the end face of the intermediate spindle. But with this



Meters Limited Dry Gas-Meter.

arrangement, unless the pin and slot or groove align with one another, the act of trying to place the pin in the groove sometimes bends the

bracket supporting the end of the intermediate spindle, and moves the worm and worm-wheel out of engagement with one another.

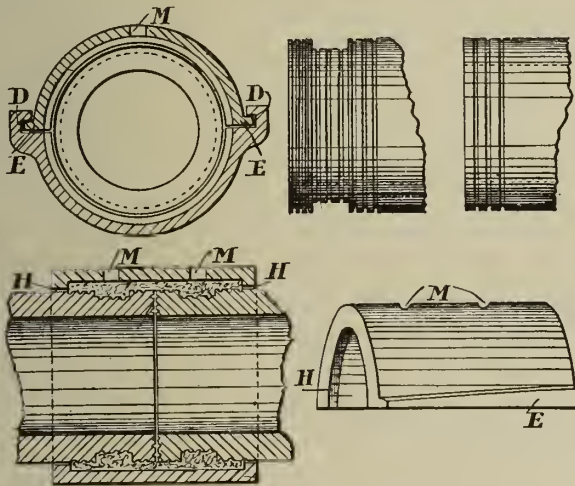
According to the present invention, means are provided whereby the pinion and intermediate spindle are readily brought into driving connection with one another when the indicating mechanism is placed accurately in position. In the form illustrated, the spindle F, carrying the pinion G, is screw-threaded and, when the indicating mechanism is in its correct position, is co-axial with the end of the internally-threaded link or connecting member H. Thus, on turning the finger secured upon the front end of the spindle, the latter screws into the link. A reduced portion of the link enters the end of the intermediate spindle E, to which it is secured by a pin I and slot or equivalent device; so that, while the link H and spindle E must rotate together, they are capable of longitudinal movement relatively to one another. The screwing of link H and spindle F therefore does not affect the position of the intermediate spindle E by imparting a longitudinal movement to it. The end of the intermediate spindle is held in correct position for engagement by the screw or other device upon the driving spindle of the indicating mechanism by a bracket J arranged near the end.

Pipes to Stand High Internal or Severe External Pressure.

CLARK, R. O., of Hobsonville, New Zealand.

No. 10,751; May 18, 1908. Date claimed under International Convention, May 18, 1907.

This invention relates to joints of pipes made of earthenware that may be used in place of iron or steel pipes in the construction of gas and water mains, "and the objections incidental to such metal pipes may be avoided." The meeting pipe-ends are of equal diameter, and are surrounded by a separate socket, in one or more parts, so as to leave an annular space between the outer sides of the pipes and the inner sides of the socket for receiving and holding cement filling or the like.



High-Pressure Gas and Water Mains of Earthenware.

The pipes (as shown) are made of a thickness varying from one-and-a-half to four or five times the thickness of ordinary earthenware pipes, which vary from $\frac{3}{8}$ inch to 2 inches in thickness, according to the diameter of the pipe. The ends are formed with narrow and with wide circumferential grooves at the base. This arrangement ensures a good connection between the pipe ends and the grouting or cement filling. The pipe-ends are also formed with concentric grooves in their meeting faces, where they butt together, to hold cement and ensure a good junction.

The socket is made in upper and lower half-parts, respectively formed of a semi-circular cross section throughout the length, and with a longitudinal tongue E, and a longitudinal groove D, which are adapted to slidably engage with one another, as will be readily understood on referring to the engraving. The tongues and co-acting grooves are made of a tapered formation, so as to cause the socket parts to be held tightly together when slid into position. The socket is formed with internal lips H or lugs, so that when the halves of the socket surround two butted pipe-ends, an annular chamber is formed for receiving grouting or cement filling, which may be inserted through apertures M to make the joint tight.

In forming a joint, cement is placed on the end faces of the two pipes, which are then butted together and laid on the lower half of the socket. The upper half is then slid into position, and the grouting is introduced through holes M until all spaces are filled.

Rhyl Gas-Works Loan.—Mr. S. Perks has informed the Rhyl Urban District Council, with reference to a gas loan of £4183, that through the tact of their Engineer (Mr. L. G. Hall), and also a reduction in the price of iron and steel, they were able to reduce the amount of the required outlay by £585. He moved that the Local Government Board be asked, as soon as possible, to reduce the loan by this sum. The motion was carried.

Gas Discounts at Belfast.—At a recent meeting of the Belfast Gas Committee, Alderman James Craig brought forward the question of gas discounts, and pointed out that at present consumers using up to 400,000 cubic feet per annum were entitled to a discount of 15 per cent., while those consuming over this quantity were receiving a discount of 20 per cent. In order that the discounts should be equalized over all consumers, he moved that the discount of 15 per cent. be increased to 20 per cent. The motion was carried; seven voting for, and four against.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Mountain Ash Urban District Council Bill, Northallerton Water Bill, Swinton and Mexborough Gas Board Bill.

Bills read the third time and passed: Bungay Water Bill, Donington Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Workson Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Workson Water Bill.

Lords Bills read a second time and committed: Clevedon Water Bill, Heckmondwike and Liversedge Gas Bill.

Bills read the third time and passed: Mountain Ash Urban District Council Bill, Northallerton Water Bill, Swinton and Mexborough Gas Board Bill.

The consideration of the Gaslight and Coke Company Bill, as amended, which was down for last Tuesday, was deferred till to-day. The Bill is being opposed by Mr. Thorne, who will move its rejection.

YORKTOWN AND BLACKWATER GAS BILL.

House of Commons Committee.—Thursday, April 22.

(Before Mr. ROSE, Chairman, Major RENTON, Mr. AGNEW, and Mr. C. HARMSWORTH.)

This is a Bill by which the Yorktown and Blackwater Gas Company ask for, among other things, authority to supply electricity and for further powers. They also desire to change the name of the Company.

Mr. BALFOUR BROWNE, K.C., Mr. VESEY KNOX, K.C., and Mr. HENRY LYNN appeared on behalf of the promoters; Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, and Mr. JEEVES represented the Aldershot Gas and Water Company, who petitioned against the Bill. Mr. JEEVES also appeared on behalf of the Easthampstead Rural District Council.

Mr. BALFOUR BROWNE, in opening for the promoters, said this was a Bill to enable the Yorktown and Blackwater Gas Company to supply electricity. Further powers were also requested; and it was desired to change the name of the Company. There was another Bill before the Committee promoted by the Aldershot Gas and Water Company, to extend their limits of gas supply, to empower them to construct additional water-works, to supply electricity, and to change their name. They were competing Bills, and so would have to be taken together. One of the objects of the first Bill was to extend the gas supply limits of the Yorktown Company; and they sought to repeal certain powers of the Aldershot Company over an area which they had never supplied, and which the promoters were now supplying. The Yorktown Company were seeking powers to supply electricity in the district of Frimley and such other parishes as were within their gas limits. They also sought authority to repeal powers of the Camberley Electric Supply Company in an area which they had never supplied, and which was covered by the gas area of the promoters. In order to carry out this work, they proposed to raise an additional capital of £50,000, and to borrow £16,666. The Company was formed in 1859, with a capital of £1500, for the purpose of supplying gas to Yorktown and Blackwater. In 1866, the Aldershot Gas and Water Company was incorporated; but there was at that time a concern known as the North Camp Gas Company, who were authorized to supply Frimley. This Company and the Yorktown Company had concurrent powers to supply gas; but the former had neglected to supply a certain area. There was also the Ascot Gas Company; but they, too, had not supplied in the area of Sandhurst, Ash, or Normandy. The Aldershot Company were now seeking to repeal the powers of the Ascot Company to supply gas in Ash and Normandy—they were doing there exactly what the promoters were doing in the Yorktown area. The promoting Company had made great progress since their formation; and in 1900 they applied to the Board of Trade for an extension of their limits of supply. The Confirmation Bill was opposed by the North Camp Company; and, after negotiations, an agreement was come to which limited the North Camp Company to a certain area. The two Companies were not to interfere with each other's area. The Yorktown Company, however, had power to supply gas in bulk beyond the limits of supply. In 1900, the Aldershot Company obtained additional authority to supply; and in 1901 they acquired the undertaking of the North Camp Company. In 1900, an agreement was come to between the Yorktown Company and the Aldershot Company for the sale of the undertaking to the Aldershot Company. This agreement provided that the sum to be paid for the concern was £16,000. A Bill was promoted in 1901 to carry out the terms of the agreement; and the House of Commons passed the measure authorizing the purchase. In the House of Lords, however, the question was raised that competition in gas was bad, and that it would be well for the competition to cease. The result was that the purchase did not take place. In 1903, the promoters were asked to make an offer to supply gas to Sandhurst. Up to this time the War Office had been making and using their own gas; and they invited tenders for a supply to the Royal Military College. The Aldershot Company also tendered; but the offer of the promoters was accepted. The War Office entered into an agreement with them; and they had

been supplying gas ever since. At that time, they went outside their area of supply; but under the Act of 1903, Sandhurst was brought within the area. In that year, the Aldershot Company promoted an Order before the Board of Trade. The Yorktown Company opposed this, because they had the fear of the Aldershot Company competing with them in Yorktown. The result was that a clause was introduced which provided that it would not be lawful for the undertakers to expend or apply any part of their capital, or of the money belonging to the undertakers, for the purpose of affording a supply of gas in any part of the district within which the Yorktown Company were authorized to supply. In certain places where the Aldershot Company had powers to supply, they had failed to do so; and the promoters were now asking to have these powers repealed *in toto*. The promoters had been in communication with the War Office; and the modifications they had suggested in the Bill had been complied with. On the question of repealing of powers, Counsel called attention to the Draycott Bill of last session, where the position was very similar to the present case. This was a district where nothing had been done, although powers had been given 32 years ago. With regard to the petition of the Easthampstead Rural District Council, they objected to any powers being given in reference to the supply of electricity in their district. The Yorktown Company worked under the sliding-scale; their dividends increasing as they reduced the price of gas. If it should be one of the results of the investment in electricity that they reduced their profits, they would be the primary sufferers; and if the effect was to increase the price of gas, their dividends would go down. There were good reasons why the two businesses should be conducted as one. They did not think it would be possible to raise money for electricity alone; and they believed they could raise the capital on the ordinary stock of the Company on easy terms. From the point of view of the gas shareholders, there was an advantage in securing themselves against the competition of some outside electrical undertaking. The only other petition was that of the Aldershot Company.

Mr. Alfred H. Claypole, the Chairman of the Yorktown Company, in giving evidence in support of the Bill, said that in 1904 they were made a sliding-scale Company, with a standard price of 4s. 3d.; and the capital was raised to £50,000. Since then the capital expenditure had been very greatly increased. In 1903, the share capital expended was £13,000, and the money borrowed £2405; whereas in 1908 the share capital expended was over £41,000, and the amount borrowed £9250. The consumption of gas had also increased from 2 million cubic feet in 1879 to 63 millions in 1908. In 1897, the price of gas was 4s. 6d.; and by gradual stages it had been reduced to 3s. 6d. They had been some considerable time without making a dividend; and it was only in recent years that they had been getting a handsome return. They were anxious that the area of supply should be defined, so as to prevent the possibility of conflict; and they were wishing to give a supply of electricity with a view of meeting the desires of their customers and to move with the times.

Replying to Mr. JEEVES, witness agreed that the Easthampstead Council were the local authority for the larger part of the existing area of the Yorktown Company. Between £20,000 and £30,000 of the capital would be required for the electricity extension. If the electrical undertaking was worked at a loss, the Company would pay it out of receipts from the gas consumers.

Mr. JEEVES: Suppose it just manages to pay its way, but does not earn enough to pay the same rate of dividend as the gas capital earns, I suppose you would pay the dividend on the electrical capital out of moneys received from the gas consumers?

Witness: Probably that would be the case at first.

Asked if he thought it fair that people living in the Crowthorne parish should be subject to liability to pay moneys in respect of an undertaking that did not benefit their district at all, witness held that they were sharing the benefits of the profits of the Company in the past. He agreed it might happen that if the electrical undertaking were not worked at a profit the gas consumers would have to find 1 per cent. on the amount of the capital employed in the electrical undertaking.

Mr. JEEVES: Is not the sole reason for seeking to mix up the two the fear that there may be a loss on the electrical undertaking, and it will not be easy for you to raise the capital separately?

Witness: We admit that there may be a loss.

In cross-examination by Mr. HUTCHINSON, witness said that the Staff College which his Company were supplying was within the area of the Aldershot Company, in which area they were not to supply without consent. They had not got that consent.

Mr. HUTCHINSON: As a matter of fact, did not the Aldershot Company, either at the end of last year or the beginning of this year, complain that you were acting *ultra vires* and supplying gas without their consent?

Witness: Yes.

Did not the Directors of the two Companies meet, and was it not agreed that the Aldershot Company were supplying without consent, and acting *ultra vires*?—The proceedings were without prejudice.

Is not there an action pending against you by the Aldershot Company, alleging that you were acting unlawfully?—Yes.

Is not this the reason you have now come to Parliament, to relieve you from the consequence of your wrong-doings?—Certainly not.

What reason is there?—To protect ourselves.

Friday, April 23.

When the Committee resumed their sittings this morning, evidence was given by

Mr. E. H. Stevenson, who said that the gas undertaking of the Yorktown and Blackwater Company had expanded at an exceedingly rapid rate during the past six years. The main expansion took place in 1903-4, which was largely due to the supply of gas to the Staff College. In the last five years, the increased consumption had been 5½ per cent. The two main objects of the Bill were to extend the limits of supply, to which there did not appear to be any opposition from local authorities, and to take into their extended limits a small area which they had supplied but which the Aldershot Company had never supplied. The capital of £50,000 was a reasonable amount to ask for,

having regard to the growth of the district. With regard to the gas portion, the capital would only last probably seven years. The small area to which he referred was situated in the Aldershot Company's limits; but that Company had never supplied a single foot of gas there, whereas the Yorktown Company had been supplying the whole of the area for seven years under the War Office contract. It was reasonable, and the practice of Parliament, to say that, where a company had power to supply but had never supplied, they should be turned out of the district. There were a number of cases where Parliament had protected gas companies against competition from other companies and local authorities who had statutory powers but had failed to exercise them. About 20 per cent. of the gas supplied by the Yorktown Company was taken by the War Office. The Easthampstead Council appeared to think that if the gas and electricity undertakings were under one control the people in the district would have to pay more for the gas; but he was sure that economy would be the result of such control. It would tend to a reduction of the price of gas, and there were obvious economies that would be to the benefit of the gas and electricity undertakings. The Company would be able to obtain their capital much more cheaply, because if they went into the market with merely an electrical undertaking, there would be no security at all. He was sure the gas consumers would not suffer.

In reply to Mr. HONORATUS LLOYD, witness said it was important that the promoters of the Yorktown Bill should be empowered to turn the Aldershot Company out of the area in which they both had powers, which he agreed would take away from the Aldershot Company the right to compete for the War Office contract. If this were done, the War Office would get their gas quite as cheaply; and they were open to manufacture for themselves at any time. Before the matter reached the next House, he believed the Yorktown Company would enter into definite arrangements with the War Office. The Yorktown Company had been in possession of the area in question for forty years, and they ought now to have the protection of Parliament. Competition was a good thing for the consumers, that in the present circumstances, the War Office were on velvet. With regard to electricity, he agreed that they were seeking power to supply outside their own gas limits and inside the gas limits of the Aldershot Company.

Replying to Mr. JEEVES, witness said that, taking a rate of increase of 10 per cent., which would mean 200 million feet of gas, in the next 15 years £150,000 would be required for gas. He admitted they were only asking for £50,000 for gas and electricity, with borrowing powers; but they had £18,000 in hand. He denied that they were trying to exclude competition in electricity, because if they did not exercise their powers they would lose them. The area they were seeking to supply with electricity covered only a fiftieth part of the district. He did not agree that if there was a loss on the electric undertaking it would have to be borne by the revenue of the gas undertaking. It would certainly have to be borne by the shareholders. Counsel having remarked that any loss on the electricity undertaking would have to be borne in the proportion of £200 by the public and £100 by the shareholders, witness held that if the Company got their powers it would tend to a reduction in the price of gas, and would operate to the good of the people in the district. It was a good thing in the long run, from the point of view of the Company and the consumers, that they should be freed from the risk of competition in electrical undertakings. If the consumer did not benefit, the Company would not benefit.

In reply to the CHAIRMAN, witness said that, with regard to the area in question, it had never been worth the while of the Aldershot Company to lay mains in it.

The CHAIRMAN: You are fighting for the War Office contract?

Witness: Yes; it is of such importance that it would do great harm to us to lose it. If it were lost to us, it would certainly increase the price to the general consumer. The income from this contract is about £2000 a year, and it thus carries a considerable portion of the standing charges.

Mr. Arthur Valon (Messrs. W. A. Valon and Son) generally corroborated the evidence given by Mr. Stevenson. He had examined the works of the Yorktown Company and found them in very good condition. The works were capable of producing 217,000 cubic feet of gas per day; and there was a good margin of retort power for future requirements. Between the years 1891 and 1901, the population had increased by about 40 per cent.

Mr. S. Sellon stated that the scheme was a sound one, so far as the electricity portion of the Bill was concerned. It would not be feasible to carry out an electricity supply unless it was coupled with the gas supply; but if the two supplies were associated, the undertaking would be remunerative.

Further consideration of the Bill was adjourned till yesterday.

Strange Gas Poisoning Case at Bradford.—Mr. William Barber, a Bradford merchant, is reported to have met his death in a curious manner on Monday of last week. It is stated that he was at his office, and was occupying himself in endeavouring to trace a leakage of gas from a bracket, when the bracket collapsed, and a sudden outburst of gas took place in his face. Mr. Barber seems to have inhaled the gas; and the effect was to render him at once unconscious. A warehouseman in his employment had occasion to go into the office and found him, and at once summoned police aid. Two constables tried artificial respiration for a considerable time, but without effect, and a medical man who was called in pronounced life extinct. Mr. Barber was sixty years of age.

Unprofitable Electricity at Morecambe.—In the Morecambe Town Council, Alderman Gardner referred to the continued losses on the electric light undertaking, and said that this year the Committee were asking for £2083 to meet the deficiency. He produced figures which showed that if the undertaking were worked in connection with the gas concern, the town would be saved something like £3000 a year. Under this arrangement, he said they could produce electric current at 1½d. per unit. Mr. Baxter remarked that the Electric Light Committee accounted for a portion of their losses last year through damage caused by a great flood. Did the Committee expect an earthquake this year? Alderman Carleton (Chairman of the Committee) said the Committee had schemes in hand for installing gas or oil instead of steam.

LEGAL INTELLIGENCE.

LIABILITY FOR WATER-RATES IN FLATS.

At the Westminster County Court last Thursday, the case of *Metropolitan Water Board v. Cannon* came before his Honour Judge Woodfall. It was a claim for 11s. 6d., being two quarters' water-rate, against the tenant of a flat at Cranworth Gardens, Brixton. The case was a test one, in which the decision was to be accepted by a number of tenants in the same district.

Mr. A. B. SHAW, who appeared for the Board, said this was the first in a long series of actions which were adjourned pending the decision of the present case. It was admitted by the defendant that he was in the occupation of the flat, and that water was supplied to it. A house agent had always paid the water-rate for the flats in Cranworth Gardens up to the date of the rate sued for; but when he was applied to, he referred the Board to a firm acting as receivers of the property. There was no satisfaction; and the Board proceeded against the users of the water.

Defendant was called, and stated that his rent was "inclusive," and that he had paid the water-rate in his rent.

Mr. GIVEN (instructed by Mr. George Kebbell), for the defendant, said the case was a far-reaching one for owners and occupiers of flats. At the time of the commencement of the service, the names of the tenants were unknown to the suppliers of water, and the agreement was made with the agent, who paid the rate and was applied to by the Board for payment. There was a perfectly good agreement with the agent, and the tenant could not be called upon to pay as long as the agreement was in existence. Notice had been given by the Board that the "farming" agreement was to be determined; but he submitted that this notice, which was one to the owner, was not a good one. If the Board were right, tenants of flats might find themselves liable to pay again water-rates which they had already paid in their rent, and for which they had never received application—this having been made to the landlord.

Mr. SHAW said the tenant would have his remedy against the person he had paid. Under the Board's Act of 1907, these "farming" agreements could not be made—they would be *ultra vires*; and the notice referred to was one intimating that these agreements were to be determined on a specified date. Forrest Fulton's Act did not apply in this case, as the rateable value of the premises was more than £20—being £23.

His Honour said the point involved was one of considerable importance, but he found no difficulty in arriving at a decision. The defendant, like hundreds of other people residing in flats, had an agreement with the landlord, under which the latter was to pay the rates, including the water-rate. Because the landlord did not pay, the Board had come down upon the consumer, who, no doubt, was liable. The consumer said he was not, because of the agreement with his landlord. The first thing to observe was that the Board were not a party to the agreement, and they were not affected, except by Forrest Fulton's Act. Under the Board's Act of 1907, circular notices were sent out terminating these "farming" agreements; and a point had been taken that the notice was not good because it made quarter-day the 1st of April instead of the 25th of March. The Board fixed a date to suit their own convenience; and he thought there was nothing in that point. Mr. Shaw had submitted that Forrest Fulton's Act did not apply, as it was passed for a certain class of small tenants. He (his Honour) found nothing in the Act to show that it was not applicable to the present case. There could be no doubt that, under the Act, tenants having an agreement with the landlord, as here, were protected against the supply of water being cut off if the landlord did not pay, and might deduct the amount of the rate from the rent. He gave judgment for the plaintiffs, with costs, and granted a stay of execution, in the hope that there would be an appeal. The other cases would stand over pending the decision as to an appeal.

Knocking Down Lamp-Posts at Liverpool.

At the Liverpool County Court last Wednesday, some cases were down for hearing in which the Corporation claimed damages from owners of vehicles for knocking down lamp-posts; but before they came on, the amounts were paid into Court. In regard to one of the cases, Mr. Swift said the claim was for only £1 19s. 8d.; but he asked for costs on the higher scale. The defendants were owners of motor omnibuses, and upon five days in July, August, and October last they knocked down lamp-posts belonging to the Corporation, or otherwise damaged them, by driving against them. When the Corporation complained, they appeared to set up a claim of right to do so, alleging that they were entitled to go along the roads, and that if the Corporation put lamp-posts in such positions as to render them likely to be knocked down, the owners of vehicles were not to be held liable, but that it was the business of the Corporation to remove them to places of safety—in fact, that it was the duty of the Corporation to put their lamp-posts in places of safety, and not the concern of drivers to avoid them when they were otherwise placed. He proceeded to refer to correspondence on the subject between the Deputy Town Clerk and an Insurance Company covering defendants' risks. In one letter, the Insurance Company stated that they had given the matter the fullest consideration; and they repudiated liability, leaving any further communications to their Solicitors. In these circumstances the Corporation decided to bring the claims into Court; relying on their Act, which gave them discretion as to where they should place their lamp-posts, and on the fact that there was nothing in law to give the driver of a motor omnibus, or any other vehicle, the right to knock the posts down. Mr. Proctor said the defendants did not claim any right to knock down lamp-posts; they simply repudiated liability. The ordinary law of negligence applied. Mr. Swift said the same lamp-post was knocked down three times. His Honour Judge Thomas remarked that the correspondence seemed to set up a suggestion of the improper

placing of the posts, and that the defendants were going to set up that there should be some limitation on the Corporation putting the lamp-posts where they thought proper. The whole thing had been conducted as if it was to be contended that the Corporation had no right to select places for their lamp-posts, and that there was no liability on the part of the defendants for knocking them down. If this was so, it did raise a question of some general or public interest; and costs would be allowed on the higher scale.

Use of Unauthorized Water-Works.

In the Chancery Division of the High Court of Justice last Saturday, the case of *Attorney-General v. South Staffordshire Water-Works Company* came before Mr. Justice Neville upon a motion for judgment. Mr. Whinney stated that the action was brought by the Attorney-General, on the relation of the Rural District Council of Lichfield, for a declaration that a reservoir which had been constructed by the defendants was unauthorized and *ultra vires*, and for an injunction restraining the Company from using it. He explained that it had been decided in an action brought by the Attorney-General against the Farnborough Water Company that additional works could not be erected on land acquired by agreement; and an order had recently been made against the present defendants by Mr. Justice Warrington, at the instance of another District Council, after the case had been fully argued. (See "JOURNAL" for March 16, p. 796.) Since this decision, the defendants had agreed to withdraw their statement of defence in the present case, which was practically in the same terms as in the other, and to submit to a declaration that the works in question were unauthorized, and to an injunction restraining their further use. They also agreed to pay the costs. Mr. Sheldon, for the defendants, said he was willing to consent on the understanding that the injunction would be suspended until the second motion day at the Michaelmas sittings, as a Bill had been presented to Parliament to authorize these works. In the other action, Mr. Justice Warrington had suspended the operation of the injunction. Mr. Justice Neville made an order in the terms arranged.

Water for Fire-Hydrants in Theatres.

At the Westminster County Court, last Wednesday, before his Honour Judge Woodfall, the Metropolitan Water Board sued Mr. Mulholland for 12 guineas, being a year's rate for fire hydrants at his premises, the King's Theatre, Hammersmith. Mr. A. B. Shaw, who appeared for the Board, said their case was that hydrants were fixed at the theatre to meet the requirements of the London County Council, and, under an agreement with the West Middlesex Water Company, one guinea per annum was paid for each. The Board gave notice to terminate the agreement, and said the charges would be under their Act of 1907; but the agreement was one under which the ordinary supply was furnished for the dressing-rooms, &c. There were two distinctly separate supplies—the one for the hydrants being from the special high-pressure mains. There had been no notice to determine the hydrant agreement; and the Board could claim under it. Mr. Drucquer contended that the Act of 1907 provided for uniform charges and determined all agreements. Theatre proprietors were compelled to fix hydrants, and the Board were compelled to supply water for fire extinction; but a hydrant could not be charged for any more than a bath or a garden hose. The charge was for a supply of water, not for the instrument through which it would be utilized if required. Very little water was used in theatres, but they were rated under the Act of 1907 on the high rateable value of the building; and this was a claim for a further guinea a year for each hydrant in the theatre—hydrants which had not been used. His Honour thought it rather hard on the defendant; but he had to hold that the agreement was still alive. He gave the plaintiffs judgment, with costs; but a stay of execution was granted.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Eve, Mr. Stamp mentioned a motion in the action of *Morgan v. Tottenham and Edmonton Gas Company*. He said it was an action alleging a nuisance by running certain gas-engines. The defendants, for whom he appeared, had now moved the engines, and terms had been arranged with the plaintiff and signed by his Counsel. There would be a consent order in the terms agreed; defendants to pay the costs of the plaintiff.

Charge to Prepayment Meter Users in Manchester.—At a meeting of the Manchester City Council last Wednesday, Mr. Jennison proposed "That the Gas Committee be instructed to consider and report on the advisability of making the price of gas to consumers using penny-in-the-slot meters the same as to those using quarterly meters." He said the question concerned an enormous number of the poorer people in the city—in fact, some 60,000 people would be affected by the resolution. Alderman Gibson, the Chairman of the Gas Committee, said he had no objection to taking the matter back and considering it.

Tar Road-Painting Difficulties.—Difficulties (according to the "Daily Telegraph") have arisen in the matter of tar painting of the roads, which has proved such a boon all over the country to residents near main roads and to motorists. The Kent County Council are in a quandary, as one of the Local Government Board auditors has taken exception to the charges made for the work of tar painting. They have decided to approach the Local Government Board on the matter, as it is a subject of great importance all over Kent, where motor traffic is particularly heavy, and where the work should be now starting. However, in view of the expression from the auditor, if it is a reflex of the opinion of the Local Government Board, they would be surcharged all round if the work is done. Where Part III. of the Public Health Act has been adopted, application, it is stated, can be made to have the work done; otherwise application is necessary to the Local Government Board for permission to make tar painting a special expense on the respective parish, and in case of approval, the County Council could do the work.

MISCELLANEOUS NEWS.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Fourth Day.—Thursday, March 25.

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The earlier proceedings were reported on pp. 105, 167.

The following were the Counsel engaged: For the Corporation Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASPINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

Further Evidence for the Corporation.

Mr. Walter Chaney, re-called, and further examined by Mr. BALFOUR BROWNE, repeated that it was the limited length of the connecting siding at the Nechells works which forced the traffic to be delivered by the Midland Company in dribbles. If, he said, the siding were extended, as it might easily be, or if the siding into the works were connected with any of the Duddleston Mill sidings, the Corporation could accept deliveries of full train-loads, and the Railway Company would be able to deliver the whole of their requirements in about half-an-hour to an hour's time. As to the two special sidings in the Duddleston Mill group which the Company said were reserved for the Corporation traffic (and which he had seen used for other traders' goods), it did not really matter to the Corporation whether they were reserved for them or not. Their traffic would do equally well on any other of the Duddleston sidings.

Sir ALFRED CRIPPS: I do not think it matters whether we reserve it in that sense or not. It is the occupation of space upon two sidings, whether it is reserved or not.

Justice LAWRENCE: Of course, there is an advantage in reserving it. It is no use saying there is not. If they were to put the traffic into a dozen sidings, there would be much more shunting in getting it out again.

Mr. BALFOUR BROWNE: That is their look-out.

Justice LAWRENCE: I do not think that is really a supportable business view of things.

Mr. BALFOUR BROWNE: It is the view I am going to try to put before the Court. If, for instance, they bring down a full train-load, and they find that their sidings are nearly all full, and separate the train-load into these ten sidings, that is their look-out, and not ours.

Justice LAWRENCE: I quite agree it is their look-out; but, as a matter of business, it is much better for you that they should only be put into two special sidings.

Mr. BALFOUR BROWNE: I quite agree; but it does not matter whether it is one siding or another. If I may say so, the mere question of reservation has nothing to do with it.

Justice LAWRENCE: No.

Mr. BALFOUR BROWNE: Then I get rid of that word in the Company's answer, which is apparently relied upon.

Sir ALFRED CRIPPS: If we are merely fighting about a term of that kind, I agree with my friend that it is not worth taking time over it.

Examination resumed: It was not correct for the Company to say the traffic was subsequently shunted day and night as required by the Corporation. The shunting was done entirely at the pleasure of the Company, who pleased themselves as to the hours at which they put the traffic in. As to empty waggons for coke, as a rule they gave the Company notice, perhaps once a day, of the number they might require during that day; and the Company put these on to the connecting siding at their own option. Then within a short time the Corporation locomotive came and took them into the works. He denied the correctness of the Company's allegation that the labour and expense in working the outward traffic was greatly increased by reason of the limited siding accommodation in the works compelling collection of coke in less than full train-loads. The accommodation was ample.

Mr. BALFOUR BROWNE: Now we will go to the London and North-Western Railway.

Sir ALFRED CRIPPS: There is no question between that Company and the Corporation with regard to inward traffic. It is only the outward traffic.

Mr. BALFOUR BROWNE: As to everything except coal, there is a question between us. They allow us a 3d. terminal on coal; but with regard to every other traffic there is a dispute.

Examination continued: Trucks were put upon a connecting siding,

the same as in the case of the Midland Company, and a Corporation locomotive pulled them into the works. The Company did not intimate when they had placed traffic on this siding, so that they had to send out several times a day from the works and examine it. The outgoing traffic the Company removed from the works twice a day, at stated hours. At times there might be more than they could take out at once; and in this case the balance would be left for the next journey. As to coal, the Company delivered this almost when they liked. On Feb. 27, for instance, they delivered sixty trucks within an hour; while at other times they might only deliver a few. Even when they received the sixty trucks, they were able to deal with them at the works.

Charles A. Cannon, foreman shunter at the Saltley works, said that when the Midland Company took empties out of the works, they pulled them directly over to the Duddleston sidings. All the Company had to do was to hook on the engine and draw out the trucks. He expected the Company had to marshal the trucks somewhere; but they did not do it on the Corporation siding. The Corporation did not do it. It was just the same as if the Company picked up each truck from a separate trader. He had never known of any request being made to the Company to deliver any special coal, or coal in any particular order, to the works.

Justice LAWRENCE: We had some cards shown yesterday with requests for particular trucks to come. Have you ever known of that?

Witness: No; I never knew of it till yesterday.

And you are the foreman shunter?—Yes.

William Hivons, foreman shunter at the Nechells works, said the two sidings in the Duddleston Mill group, which were stated to be used only for Corporation traffic, were sometimes employed for other goods as well. The connecting siding for the works would hold fourteen large waggons or fifteen small ones. It was left to the discretion of the Company to get the traffic as they pleased from Duddleston Mill to the connecting siding. When the latter was empty, they filled it up at their own convenience. The Corporation were prepared to take the traffic out of this siding practically as soon as put in. Half-an-hour was about the average time it was allowed to stand there. The longest period he had known waggons to remain there was three hours. No instructions were given to the Company to bring in waggons in any special order. As to sending coke out, the Corporation put the trucks on the connecting siding, and the Company took them away to the Duddleston sidings; and he supposed they were marshalled in the same way as other traffic was marshalled there. To his knowledge, they had never refused or been unable to take any coal that the Company wanted to deliver to them. The Company signalled when empties and coke trucks could be taken out of the works on to the connecting siding.

Justice LAWRENCE: They have to go somewhere to be marshalled?

Witness: Yes.

It is fair to say, then, that the waggons leave Nechells in a rough state?—Yes.

John T. Hardwick, a waggon inspector of the Birmingham Corporation, said it was his duty to make arrangements for the waggons which were required to take the coal from the collieries to the gas-works. It was the practice of the colliery people, after they had weighed the coal upon their machines, to send it down into their sidings and label it; and then the Railway Company would pick it up, take it to a siding and marshal it for its destination, and then bring it forward. The bulk of the coal was sent in whole train-loads. That was to say, at the making-up siding the Railway Company made up a train-load for Nechells or Saltley, as the case might be, and then could run it right through if they wanted to. On arrival at Washwood Heath sidings, the trucks would be left for varying times, and would be taken on to the works when the Company liked—subject to the reservation that, if the Corporation had not got any coal, they sent and told the Company so. So far as he knew, coal had never been sent down from Washwood Heath siding either to Saltley or Nechells and refused by the Corporation. The coal-waggons were not always sent on from Washwood Heath sidings in the order in which they were received there. When he had seen waggons which had obviously been there longer than they would be in the ordinary course, he had requested the Company to send them on. This happened often years ago, but not recently. Except in these cases, he had never interfered with the order of delivery. He thought it was in July or August last year that the Company introduced the practice of sending advice notes of the number of waggons lying at Washwood Heath. He had not before that asked to be supplied with advice notes.

Mr. FOOTE: The present system of making returns is a revival of a system which began in January, 1906, for good or for evil. I do not think it is suggested by the Company that they ever sent any returns except in the shape in which they give them now—namely, the number of waggons lying at Washwood Heath. On April 26, 1906, Mr. G. Hampton Barber wrote: "Referring to my letter of Jan. 22 last respecting a daily return of the number of trucks of coal on hand at your Washwood Heath sidings in transit for us, please note that the information in the manner in which it is submitted is of no use to us; and you may please therefore discontinue making the returns." In July of last year they resumed sending these returns without request.

Sir ALFRED CRIPPS (in cross-examination): There is just one letter I ought to put to you. Apparently it is written by someone for you. It is signed "Mr. Riley, for Mr. Hardwick." It is dated Aug. 27, 1908, to Mr. Thompson, a Midland Railway official: "I have given instructions to one of the collieries to hold back all supplies of coal to Saltley for four days, and trust this will help to reduce the number of trucks on your hands, which I know stands at 416."

Witness: This was written by one of my clerks. I had no knowledge of it. I should question the number 416; he might thoughtlessly have added some other traffic to it. If I remember aright, I was away for my holidays at the time.

Mr. William B. Lampard, in answer to Mr. FOOTE, said he was a coal-factor, and owned over 600 waggons. He had sold coal to the Birmingham Corporation for the past seventeen years, in quantities up

to 130,000 tons per annum. The coal had come from various collieries—mostly in Derbyshire. He furnished the waggons for the supply of this coal; and during 1907 he had 5783 waggons loaded at the Derbyshire and Nottinghamshire collieries for the Corporation. On the average, the double journey took about 6·1 days—say, three days each way. This included the loading at the colliery, and the date of arrival at the colliery back again. He supplied coal from the same collieries to other people; and he should say that the time occupied in the Birmingham Corporation trade by the waggons was shorter than in the other cases.

Sir ALFRED CRIPPS: I do not know that this is relevant.

Mr. FOOTE: It is relevant in this sense. As I understand, the Railway Company suggest that we have this coal detained *en route* at Washwood Heath siding and Duddleston siding; and therefore I wanted to ask the witness whether the total time of transit of the waggons employed by the Corporation is shorter or longer than the transit to other traders in a like business.

Witness, in further examination, said that for this reason he made a difference in his charge for the hire of the waggons. He charged the Corporation 4d. per ton for carrying coal from Derbyshire to Saltley. He had frequently had to complain to the Midland Company of the detention of particular waggons.

Justice LAWRENCE: I should think half your life is taken up in making complaints as to detention?

Witness: Yes.

Is there any railway company that you have not complained to?—Very few. They are all the same.

Mr. FOOTE: At the time of these complaints, what is the daily average that you were delivering to the Birmingham Corporation?

Witness: Sometimes 40 waggons a day. From 35 to 40 a day on an average on a big contract. It varies every year.

Sir ALFRED CRIPPS: I ask no questions. I do not see that it is relevant in any way.

Mr. Alfred E. Bond said he was Managing-Director to Messrs. J. Abbott and Co., who supplied anything from 10,000 to 200,000 tons of coal a year to the Corporation. In thirty years, he could only recollect one occasion on which the Corporation asked him to stop, vary, or alter the even routine of supplying the coal. This was in 1904, when there was a temporary breakdown at the Saltley works. Their waggons accomplished nearly four journeys a month, which was considerably less than the average to other customers for the same distance.

Mr. Thomas H. Hack, Engineer-in-Charge of the Swan Village works, which he has superintended for the past seven years, said that of the incoming traffic about 87 per cent. was loaded coal trucks and empty coke waggons. At present all the coal came from Derbyshire and Nottinghamshire. It travelled over the Midland to the Great Western at Bordsley Junction, and came to the works, after being taken down to the Swan Village Basin. It was only during the past twelve months that the coal had come from the south; previous to that it was sent from the north. The reception sidings held 43 waggons; and other sidings would hold another 40 waggons. He had never found the slightest difficulty in taking coal as fast as the Great Western Company could bring it to him. Empty coke trucks were put on the siding in the order in which they were received from the works. The Company did the necessary marshalling outside. Swan Village Station was the station for the district.

Sir ALFRED CRIPPS: I do not think that Mr. Hack has said anything with which I disagree as regards the working, if I follow it all.

Witness: I should like to say that on June 27 last year we had as many as 82 waggons at our works empty and full; and the maximum requirement of the works is not more than 39 per day.

Mr. BALFOUR BROWNE announced that, subject to interposing later the evidence of Mr. John Foster, the Engineer at Windsor Street, this was the Corporation case.

Sir Alfred Cripps's Address for the Railway Companies.

THE CHARGES FOR CARRIAGE OF COAL.

Sir ALFRED CRIPPS, in addressing the Court on behalf of the three Railway Companies, said he thought the principles they had to deal with there, both as to matters of principle and as decided in cases, had been fairly clearly ascertained. He did not contend that there was not room for discussion of certain points; but, still, in the main they were clearly ascertained. The largest, and by far the most important ground of complaint, as regarded value or extent of traffic, was the allegation made against the Midland and Great Western Companies that they were in some way or other charging either for station accommodation or station services, whereas they did not provide the accommodation or render the services. This was the main point in respect of the coal traffic. Then as regarded coke, or the outgoing traffic, which applied to all three Companies, he understood the same point had been raised—that they were purporting to make something in the nature of a terminal charge at the forwarding end, whereas they did not provide accommodation and did not give services. There were other small points—the Congreave and Small Heath questions—but the ground involved was very slight, and presumably would be easily settled between the parties but for the larger consideration. Therefore he was going to deal first with the question as a matter of principle. What was the relationship between a trader and a railway company in connection with the rights of a trader under section 4 of the Railway and Canal Traffic Act of 1894? This was the section which gave a certain remedy to traders in connection with private sidings; and it was in connection with this section that the main dispute between the parties arose. It said: "Whenever merchandize is received or delivered by a railway company at any siding or branch railway not belonging to the company, and a dispute arises between the railway company and a consignor or consignee on such merchandize as to any allowance or abatement to be made from the rates charged to any such consignor or consignee, in respect that the railway company do not provide station accommodation or perform terminal services, the Railway and Canal Commissioners have jurisdiction to hear

and determine such dispute, and determine what, if any, is a reasonable and just allowance or rebate." The Corporation case was to ask the Court to decide, first of all, as regarded coal traffic, what was a reasonable and just allowance or rebate, if any, which ought to be made to them. The charge the Companies were making to the Corporation was, of course, wholly justified and proper and legal as it stood. They were making a charge which worked out at about two-thirds of the conveyance rate alone. As a matter of fact, subject to any case which his friends might make there, the Companies were entitled to charge up to the maximum of the conveyance rate alone, on the assumption that they were only providing conveyance accommodation and conveyance services. This was the *prima facie* position. The Railway Companies were making to the Corporation a perfectly legitimate charge on the basis that the whole charge was applicable to conveyance, and none of it had any relation whatever to these terminal services. He would agree that where there was competitive traffic of the same class to a private siding and a station next door to one another, and the railway company were making the same charge in each instance, there would be a case to answer. In other words, there would be an assumption that the Company were putting something into what they called their conveyance rate really in connection with what ought to be called a terminal charge.

Sir JAMES WOODHOUSE: Is not there an absolute presumption arising that by reason of using the station a terminal charge must be made?

Sir ALFRED CRIPPS replied that it was not necessary; but they might assume it for his purposes.

Sir JAMES WOODHOUSE: If you disintegrate the rate, must not you allot something to the terminal services? I suppose as to that you would rely on the Salt Union case.

Sir ALFRED CRIPPS: No, I think I may put upon that exactly what we have done here, because it is perfectly accurate. Continuing, he said they had been asked—he was speaking for the Midland Company now—in substance for a disintegration of their coal rate. They stated, and it was quite right, that there was nothing in the nature of a terminal charge or station accommodation in their coal rate—which was a conveyance charge, *plus* 1d. for services rendered at, or in connection with, a private siding. Though the whole charge would be within their conveyance maximum, they said that 1d. of the amount was a charge they were entitled to make under section 5 of one of the Provisional Orders Acts in connection with a private siding. Of course, this must be dissociated entirely from a terminal charge, which depended on different considerations and circumstances. There was no assumption against a railway company who were making a charge to a private trader within the maximum conveyance rate that they were including in that rate anything as regarded a charge for terminals which they were not entitled to make. Then there was no jurisdiction in the Court as at present constituted to decide exactly what was the proper charge for the Company to make for duties in connection with these private sidings, if the Corporation were raising the point that the Company were seeking to charge too much, because the Court would have to sit as arbitrator under one of the Provisional Orders which said that in case of dispute as to the charges which might be made by a railway company to a private siding owner under these conditions, the amount of the charges was to be settled by arbitration.

Justice LAWRENCE: Take it that 1d. is the amount of the disintegration attributable to the services. Do you say that the Court as at present constituted cannot deal with the quantum of the 1d.?

Sir ALFRED CRIPPS: That is so. But they can deal with it in order to see whether in substance the allegation of the Railway Company as regards the 1d. is probably correct or not, because we have given as the basis of our charge partly conveyance rate, and partly a charge which would come under section 5 of one of the Provisional Orders Acts. What this Court can do is to see whether that is what I may call roughly a *bona fide* suggestion made by the Railway Company.

Sir JAMES WOODHOUSE: Under the Order, the charge has to be reasonable.

Justice LAWRENCE: How do you distinguish between a terminal charge properly so-called and these things which come within this section 5?

Sir ALFRED CRIPPS: Under section 5, you can make certain charges to a trader for services in connection with his private siding.

Mr. BALFOUR BROWNE: At or in connection with.

Sir ALFRED CRIPPS said he would state exactly how the law stood, according to his view, on this point, as ascertained in this Court. Within the conveyance rate, the Company had to put the traffic on to the private sidings by just taking it down over the points, or they had to take the traffic, properly placed as regarded marshalling and matters of that kind, off the private siding by backing their engine down on to the trucks which had been put in order in the private siding of the trader. Everything outside of a simple operation which was rendered necessary by the reasonable manipulation of the traffic was a service in respect of which the Railway Company were entitled to make a charge under section 5. It was on an entirely different basis from the terminal charge, which was a maximum charge for which the Company gave station accommodation. Supposing, for instance, the private siding owner had not sufficient accommodation for taking his traffic right off the main line, but, as they said here, the Railway Company were obliged themselves to supply siding accommodation, such as they did at Duddleston Mill and Washwood Heath, then they were entitled, in respect of the cost so thrown upon them, to make a charge, because the sidings were in connection with delivery, not conveyance. The other elements of charge permissible in connection with a private siding were the incidental costs of shunting, the provision of railway engines, and matters of that sort, where the private siding owner had not sufficient accommodation. For instance, take the case here, of where it was necessary to do shunting operations on the Railway Company's sidings because there was not sufficient room within the area of the private sidings. This was a matter the Court had to take into consideration. In fact, everything which was thrown as a cost upon the Railway Company outside what he might call the simple duty of putting the full waggons in and taking the empties or return waggons out, had to be brought into account.

Mr. BALFOUR BROWNE: I think conveyance means delivery too. There is no conveyance unless you deliver.

Sir ALFRED CRIPPS said that, of course, there was no conveyance unless they delivered; but there were services in connection with conveyance, and services in connection with delivery. Where the services in connection with delivery were not in connection with conveyance, and those services were thrown upon a railway company in connection with a private siding owner's accommodation, he had to pay. He agreed that the amount must be reasonable; but the considerations the Court had to bear in mind in ascertaining what was a reasonable amount were, in his view, well known, well ascertained, and well recognized at the present moment. Taking the Washwood Heath sidings, they were in truth and in substance an enlargement of the station terminal accommodation at Lawley Street. That was the real meaning of them.

Justice LAWRENCE: The mode, as I followed Mr. Balfour Browne, in which he treated that was this: He said when you dealt with the traffic in sidings at Lawley Street, no doubt the Court held in the 1896 case that you were entitled to some remuneration in respect of the services you so rendered; but now you have put these sidings down *en route* for our works, you have to come either through them, or by them, or past them to come to me at all. So far as I understand it, he says unless you can show that I request you to do something to my traffic in the sidings, then it is transit, and not delivery.

Sir JAMES WOODHOUSE: Regarding them purely as running lines.

Sir ALFRED CRIPPS: I agree that, if they were in the nature of running lines, my friend would be right. I will answer what your Lordship put to me. Whether or not it is at the request of the Corporation, to my mind makes no difference. Supposing you are carrying traffic for a private siding owner, and in order to deal with it reasonably, so as not to block your main line, and in order to deal with it as regards your traffic facilities, you are obliged to deal with it in a particular way having regard to the accommodation which the private siding owner has got, whatever it may be, you are entitled to charge in respect of that. It is not on his request. It is whether, having regard to the conditions under which his private sidings are worked and your line is placed, the particular way of dealing with the traffic is reasonably necessary or not. That is the test.

Justice LAWRENCE: Is that clear? If you look at the latter part of section 5, it would seem that he could negative the request by giving you notice to that effect.

Sir ALFRED CRIPPS: The request in this case—I never heard of it being put as a specific request—arises in this way. We are asked to carry his traffic to his private sidings; and we come under a contract to do it. That is the nature of the request to us. We are the carriers; he is the employer. If in carrying the traffic under these conditions to his sidings, it is reasonably necessary for the proper manipulation of the traffic to incur expenses either as regards accommodation or services, they would come within section 5. It would be impossible to deal with it in any other way. If the necessities of the traffic under the contract to carry which he is asked to undertake reasonably necessitate costs of this kind, that it is a request in the sense that it is necessary.

Justice LAWRENCE: You say the request may be expressed or implied, and you may imply it from the circumstances under which alone the traffic can be dealt with. That is very intelligible, and, broadly speaking, very good sense; but how do you read this proviso in section 5?

Mr. BALFOUR BROWNE: How could I tell them not to use Washwood? It would be regulating their traffic.

Sir ALFRED CRIPPS: At the beginning of section 5 there are these words: "The Company may charge for the services hereunder mentioned, or any of them, when rendered to a trader at his request or for his convenience."

Mr. BALFOUR BROWNE: It is the proviso.

Sir ALFRED CRIPPS: But one must read the proviso in connection with this. The proviso is: "Provided that where before any service is rendered to a trader he has given notice in writing to the Company that he does not require it, the service shall not be deemed to have been rendered at the trader's request or for his convenience."

Justice LAWRENCE: That proviso negatives both horns of the original proposition.

Sir ALFRED CRIPPS: I do not know. I am not aware here of any formal request of the kind having been before us.

Justice LAWRENCE: I do not think there is.

Sir ALFRED CRIPPS: The only difference would be, if they did request us, we could not deliver. According to my evidence, we could not do it. We are bound, owing to the necessities of our traffic arrangements, to act as we do. I never heard in these cases questions of what I may call the actual request raised. The request comes when they ask the Railway Company to undertake the contract of conveyance and delivery. The contract of conveyance and delivery they are bound to carry out in connection with the necessities of their line and the convenience which the trader gives, and all incidental matters of that kind. When you are doing that, you are doing the best that you can. It would be utterly impossible to suggest that a railway company would create inconveniences, or anything of that kind. That is absurd; but assuming we are *bona fide* doing the best we can for a customer, if we find it is necessary to incur expenses beyond the mere putting the train on a siding or taking away the trucks put ready for our engine, then it is common ground—subject to what my friend said as between conveyance and delivery—that anything beyond this does not come within the conveyance rate, and we may make a reasonable charge for it.

Justice LAWRENCE: There is another aspect of the matter which is further pressed upon one's mind by the treatment which the witnesses for the Corporation have given it. They seem to say that all these things ought to be regarded as things done by the Company for their own convenience. As I gather, your argument is that the trader who asks a railway company to bring traffic to his works asks them to do all things which are reasonably necessary for bringing the traffic into his works; and consequently if it is reasonably necessary in order to bring traffic into his works that the things should be done which you are speaking of, then they are done by his request, and you can recover payment for them under this section. But they seem to say, "No, you cannot, because they are done for your convenience; and you must

alter your line and make it larger, or make it this or make it that." Has there been any case which has ever suggested that you have a duty to make your particular junction with their works of a different character from that which it actually is?

Sir ALFRED CRIPPS: I am not aware of any. I do not want to make an admission as regards the Railway Companies I am representing; but nothing of the kind arises here. I can conceive a case where some little matters might be done by a railway company, even if there was not a legal obligation; and it might be said by not doing it you are keeping up a source of expense to the trader that is not necessary. I think, under these circumstances, if a railway company were well advised, they would correct a matter of that sort.

Justice LAWRENCE: If I understand you aright, you say in such a case as that, it would be a reasonable facility which they ought to provide.

Sir ALFRED CRIPPS: Yes. That is how it would work out, if dealing with it technically. Continuing his argument, he said that the Companies had to give evidence on this part of their case. If the Court came to the conclusion that what they were doing was not a matter which was reasonably necessary for the conduct of the traffic, but was merely a kind of luxury for their own convenience, or something of that kind, then his friend would prove his case against him on this point. But as long as it was reasonably incident to the contract of carriage and delivery that they had undertaken, having regard to all the conditions, then undoubtedly, on every principle of the Court, the amount as regarded cost of service would have to be ascertained at a reasonable figure against the trader. Since the last case, the Midland Company had put down, for the facility of all their traffic as well as this particular traffic, at very considerable cost, the Washwood Heath sidings, to enlarge what would be their station accommodation at Lawley Street—station accommodation in the same sense as in old days, when they had to take the Corporation traffic as far as Lawley Street. His friend's position would be that the effect of all this would be to diminish the amount of charge which the Company would be entitled to make either at the station or at the private sidings, because he would say that the expenses formerly incurred at the station, or the difficulties at the private siding, had been altered in some way by transferring these difficulties from delivery to conveyance. This could not be so. The new arrangements were made in order that the Company might deal better at Birmingham with the delivery of incoming traffic and the collection of outgoing. His first point was that there was nothing to show that this section of the 1894 Act ought to be put in operation against them at all; and his second point was that they could justify as *bona fide*, fair, and accurate the differentiation they had made as regarded their charge—allocating it partly to the conveyance charge, and partly to service rendered (under section 5) to the trader. As to the Pidcock rule, even as regarded the measure of rebate, this had on several occasions been referred to by the Court as inapplicable; but supposing that the Court came to the conclusion that the account the Railway Companies gave as regarded the rate was inaccurate and untrue, and it came to be a question of the amount of damages, then it might arise. With regard to Lawley Street, his friend had shown, at the outside, that there was the same rate of charge there as at Saltley. If there was competitive traffic at these two points, there might be some suggestion of undue preference; but where there was not, and where the Railway Company were charging absolutely within their legal rights, it was not for the Court to interfere for the mere purpose of diminishing a legal charge within the maximum powers which the Railway Company had made for a long series of years. The letters written by the Company could not be taken in any sense as being an admission against them on the lines that his friend had sought to use them.

Justice LAWRENCE: The way I understand him to be putting it is this: He says, "I do not want to go into questions of presumption, because there are the letters which I take as facts. Therefore you have made a charge of so much for conveyance and so much for services which we will say are services under section 5." But he says you do not perform any services under section 5. This is the point at which he joins issue with you upon that subject. He may be right, or he may be wrong. Supposing he was right in saying you do not perform any services under section 5, would not he then be entitled to say, "Very well, I have proved my case; and I am entitled to my rebate?"

Sir ALFRED CRIPPS: I think the result of that would be, he would show that either the penny or some less sum, when you ascertained the amount, according to his point of view could not be charged against him. That is not a rebate.

Justice LAWRENCE: I am assuming you are right in what you said upon the subject—namely, that if there is anything due to him, the Court as at present constituted is not competent to go into the question of quantum; but is he not entitled to say: "You do not perform any service which comes within section 5; and your letter is an admission that you are making a charge which could only be justified if you did perform some such service?"

Sir ALFRED CRIPPS: I agree to that extent.

Sir JAMES WOODHOUSE: Do you say that we could not determine the reasonableness of the charge under section 5?

Sir ALFRED CRIPPS: You could, of course, if you had been appointed Arbitrators.

Sir JAMES WOODHOUSE: Was not the point decided in the Scotch case of Cowan?

Mr. BALFOUR BROWNE: Absolutely. It was decided also in the Birmingham case.

Sir ALFRED CRIPPS: You can go into it for the purpose of showing what I call roughly the *bona fides* of the Railway Company, but not quantitatively. My friend says our explanation of the charge is not a true one; and the Court will have to decide whether it is or not. Of course, upon that issue they have to take into consideration whether what we are putting forward is a reasonable proposition. But suppose it was a question whether the charge for services was *rd.* or *ad.*, that is not what the Court have to consider. My friend is claiming a rebate not as regards the *rd.* in connection with these services, but a rebate actually upon what he says are the terminal charges that we are making in connection with Lawley Street goods.

Sir JAMES WOODHOUSE: But assume we came to the conclusion that

3d. was not a reasonable rebate to make, and that some services were performed *ex termini* the conveyance, do you argue that we could not say you shall be entitled to rd. or something more in consideration of those services?

Sir ALFRED CRIPPS: I do not go so far as that.

Sir JAMES WOODHOUSE: Do you say it is a question of whether 3d. is allowed or nothing?

Sir ALFRED CRIPPS: No; I do not say that. Mr. Balfour Browne is stating that he wants a rebate or allowance, because, the Corporation being private siding owners, we are not performing certain services. What the Courts have done is to consider whether the attitude of a railway company is reasonable or *bona fide*, not for the exact ascertainment of what they are entitled to charge under section 5, but as a test to see whether in the charge they are making to the trader there may not be an element of really terminal charge which they are not entitled to make; and to that extent, of course, they have given an allowance or rebate. I admit it is a fine differentiation in a certain way.

Mr. BALFOUR BROWNE: It does puzzle me.

Justice LAWRENCE: I think I follow. What you mean to say is this—that, if we come to the conclusion that the Midland Railway Company are, in point of fact, making this charge of rd., not merely for services which come within section 5, but for a terminal service, strictly so-called, then it would be within the jurisdiction of the Court, as at present constituted, to determine how much of the rd. should come off as rebate of the station terminal.

Sir ALFRED CRIPPS: That would be the way it would work out. Proceeding, he drew attention to decided cases bearing upon his contention. The first was the *New Union Mills Company v. Great Western Railway Company* ("Law Reports," 1896, 2 Q.B., p. 290); and the second, the *Corporation of Birmingham and Others v. Midland Railway Company*. The latter, he said, was very close to the present case. It was the question of a rebate or allowance in connection with the Saltley sidings. Since then there had been some change in the conditions; but these were all in favour of the Railway Company. Justice COLLINS then, in stating that the application must fail, said the applicants had to satisfy the tribunal that they had been called upon to pay a charge which they ought not to pay, by reason of the fact that they had not received the accommodation, or had the benefit of the services, in respect of which that charge was made. The learned Judge then continued: "How do they discharge that onus which is put upon them? They say: 'There are two different places at which we (the Birmingham Corporation) receive our coal—one at the Lawley Street Station of the defendants, and the other at the Saltley siding. The charge made to us is the same at both places—namely, 3s. a ton. At Lawley Street there is a station belonging to the Railway Company; and the Railway Company have admitted that some portion of the reduced rate of 3s. is applicable to a terminal charge at that station. Inasmuch as the rate charged to Saltley siding is the same as the rate charged to Lawley Street Station, we assume that there is in the 3s. charged to Saltley siding a terminal charge, just as there is in the 3s. charged to Lawley Street Station.' It seems to me, unless they make good that position, they have not established their *prima facie* right to a rebate on proof that Saltley is not a terminal station. I agree that no terminal charge can be made in respect of anything done at the Saltley siding. It is not a station; and if there is any station charge in the rate to Saltley, that station charge will have to come off, subject, it may be, to a set-off in respect of other services which the Railway Company might be entitled to charge for under section 5 of the Provisional Order. Now, speaking for myself in this case—I am not quite sure that on this particular point my colleagues agree with me—I am not satisfied that the applicants have here discharged the onus thrown upon them of satisfying me that there is any charge whatever for station accommodation made in respect of the traffic delivered at the Saltley sidings." Coal was delivered at the time at Lawley Street Station for Adderley Street gas-works. Then, the traffic now put into Washwood Heath sidings was put into Lawley Street Station, shunted, &c., and then taken on to the Saltley sidings.

Mr. BALFOUR BROWNE: It was taken into Lawley Street, and taken back; and the next sentence in the judgment shows it.

Sir ALFRED CRIPPS then read further portions of the judgment, one sentence of which was: "It seems to me that when one looks broadly at the whole of the circumstances of this case, the amount of work done by the Railway Company for the applicants at the Saltley siding is larger, is more expensive to them, and is more advantageous to the applicants than the work done at Lawley Street Station; and under these circumstances, it seems to me that there is no case made for a rebate." Sir Frederick Peel, in his judgment, said: "I think that, on the one hand, the Saltley rate must be lower than the rate to Lawley Street by the amount of the terminal, whatever it is, which is included in the Lawley Street rate. On the other hand, the Railway Company, I think, have shown reasons why the Saltley rate should, in certain respects, be higher than the Lawley Street rate, first of all by the extra distance over which they have to haul in the case of Saltley; and, secondly, in respect of the storage accommodation which they provide for the convenience of the Corporation. Setting one against the other, I come to the same conclusion as the learned Judge." He then went on to quote extensively from the case of *Salt Union v. North Staffordshire Railway Company* (Vol. X "Railway and Canal Traffic Cases," p. 179).

Fifth Day.—Friday, March 26.

Sir Alfred Cripps's Speech Resumed.

Sir ALFRED CRIPPS, on resuming his speech for the Companies, argued that the Court must be satisfied, either by proof direct or by inference, that a terminal charge was included. He then referred at length to several other decided cases. He said that what emerged was this—and he suggested it was good and sound sense—that when they were fixing an allowance or rebate off a rate which was in itself legal and within the maximum, there was really no basis upon which they could set to work to try to do it, without they first of all came to the conclusion, on all the circumstances brought to the notice of the Court, that something for terminal had been included. Of course, if they arrived at the opinion that something was included, it had to be excluded. What he did say most strongly, as a matter of principle, was

that it was contrary to all the provisions of Railway Acts and Railway legislation that, where they were charging a rate in itself legal—that was, a rate within the maximum, having regard to the charges which were included under that maximum—the Court could say the charge was an unreasonable one for them to make. Of course, the Court could enter upon an inquiry in such a case, for instance, as when undue preference was suggested, or something of that kind.

Justice LAWRENCE: If you go to a Court of Law and prove merely that a charge is made and that it is within the maximum, and say that you do not think it is reasonable, and there leave your case, of course, no Court can hold that the applicant has made any case. But suppose he goes and proves circumstances from which the unreasonableness of the rate may be inferred, what is to prevent the Court from going into it.

Sir ALFRED CRIPPS: He cannot do it; and there is no case where a Court of Law has gone into it.

Justice LAWRENCE: Surely.

Sir ALFRED CRIPPS: I am perfectly certain that there is no case in the books where such an issue has been allowed to be raised. Of course, the pure point of an overcharge is, Are you exceeding your maximum or not? Subject to the principle of undue preference, and matters of that kind, taking the common-law basis, within the maximum every rate made is *per se* assumed to be reasonable.

Mr. BALFOUR BROWNE: If you alter the rate to-day by increasing it a farthing, it is no longer reasonable unless you show it to be reasonable.

Sir ALFRED CRIPPS: I agree with that.

Sir JAMES WOODHOUSE: That makes the existing rate for the time being the maximum rate.

THE COKE RATE.

Sir ALFRED CRIPPS, resuming his argument, proceeded to deal with the question of the coke rate, which, he said, was the only other point besides coal which was of any substance at all. From one point of view, he was not so strong on the coke rate as on the coal rate; but yet he was well within the principles he had laid down. When the case was started, it was found that, attributing rd. for services in connection with private owners' sidings, this rd., plus the conveyance rate, was less than the rate they were actually making. They put in a terminal at the other end. Of course, there was no question about that. But putting in their maximum, and adding the rd. for services, they could not justify the rate they were making. This he thought applied to all three Companies. When the matter was brought to their notice, they put in a revised scale, admitting that in certain circumstances they had charged too much, and reducing all the rates to such a level that they could be justified on the rd. principle. So far as the Companies had recognized this position, they were liable on the six years' basis.

THE CASE FOR THE COMPANIES SUMMARIZED.

Summarizing under one or two propositions what appeared to him to be the position in a case under section 4 of the Act of 1894, he said he thought it was pretty clear that where a railway company were within the maximum charge for conveyance, and there was no other consideration—no comparable station rate, or anything of the kind—the principle adopted in the Salt Union case must apply. That was to say, they had a railway company charging an ordinary legal rate within the maximum for the conveyance services or terminal services which they were in fact providing, and there was no reason whatever for interfering with them. His second proposition was that there was a large balance of authority as the matter stood that the Court could not make an allowance or rebate without the terminal charge in some form was included in the charge complained of. He had gone through the authorities on this point, and shown there was some difference of opinion; but he could not, when he came to think it out, formulate in his own mind how they could really quantify a rebate or allowance, if no charge was made at all in respect of the subject-matter. This position was emphasized here, because they were asked to disintegrate—the Midland Company were, at any rate. They did disintegrate, and showed, if the disintegration was to be believed, that the charge did not in fact include anything for terminal. In letters, they showed how the rate was, in their opinion, made up—exclusive of this element altogether. As to the third proposition, when they considered this case on principle, it really seemed to him that, though the Corporation were not questioning directly, as they would under section 5, the value or cost of the services which the Companies were rendering in connection with the private sidings, yet they were really saying that the rd. was too much. This seemed to him to be the substance of their case. Of course, on this point, apart from questions of presumption or rebuttal, the Court would have the direct evidence of the Railway Companies showing what services outside the ordinary conveyance service they had to perform, and how they thought that the rd. was more than covered in respect of these services. He was going to say, further (particularly as regarded the Midland case), that the facts now were really much stronger than they were at the date of the old case. In other words, a bigger cost had been incurred now by the Railway Company for the benefit of the delivery at the Corporation sidings than was the case in 1896, because of the large additional sidings that had been laid down.

The hearing of evidence was then resumed.

(To be continued.)

Public Lighting of Penge.—The lighting of the streets of Penge and Anerley has of late been a much-discussed topic, and several public meetings have been held to formulate a scheme to provide better illumination of the chief business thoroughfares. On the 19th inst. another meeting was held to receive a report of the Committee appointed to deal with the question. They stated that they had considered different kinds of lighting, and had come to the conclusion that gas-lamps with inverted burners would be the best for the district. The report was adopted; and it was unanimously agreed that it should be sent to the Penge Urban District Council with a deputation of tradesmen. The Committee expressed regret that they could not give any idea of the capital outlay involved, as the Council were then in communication with the South Suburban Gas Company on the subject.

EXAMINATIONS IN GAS ENGINEERING.

The City and Guilds Question Paper.

Our readers are aware that the examinations in "Gas Manufacture," which have been for so many years conducted by the City and Guilds of London Institute, are now held on two branches of the subject—"Gas Engineering" and "Gas Supply." The Examiner for the former is Mr. W. Doig Gibb, of Newcastle; and for the latter, Mr. J. H. Brearley, of Longwood. The examinations in "Engineering" were held last Saturday; and those in "Supply" are fixed for the 1st prox. The following were the questions set by Mr. Gibb; the candidates being directed to confine themselves to one grade only, and not to attempt to answer more than eight of the numbered questions and only one of the alternative questions in the four hours allowed.

ORDINARY GRADE.

1. (a) By the aid of a sketch or sketches explain the construction of a regenerative furnace, and discuss briefly the advantages of this (if any) over an open-fired furnace. [40 marks.]

or, (b) Describe briefly any coke-handling plant from retorts to coke-yard with which you are acquainted, and compare, in general terms, the advantages and disadvantages of various mechanical systems and hand work. [38.]

2. Sketch a cross section of a hydraulic main with a dip-pipe in position, and show an arrangement by which the seal on the dip-pipe can be regulated and the dip-pipe seal be maintained in water without the tar rising too high in the hydraulic main. [36.]

3. (a) Theoretically, the primary and secondary air supply to a generator furnace should be in equal volume. Why, in practical working, has the primary-air damper to be more open than the secondary-air one? [26.]

or, (b) What are the general effects of low and high temperatures in the retorts on the quality and the quantity of the gas produced from the retorted coal? [30.]

4. Describe the practical working of a carburetted water-gas plant, and name the special points which require watching if a uniform gas is to be the result. [36.]

5. (a) After the greater part of the water has separated itself from the tar in a tank by natural settlement, the tar when pumped for distilling purposes still contains water. Describe the process by which the percentage of this water left in the tar can be accurately determined. [36.]

or, (b) How would you test the value as a purifying material of a sample of oxide of iron? Give the approximate results which you would expect to obtain from an average sample of any particular oxide with which you are acquainted. [36.]

6. (a) Describe, with sketches, any form of atmospheric condenser with which you are familiar, and state the advantages claimed for an arrangement by which the path of the gas through the condenser can be reversed at will. [38.]

or, (b) Discuss the relative advantages of tower scrubbers and mechanical washers. Explain, with sketches, the most efficient methods of distributing the water in a tower scrubber. [36.]

7. (a) What are the principal constituents in saturated gas lime? Does prolonged exposure to the air before being used for agricultural purposes, improve or deteriorate the gas lime from a farmer's point of view? If any changes take place, state briefly and generally what those are. [36.]

or, (b) Give the chemical reactions which occur in lime and oxide when unpurified coal gas is passed through them. [36.]

8. (a) How would you remove the SH_2 present in the gas after condensation? Give the chemical reactions. [40.]

or, (b) Explain briefly how the amount of nitrogen present in purified gas is usually estimated. [36.]

9. (a) If a spiral-guided (Gadd and Mason) telescopic holder be constructed in a concrete tank, why is it not necessary to provide radial movement on the guide-rollers attached to the holder itself, and equally necessary to provide this on the guide-rollers fixed to the tank? [32.]

or, (b) A holder does not give the required pressure, and it has been decided that machinery must be employed to take the gas from the holder and deliver it to the governor-house. The required work can be done by either enclosed "open" fans or by ordinary exhausters. Irrespective of first cost or cost of running, which would you employ? Give reasons for your preference. [38.]

10. What is meant by correcting the amount of a volume of gas to standard temperature and pressure? A volume of gas measures 500 cubic feet when measured at 65°Fahr. , with the barometer at 29.5 in. What volume would this be when corrected to standard temperature and pressure? [36.]

11. Describe the different joints and jointing materials with which you are acquainted which might be employed in connecting together the straight lengths of a cast-iron gas-main laid in a road or street. Under what circumstances might it be desirable to lay a wrought-iron main in preference to a cast-iron one; and if this were done, when would it be most desirable to specially protect the wrought-iron of which the main would be composed? [36.]

HONOURS GRADE.

1. (a) Name the chief points of difference in, and the special advantages claimed for:—

- (i.) Woodall-Duckham vertical-retort system,
- (ii.) Dessau vertical-retort system,
- (iii.) Munich chamber system,
- (iv.) Love's 45° inclined system. [40 marks.]

or, (b) Assuming that a single section of coal-gas plant be required to turn out one million cubic feet per 24 hours, what would be the approximate figures: (a) Length and breadth in feet of retort-house (inside sizes, ignoring coal-store, and for hand stoking), (b) number and size of horizontal retorts, (c) square feet of condensing surface (atmo-

spheric), (d) cubic feet in tower scrubbers (no washers of any kind to be used), (e) square feet of single sieve area in purifiers each containing four tiers of sieves (oxide to be used), (f) sizes of gas-main connections throughout the works? State the approximate costs for: (g) Retort-house and retorts complete (without coal-store or machinery, but with horizontal retorts for hand charging, regenerator furnaces, and stage floor), (h) atmospheric condensers and foundations, (i) exhausters and boilers (without houses, chimneys, or stand-by plant), (l) scrubbers, pumps, and foundations (no washers to be employed), (m) purifiers and connections on ground level with house to cover purifiers, and in addition as much extra space for materials as purifiers themselves will occupy. [40.]

2. (a) If a bed of retorts heated by gas from a regenerative furnace is first heated well and evenly, and afterwards unevenly, what steps would you take to ascertain the causes for this bad working? [36.]

or, (b) What are the effects of temperature (i.) on the volume and the quantity of the produced tar, (ii.) on the production of ammonia, (iii.) on the impurities in coal gas which have to be removed (CO_2 , SH_2 , CS_2)? [32.]

3. (a) How do variations in (i.) quantity of air blown in, (ii.) quantity of steam blown in, (iii.) temperature of carburettor and super-heater, affect the quantity and quality of carburetted water gas? How would you proceed to test the oil used in carburettor by fractional distillation? [34.]

or, (b) Compare concisely the claimed advantages and disadvantages of high and low grade gases. [30.]

4. (a) What proposals have been made, and what processes have been tried, to revivify spent lime to enable it to be again used for coal gas purification? [38.]

or, (b) Describe any method for determining the amount of cyanogen present in purified coal gas and in spent ammoniacal liquor. Why is it necessary in the latter case to reduce this quantity as much as possible when the spent liquor has to be run into a sewer or river? [32.]

5. (a) How can the amount of NH_3 in a sample of sulphate of ammonia be accurately determined? If a sample contains 24.75 per cent. of ammonia, what percentage of nitrogen does it contain? [36.]

or, (b) If a "closed" saturator be used in the manufacture of sulphate of ammonia, how can the arsenic which may be contained in the acid be removed so that a good grey salt can be produced? [34.]

6. (a) Describe fully the process employed for determining the amount of naphthalene in coal gas. [36.]

or, (b) Describe fully the method you would adopt for determining the amount of CO present in a town's supply (containing from 10 to 20 per cent. of carburetted water gas). [34.]

7. (a) What is meant by ammoniacal liquor being 10-oz. strength? What percentage weight of NH_3 does such a liquor contain, and what does this amount to in grains per gallon? State a method of accurately determining the amount of contained NH_3 . Why does the ordinary hydrometer test only give very approximate results? [32.]

or, (b) Explain, with sketches, a standard calorimeter, and describe the process of making a test of gas with this. Explain clearly the difference between "gross" and "net" calorific values. [36.]

8. (a) Give a brief description of the different systems employed for transporting coal in a gas-works. [38.]

or, (b) Explain why different gases when burned at the same rate through the same burner give different lengths of flame. [30.]

9. (a) A concrete tank is required for a large gasholder. What ingredients, and in what quantities, would you make the concrete with? What precautions would you take to insure firm bonding between the horizontal joints and between the vertical joints of the different batches of concrete employed? What special precautions would you take if it were to be specified that the concrete was to be thrown from a height, and what are your objections to this practice? What specification would you give for the cement to be employed, and how would you test the cement when delivered? [40.]

or, (b) A gasholder has just been finished, and the air in it has to be displaced with gas. It is not desirable to "blow off" in any careless way. Show, by a sketch, what method you would adopt to insure safety and to get such samples of the "blown off" gas as might be required for testing purposes. [34.]

10. (a) Describe, with sketches, an efficient apparatus for keeping the lutes and tank of a three-lift gasholder free from ice, steam being available for this purpose. [36.]

or, (b) A single-lift gasholder, 137 feet diameter, is open to the air when the tank is quite filled up with water, the tank being 140 feet diameter, and the depth of water in tank from bottom till it just overflows, 42 feet. A pressure of 5 inches is required to lift the holder. When the holder is shut off from the air and gas forced in, how many gallons of water will have passed through the overflows by the time the holder is just commencing to rise? [32.]

Double Gas Fatality at Liverpool.—Last Wednesday morning, two men were found suffocated and two others unconscious in a boarding-house in Hardy Street, Liverpool, used by emigrants waiting for the Cunard steamers. The four men arrived a day or two previously from Finland, bound for America. They occupied the same room in the boarding-house; and on Tuesday night, when the attendant went his rounds, he found them playing cards. It is supposed that they blew out the gas when going to bed. Upon the room being entered, it was full of gas; and when a doctor arrived he pronounced two of the men dead, while the remaining two were unconscious.

Engineman Killed at Salford Gas-Works.—While following his occupation as an engine-tender at the Salford Corporation Gas-Works, in Regent Road, on Tuesday last, Thomas Ackerley, aged 57 years, met his death. Ackerley had charge of two engines used for the purpose of working hydraulic lifts and capstans. He was asked to stop the engines, in order that one of the capstans could be repaired, and a few minutes later was discovered dead, wedged between the crank shafting and the engine-bed. At the inquest, when a verdict of "Accidental death" was returned, it was suggested by witnesses that Ackerley had not properly shut-off steam, and that while examining the machinery the engine started; he being caught in the shafting and killed.

LIGHTING OF THE CITY OF LONDON.

The Recent Deputation of the Streets Committee to the Continent.

On Monday last week, the Lord Mayor (the Right Hon. Sir George Wyatt Truscott) and Sheriffs were the guests of Mr. C. A. Teuten, the Chairman of the Streets Committee of the Corporation, at a dinner held at De Keyser's Hotel, for which a large number of invitations had been issued.

The toast of "The Lord Mayor and Corporation" was proposed by Colonel Leese, who remarked that so-called "reformers" had tilted against the Corporation; but he believed this body would long remain an example to all others of a like character. After alluding to the remarkable and interesting history of the Corporation, his Lordship proceeded to say that the Streets Committee gave an example of successful work well done for the benefit of the citizens of London. He was correct, he believed, in stating that there was no better-lighted, better-paved, or better-cleansed city in the world than their own capital. These results were due largely to the Committee and their excellent officers.

A presentation of a silver bowl and a timepiece having been made to the former Chairman of the Streets Committee (Mr. G. H. Heilbuth), the Lord Mayor proposed "The Chairman;" saying Mr. Teuten had a record of service second hardly to that of any one of the Corporation. In eight years he had filled no fewer than three chairs. Entering the Court in 1901, in 1905 he was elected the Chairman of the Officers and Clerks Committee, and in 1907 the Chairman over the Central Markets Committee, while he now directed the work of the Streets Committee.

In acknowledging the toast, the Chairman spoke of the recent visit which he and five other members of the Corporation had made to various Continental cities. The journeyings, he said, covered fourteen days—"fourteen days' hard labour." From the experience which had been gained, they believed they would be able to save money to the ratepayers. For years his predecessors in office had endeavoured to get the best possible light for the City; but the difficulty was that one street was lighted by electricity, another by gas, and a third by inverted incandescent gas-burners under pressure. Looking through the City, Fleet Street, he thought, was the best-lighted thoroughfare. In all, there were in the City 3160 public lamps, of which 500 were electric, and 110 inverted incandescent gas-burners under pressure. With regard to the tour, the principal cities visited were Brussels, Cologne (which was brilliantly illuminated, the main thoroughfare being lighted by arc lamps of 1200-candle power, centrally suspended), Düsseldorf, and Berlin. The authorities in Berlin had decided on spending 7 million marks, at the rate of a million per annum, on installing in all thoroughfares inverted incandescent gas-burners under pressure. This decision was arrived at after much investigation and many experiments by their Professor of Chemistry (Professor Drehschmidt). Other cities visited were Dresden, Vienna, Munich, and Paris—where there certainly was quantity, if not quality. He added that if one system could be decided upon for the lighting of the City of London, much money would be saved to the ratepayers.

RIVER PLATE GAS COMPANY, LIMITED.

The Municipality and the Price of Gas—A Forced Reduction—Scheme of Amalgamation of the Three Buenos Ayres Gas Companies.

The Annual Meeting of the Company was held last Friday, at the River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN in the chair.

The SECRETARY (Mr. H. T. Adkins) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in commencing the proceedings, referred to the death of Mr. Alfred le Rossignol. He said the members of the Board all felt his loss very much. He had been a Director of the Company since its inception in 1897; and his vast business capacity, and intimate knowledge of the Argentine, were of the greatest value to the concern. Proceeding to move the adoption of the report and accounts, he said he was very pleased to again meet the shareholders with what they might consider to be a very satisfactory statement of affairs, especially when consideration was given to all the trouble they had had, and the adverse circumstances under which they had laboured almost throughout the year. The profit was a little better than in the previous year. It was £130,445, against £129,325—say, £1100 better. But it would be noticed that £24,627 had been spent on upkeep, against £20,718 in 1907. The increase in the gas sold last year was no less than 10·33 per cent. over 1907; and this was on top of an increase of 7·27 per cent. over 1906, and 8·70 per cent. the year before. Of this increase of 10·33 per cent., 44 per cent. was for lighting purposes, and 56 per cent. for cooking and heating, which, as the shareholders would see, was now a very important branch of the business. They had upwards of 6400 cookers and grills hired to customers on Dec. 31 last. Coal cost 2s. 3½d. per ton less than in 1907; and it was hoped the cost would be even lower this year. The number of public lamps now lighted and attended to was 8970, or an increase of 852 during the year. It would therefore be seen that expansion in every branch of the business continued. Fortunately, there was no trouble with the men last year. The work was carried on quite satisfactorily; and it would appear that labour was now happy and contented in the Argentine. The prospects in the Republic were never so bright as at the present time; and the city of Buenos Ayres, where their business was carried on, was the centre and heart of all the prosperity. So he thought the Company might look forward to even more prosperous times than they had enjoyed up to the present, if they could only arrive at some mutually satisfactory arrangement with the Municipal authorities—and that had been their trouble. It might be remembered that last year he told the shareholders about the agitation among the authorities for a reduction in the selling price of gas; and he added that both the Directors and

their officials in Buenos Ayres had had a very anxious time. It had been much worse in the past year. The shareholders had no doubt been expecting to be called to a special meeting in connection with this matter, as he promised would be the case when anything definite was arrived at. But nothing really tangible was obtained until last Wednesday. Before speaking of this, however, he would explain just what had happened during the past year. Shortly after the last meeting, the Intendente (the Lord Mayor), who had urged them to submit to him an *ad-referendum* project for the municipalizing in a term of 50 years of the Gas Companies, resigned; and the new Lord Mayor, with a Committee of the Municipal Council which was named to study the proposal the Directors had drawn up, and submitted after protracted conferences with their colleagues of the other two Companies (Buenos Ayres New and Primitiva), decided that they could not accept the conditions, though the Directors knew them to be quite fair and reasonable. The Directors placed all the books and accounts at the disposal of the authorities, so that they might check the figures, and see that they were only asking for about the same dividends as the shareholders had been receiving. They were then back again to where the negotiations started. The obnoxious ordenanza, or decree (referred to in his last speech,) still existed; and it was to have come into force on April 1 last year. However, the Directors succeeded in getting it prorogued until July 1, and commenced active negotiations with the Municipal Council. It would be wearisome to relate all that happened, and to tell of the innumerable meetings held with their colleagues of the other Companies to confer about cabled propositions from Buenos Ayres. Several times they seemed on the verge of coming to a mutually satisfactory arrangement; but some further exactions of the authorities, which could not be agreed to, always prevented their doing so. Meanwhile, time was slipping by. The Directors always had the obnoxious decree before them; and though they could always appeal to the Supreme Court for protection, they knew this would mean a great loss to the Company in any event, as they had no fewer than 32,000 customers in the city, and they would probably one and all have refused to pay their account at any higher price than that fixed by the decree in question, which price would have meant almost, if not quite, the ruin of the Companies. Again, with the utmost difficulty, they obtained a further prorogation of the decree to Sept. 30; and they were then told that this was the last chance. It could quite be imagined that the Companies were anything but happy at that time. Still they knew that they had to stand fast, and do everything possible to protect the interests of their shareholders; and notwithstanding all the red tape and the delays, they continued the negotiations as best they could. But Sept. 30 arrived; and they were as far as ever from an arrangement, as the Municipal Committee could not make up their minds what they wanted. The Company had to send out on Nov. 1 their October accounts (the accounts were rendered monthly); and the Directors were afraid they would not be paid. But on Oct. 28 the President of the Municipal Council proposed that, as a friendly solution of the actual difficulty, the obnoxious decree should be modified to the extent of fixing the selling price of gas for the remaining three months of 1908 and all the year 1909, at 2 cents per cubic metre less than they were charging up to then, but which price was very much above what the much referred to decree called for. There seemed nothing else to be done; so the Companies accepted this, stipulating that they must enter a legal protest against the right of the authorities to fix selling prices without reference to the Companies. This legal protest was duly made. In order that the shareholders might be able to thoroughly understand the position the Companies took up, he would read the cable sent out at this juncture:

The Boards of the three Companies attended a joint meeting to-day, unanimously resolved that, in their judgment, the authorities are making a grave mistake in coercing Companies, as it will affect seriously the national and municipal credit in London, and will make it extremely difficult for the Gas Companies, and the railways, to raise the large amount capital required immediately for the development of the country. In their opinion, it would be very much wiser and better in the interest of the country to prorogue the ordenanza until June 30 next year, and so allow time for a friendly and final settlement of the whole question. But if the authorities still insist, we will agree to charge 22 cents until the end of the year 1909, with the understanding that we do not accept ordenanza in any shape or form, or recognize the right of the Buenos Ayres Municipality to fix price without reference to the Companies.

The Directors had not so far carried the protest to the Supreme Court, although their lawyers in Buenos Ayres told them that the Companies' rights were undoubted, and that the Courts would be sure to protect them. As would easily be understood, if at all possible, the Directors wished to arrive at an amicable settlement with the authorities, and so be enabled to work the business in peace and quietness. In a city like Buenos Ayres, it meant everything to have the authorities with them; and as the Directors knew they were asking nothing unreasonable, they still had every hope that, within a short time, they would arrive at a settlement which would satisfy the authorities and at the same time properly protect the interests of the shareholders. It might be that within a short time, the Directors would be able to again meet the shareholders with a scheme which would involve the amalgamation of the three Gas Companies trading in Buenos Ayres, as it seemed that the only way to thoroughly satisfy the authorities was to effect such economies as would allow of a further reduction in the selling price of gas. These economies could only be obtained by a fusion of the three Companies, who had separate mains in many streets of the city. He might add that negotiations to this end were considerably advanced, and even an adequate basis had possibly been arrived at with the Municipal Committee, but *ad-referendum* to the Council and, of course, to the shareholders. The Board had thought and hoped so many times during the last twelve months that they had settled with the authorities, only to find that they wanted something important changed, to which there could not be agreement, that he was diffident about making at present a decided statement. But he was glad to say he had received a cablegram that morning informing him that the *ad-referendum* contract had been signed. The shareholders might be sure, after what he had told them, there was no doubt about the Directors properly protecting their interests, and that any project they might decide to submit to the shareholders would be satisfactory from every point of view. The figures as to amalgamation had not been agreed on which the three

Companies should amalgamate. Possibly it would be on the basis of ordinary and preference shares to the shareholders; but he could not give the actual figures because they had not yet been arrived at. When, however, the Directors asked the shareholders to a meeting in the course of a few weeks, he should be able to satisfy them that their interests had been perfectly protected. The last two or three days different cables had come; but it was only that morning he had received the message saying the contract was at last signed—that was, between the Intendente and the Companies. It had still to be submitted to the Municipal Council; and, of course, when it was approved by the Council, it had to be submitted and approved by the shareholders of this and the other two Companies. He should be very thankful when it was all over, as the worry they had had for the last two or three years had been very trying indeed. Running next through the financial statements of the year, he said the revenue account showed a balance of £125,947, against £123,768 last year. When it was considered that the selling price of the gas was reduced by nearly 10 per cent. during the last three months of the year, this would no doubt be regarded as satisfactory. The balance was £105,192, against £104,600. The reserve fund was £185,000; and if the Directors' recommendations were approved, it would be £205,000. On capital account £36,758 had been spent during the year, which was some £18,000 less than in 1907. The principal items were £11,000 for 15 miles of new mains, and £18,000 for 3404 new house services. A new governor station had also been put up on the land at Flores. Their colleague Mr. Tulloch had just returned from Buenos Ayres, where he carefully inspected the various works, and went into all matters affecting the business; and he found everything was quite satisfactory. As to the appropriation of the balance at the credit of profit and loss account, it was proposed to add £20,000 to the reserve fund (making it £205,000), to give £2078 to the old age and pension fund (making it up to £7000), and to pay a final dividend of 9s. per share (free of tax), making the usual 8 per cent. for the year, so leaving £30,908 to go forward to next year, or (say) rather above £3000 more than was brought in.

Mr. C. P. OGLIVIE seconded the motion; and, in doing so, he referred to the arduous duties the Board had had to perform during the past twelve months. He did not think they could have found a man in the City of London more capable of handling this matter than their Chairman. He had worked continually for the Company; and he felt sure that Mr. Bowen had the respect of every shareholder in the other two Companies. This was what made his position so strong both inside and outside the room. Day by day Mr. Bowen had been in the Company's office at work on a particular object. That object was to pull together with the Municipality. A year ago the Municipality wanted to put the Companies down to such a figure that it would have been impossible for them to live, or to pay the proper dividend that such an investment as a gas company was entitled to. It was their Chairman's work, and his work almost alone, that had brought them into the position they were in now. He believed the day was coming when they would be able to make an agreement, and a permanent one, with the authorities.

The motion was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. C. J. HEGAN, a final dividend of 9s. per share was declared; making, with the interim dividend of 7s. per share, 8 per cent. for the year, free of income-tax.

The Chairman and Mr. Ogilvie were the two retiring Directors, and they were unanimously re-elected, as were also the Auditors.

Mr. TULLOCH proposed a vote of thanks to the Secretary and staff in London, to the Chairman of the Local Committee, and to the General Manager and Engineer and staff in Buenos Ayres. He spoke of his visit to Buenos Ayres, and stated how pleased he was with all he saw at the Company's works, and how loyal and diligent he found their officers and staff.

The CHAIRMAN seconded the motion; and it was heartily passed.

Moved by Mr. SKEEL, and seconded by Mr. A. W. OKE, a cordial vote of thanks was also passed to the Chairman and Directors.

The CHAIRMAN made acknowledgment on behalf of himself and his colleagues; and the SECRETARY on behalf of the officers and staffs at home and abroad.

The Water-Gas Question at Limerick.—A Whole House Committee of the Corporation of Limerick have decided (the Mayor and Mr. T. Ryan dissenting) that the project to expend £5500 on water-gas plant should not be proceeded with by the Gas Committee. Counsel's opinion was obtained, and was to the effect that the Committee could not legally go on with the work without the consent of the Corporation; but the Mayor has declined to be bound by the vote of the Whole House Committee.

Municipal Trading at Birkenhead.—Addressing the Birkenhead Town Council on the existing financial position, Mr. T. L. Dodds remarked that capital expenditure showed a disposition to go up by leaps and bounds. If the rates were to be kept down, some return must be obtained from the trading departments; and he had always held that municipal trading concerns ought to be productive of profit. In twelve years the total capital expenditure had been increased by £674,659, which had been largely reduced by the operation of the sinking fund during those years. It was expected, if capital was largely augmented, there would be some proportionate increase of income. This was not so, however. In 1896, the income from all trading concerns amounted to £12,000; while last year it was £11,000. The Corporation had invested in trading concerns £1,135,280; and the profit was £11,750—less than 1 per cent. on the capital invested. If this 1 per cent. were added to the 2 per cent. which was set aside for sinking fund, it made a total profit of 3 per cent.; and out of it must come the depreciation. This was not satisfactory. In 1896, the total debt was £1,211,730; while this year it was £2,153,465. He had come to the conclusion that in fourteen years they would have practically doubled the debt which it took the Commissioners and the Council up to 1896 to accumulate. Earlier in the meeting, Alderman Oldam, the Chairman of the Finance Committee, stated that the Gas Committee had come out nobly. They estimated last year that they would receive from the Gas Committee £9500; but, as a matter of fact, they had received £11,638—an increase of over £2000, which increase was equal to a penny rate.

MANCHESTER GAS PROFITS AND THE RATES.

A Smaller Contribution for the Current Year, or Dearer Gas.

Dealing with the estimates for the current year and the prospective rise in the rates of the city, the "Manchester Guardian" last Tuesday made the following remarks with regard to the contribution to be expected from the Gas Department.

"The statement that the Manchester Gas Committee cannot afford any longer to give sums of £50,000 or £60,000 in relief of the city rates will cause surprise and help to occasion a rise in the rates. When the City Council the other day agreed to keep the city requirements within the cost of a year ago, so that the only advance in the rates would be due to the Ship Canal rate, it was on the understanding that the Gas Committee would be able to contribute at least £50,000. This has been the sum handed over by the Committee for many years, except when, as last year, they have raised the total to £60,000. The Committee now find they cannot afford either sum. Last year their surplus was £26,894; and to make up the £60,000, they took £33,106 from their reserve fund. For the current year, the Gas Committee estimate their profits will reach £26,595; and as they have no reserve fund now to draw upon, they decided yesterday that the sum named is all they dare offer in relief of the rates. Even then they think it is contrary to the rules of sound finance not to build up a good reserve fund. If the Council insist on the usual contribution, it means raising the price of gas. In that case, they feel there would be a protest on the ground that the rates of the ratepayers who do not use gas were being eased at the expense of the gas consumers, many of whom are poor. Figures submitted to the Committee yesterday show that £759,026 was the estimated expenditure for the past year, and £779,800 was the estimated income, leaving a balance of £20,774. As a matter of fact, the expenditure was £734,791, and the income £761,685; so that the balance was £26,894. For the current year the income is estimated at £761,685, the same as last year; and the expenditure is put down at £733,605, which is £1186 less than last year's amount—leaving the prospective balance at £26,595."

After referring to the finances of other Committees, our contemporary concludes: "It is obvious that the task of arranging matters so as to keep the rates from increasing is more difficult than was at first imagined. The Finance Committee will find it hard to get departments to make demands commensurate with the big drop in the gas contribution. The latter in itself is equal to a rate of 2d. in the pound."

COVENTRY CORPORATION GAS UNDERTAKING.

Application for Additional Powers.

Mr. F. J. Willis, one of the Inspectors of the Local Government Board, held an inquiry at Coventry last Thursday in regard to an application by the City Council for a Provisional Order to amend, by the insertion of new clauses, the Coventry Gas Act, 1856, the Coventry Corporation (Gas Purchase) Act, 1884, and the Coventry Corporation Gas Act, 1898. The Corporation also sought powers to enable them to inspect gas-fittings in new buildings, compel consumers to use effective anti-fluctuators or other apparatus for controlling and regulating the supply of gas to engines, prevent gas-fittings (including stoves and cookers) let on hire being subject to distress, and substitute improved methods of testing the illuminating power of the gas for those at present prescribed. It was also asked that the Provisional Order should give the Corporation power to specify the size and material of the pipes and fittings laid by the consumer between the main and the meter on his premises, control the position of meters so as to make them easier of access, require notice to be given of the laying of pipes or the placing of meters, and refuse to supply gas to premises until these provisions have been complied with.

The Town Clerk (Mr. George Sutton) explained that in some cases the pipes put in were too small for the consumption of the house, and the result was that there was insufficient pressure. The occupier was apt to attribute this to the Gas Committee or to the quality of the gas, whereas it was due entirely to the pipes being too small. The Corporation had done a little in the way of putting in fittings in tenement property, and the gas-fitters of the city had objected, as it interfered with their province. Recently the Gas Manager (Mr. Fletcher W. Stevenson) had an interview with them, and they intimated that they would be very pleased to fall in line with any specification which the Corporation might impose. At present, however, the Corporation had no power to do it; and they would like to have it.

There was no opposition to the application.

GOWERTON AND DISTRICT GAS COMPANY, LIMITED.

Statutory Meeting in Private.

The Statutory Meeting of the above-named Company was held in Swansea a few days ago, under the presidency of Mr. W. John. Ten shareholders (two being ladies) answered to their names. At the outset, the Solicitor (Mr. C. W. Slater) called attention to the fact that reporters were present; and, after some discussion, they were requested to withdraw, on the understanding that an official report would be supplied to them at the close of the meeting. This was done; and it furnished the following particulars: The Directors' report was received and adopted, and the action of the Directors, as set forth in the notice calling the meeting, affirmed. The three local Directors—Messrs. W. John, Henry Vivian, and W. Williams—intimated their intention of materially increasing their shareholding in the concern. Mr. Chaplin (Cardiff) and Mr. W. E. Morgan (Hafod) were added to the list of Directors. Sir Charles Buckworth Herne-Soame, of Dawley, Salop, the Chairman of the Directors, intimated that, owing to differences of opinion with the local Directors, he did not seek re-election.

The local papers in which the foregoing report appeared contained

the following additional particulars: From the report of the Company which has been filed at Somerset House, it appears that the total number of shares allotted is 1021, of which 717 have been fully paid up. On the remainder, £670 is unpaid. The total amount of cash received in respect of shares issued wholly for cash is £4435. The amount paid in expenses so far is £1997 7s. The Water-Works, Lighting, and Power Investment Corporation, Limited, claim that 60 shares were allotted to them as nominees of the Contractor, and that they are entitled to them as fully paid. They also claim to hold 80 first mortgage debentures of £10 each, part of an issue of 200 such debentures alleged to have been made on the 2nd of January last. The Company deny the validity of these debentures. The balance (120 debentures) of such alleged issue were sent to the Contractor by the Corporation, but have been delivered up to the Company's Solicitor for cancellation. An action in regard to the matter is pending in the High Court.

GAS MANAGERS AS MUNICIPAL COUNCILLORS.

We have on several occasions recorded with gratification the election of a gas manager to serve on the governing body of the town in which his professional duties are discharged. This feeling has been engendered by the consideration that a man possessing the qualifications necessary for superintending the working of a gas undertaking must be quite as capable as a local butcher or greengrocer of representing and studying the interests of the ratepayers. It would be out of his power, even if he were so disposed, to use his position to the advantage of his company, inasmuch as he would not be able to vote on any question in which they were concerned. There does not, therefore, seem to be any reason, except spite, for endeavouring to oust a gas manager who has been duly elected a member of a council. Yet this appears to be the desire of the Socialist and Labour party in East Cowes, of the Urban District Council of which place Mr. Robert Fish, the Engineer and Manager of the East Cowes Gas Company, is a member, having been elected for the second time without issuing any address or soliciting votes.

At the last meeting of the Council, a letter, signed by certain rate-payers and parochial electors, was read, in which they expressed a wish to know whether Mr. Fish had any legal right to sit on the Council. The Clerk (Mr. A. Damant) said he had several times told the Council that, in his opinion, Mr. Fish was not disqualified from membership by reason of his being a shareholder in his Company; the only thing was that it would not be legal for him to vote on any question relating to the concern. Mr. Floyd urged that Mr. Fish was not only a shareholder but a Director and the Manager of the Company. As a Manager he no doubt received a salary, part of which was money paid by the Council for gas, and came out of the rates. If this was so, Mr. Fish could not legally sit on the Council, because he was receiving money out of the rates. In order that the question might be settled once and for all, he moved that it be referred to the General Purposes Committee to be fully considered and reported upon. Mr. Board said the subject had been discussed at the Council several times. Perhaps Mr. Floyd forgot that, seeing the Council themselves held shares in the Company,* each councillor was a shareholder. The letter was very bad policy, and he was surprised at some of the people who signed it. It was easy to see whence it emanated. The ruling of the Clerk should surely be sufficient. Mr. Trowbridge said that to him the letter appeared to be a bit of petty spite. Mr. Fish did not get unseated at the last election, and perhaps some people wanted to make a little fuss about it. If it was illegal for him to sit on the Council, it was also illegal for some of the other members to do so. Mr. Glasspell said it seemed that the Council did not know where they were in the matter, and, not out of any ill-feeling, but just to know how they stood, he would move that the Clerk should write to the Urban District Councils Association and ask for a ruling. Mr. Groves seconded the motion, on the understanding that all cases as to which a question could be raised should be investigated. He did not know why Mr. Fish should be singled out, because other members' legality might also be questioned. Mr. Floyd said his main contention was with regard to the position of Manager held by Mr. Fish. Mr. Glasspell's motion was carried.

* Shares to the nominal value of £200 were some years since given to the town by the late Lord Gort.

Bombay Gas Company, Limited.—The Directors of the Company report a further expansion last year in the sale of gas to private consumers and for public lamps; the latter resulting from the decision of the Municipality to abolish the practice of extinguishing lamps on moonlight nights. There was an increase of £1753 in the rental from private consumers, and of £3360 in that for public lighting. The accounts accompanying the report show a profit of £15,962 on the net revenue account; making, with £3225 brought forward, £19,187 available for distribution. The interim dividend paid in December absorbed £7200, and the Directors recommend a dividend of 3½ per cent., free of income-tax; making 6½ per cent. for the year. This will leave £3587 to be carried forward.

Water Scheme for Diss.—Mr. W. H. Booth, the Engineer appointed to carry out a water supply scheme for Diss, has written to the Council in respect to particulars required by the Local Government Board. He suggested that, in view of the attitude of the Local Government Board, it might be desirable to fall in with their views, and apply for sanction for a preliminary loan for experimental boring and incidental expenses. Mr. Booth estimated that the cost of boring would be £260; and if the Board insisted upon a long pumping test, he should recommend that application be obtained for sanction to a loan of £400, as any surplus could be merged into the larger sum to be borrowed for carrying out the work. The Council resolved to make application to the Board for sanction to borrow the sum of £400 for experimental purposes.

SOUTH METROPOLITAN COMPANY'S RATING APPEALS.

Bermondsey Borough Council and Messrs. Dinwiddy.

The objections of the South Metropolitan Gas Company to the passing of the accounts for 1907-8 of the Woolwich and Greenwich Unions and the Bermondsey Borough Council, on the ground that various amounts paid to Messrs. Dinwiddy and Sons (representing the taxed-off balances of their bills of costs against the Company, after the latter had lost their appeals against the 1905 valuations) should be surcharged against the Local Authorities, concluded, as already reported in the "JOURNAL," a few weeks ago. The result so far is that Woolwich has been surcharged £143 16s.; at Bermondsey, the Auditor having intimated that there would be a surcharge of £112, and possibly more, Messrs. Dinwiddy refunded £122 17s.; and at Greenwich, the firm having accepted 50 per cent. of their bill in settlement, the Company only entered formal objection to maintain their status, and the half payment was approved by the Auditor. Messrs. Dinwiddy have since addressed a letter on the subject to various local papers in Woolwich, Bermondsey, and South London generally, and in the course of it have stated as follows with regard to the Bermondsey proceedings: "The Council, after taking an eminent Counsel's opinion, paid us an excess over our original claim; we spontaneously refunding that difference to protect our clients from the obvious surcharge to which their own generous action had exposed them."

This statement was the subject of questions at the last meeting of the Bermondsey Council. On the agenda was a report from Mr. A. Carson Roberts, the Auditor, on the subject of the Gas Company's objections to the accounts. In this he stated that he finally decided to disallow £115 off the account paid to Messrs. Dinwiddy, but that a surcharge had been obviated because, after the meeting at which he said he had already decided, up to that point, to disallow £112 (subsequently increased), the firm in question had refunded to Bermondsey £122 17s. Mr. J. Oake took exception to Messrs. Dinwiddy's statement that the Bermondsey Council had paid them more than they claimed, and that the refund was spontaneous on their part; and he asked the Town Clerk a series of questions on the subject. The Town Clerk's reply was that Messrs. Dinwiddy's claim was originally for £775 15s.; and that underneath this amount they had put "Less rebate £122 17s." They explained in a letter that the rebate was given because they had done some similar work for two or three other districts. The Assessment Committee and he (the speaker) thought the charge excessive; and he communicated with Messrs. Dinwiddy, who replied that as the bill was disputed they would require the full £775 15s. Counsel's opinion was then taken, and it was to the effect that the Council were liable. The full amount was accordingly paid in February, 1908, and nothing further was heard of the matter till the Auditor came to investigate the accounts for 1907-8 and the Gas Company entered their objections. It was only this year, after the Auditor had decided to disallow £112, that Messrs. Dinwiddy sent a cheque for £122 17s., the amount of their original offer of rebate. He did not call this return a "spontaneous" one, nor did he call it a "generous action" for Bermondsey to pay a bill which Messrs. Dinwiddy had demanded, and for which Counsel had said that, under their contract, the Council were liable. In answer to a further question, the Town Clerk said that, in his opinion, if Messrs. Dinwiddy had not refunded the amount, and the Council had been surcharged, the latter would have had cause of action against the firm. Mr. Oake said he hoped his colleagues would remember this incident when the question of appointing a quinquennial valuer came up for consideration.

HAVERHILL GAS-WORKS EXTENSIONS.

At the Meeting of the Haverhill Urban District Council on Monday of last week, there was submitted a report of a special meeting of the Gas Committee, which showed that they had considered plans of the proposed extensions necessary to the gas-works, and recommended that three additional benches of retorts be constructed on the Winstanley system, with the necessary building and alterations to the existing plant, at an estimated expenditure of £1575. The Committee recommended that a loan of £1000 should be raised on account of the expenditure, and that the Council be asked to apply to the Local Government Board for their sanction, authorizing such loan to be repayable in twenty years; and also that the Committee be empowered to undertake such work as they could carry out themselves, which should be paid for out of revenue account.

In moving the adoption of the report, Mr. Coster said the proposed work had been in the minds of the Committee for some time. They had known that they were gradually getting towards the date when the works would have to be extended; and the various alterations had been made with this end in view. It was obvious it was hardly worth while to extend a system which was of the very earliest type, when it was remembered that all the works in the country of any size were now carbonizing coal on the regenerative plan; and the Committee thought that now was the time to adopt a tried and proved system, and one which would give the most efficient results. They proposed to instal three retort-benches; keeping one as a stand-by. The Committee had had an interview with the patentee of the system; and he had offered to guarantee the capacity, the efficiency, and the life of the work. So the Committee felt they were not going into the matter blindfold. The reason they asked for the loan for twenty years was that the Committee knew the profits from the alteration would be ample to repay the loan and all the interest, and still give them a considerable amount to spare.

In the course of the discussion which ensued, Mr. Unwin asked whether it was fair that so much money for the extensions should be taken from revenue. Why should not £1200 or £1500 be borrowed? Had the Committee any idea of what the minimum price of gas should be before the rates received part of the profits? He quite admitted that the gas consumers had the first claim; but when the gas got down to what he called a very low limit, the profits should be devoted to the relief of the rates. He should think a low limit for the price of gas

would be 3s. per 1000 cubic feet. In reply, Mr. Coster said that, when they came to think that in about seven years' time the ratepayers would stand in the position of owning gas-works which they, as ratepayers, had never contributed a penny towards, he did not see that the ratepayers ought to raise the question of the price of gas at all. He thought it was the consumers who should have the first consideration. The ratepayers had never been taxed in any way for the benefit of the gas consumers of the town. The consumers had, besides keeping the works in repair, paid for them; and they had been taxed for their own benefit. He would very much like to see the price of gas at 3s. per 1000 cubic feet. He should not care to promise such a thing in the immediate future; but it was not by any means a vision. It was quite practicable; and he hoped to see it.

The report was adopted.

VALUE OF INDUSTRIAL CO-PARTNERSHIP.

In the course of a lecture on "Co-Partnership," delivered under the auspices of the Chartered Institute of Secretaries last Wednesday by Mr. Russell Day, B.A., he remarked that, in order to carry on trade, in addition to capital and labour, there was a third essential element—viz., ability or brain power to control the others. These three should work in perfect harmony to produce the best results. Strikes had cost millions, both to labour and capital, and had caused loss of trade to the nation, besides driving capital out of the kingdom. There had been more than 300 endeavours by employers and workmen in England to work on profit-sharing and on co-partnership lines; but the late Sir George Livesey was the man who first introduced it on a large scale, at the South Metropolitan Gas-Works. There were now fifteen gas-works in which the system of enabling workmen to become shareholders had been adopted; one of the last being the Gaslight and Coke Company, whose scheme affected some 10,000 men. The root of the whole matter seemed to be thrift. It improved the good character workmen mostly possessed, and strengthened them to resist unsound principles tending to deteriorate character and foster discontent. Differences would be arranged by the Committees, and good trade would bring happiness to all.

Speaking at West Hartlepool last Thursday, on the occasion of being made a freeman of the borough, Sir Christopher Furness, M.P., made the following remarks on the subject of co-partnership: "It may not be too strong a thing to say that the future of British industry hangs on the development of labour co-partnership. I am entirely satisfied that the system, with the loyalty, the intelligence, the zeal, and the industry which it brings into play, will enable us to confront our rivals, wherever they arise. Indeed, I appraise the system, with its invaluable adjunct of a works council, so highly that, in view of the peril which has for some years past environed the future of British industry, I am strongly disposed to urge that it shall, in some form or another, be brought into operation in every trade to which it can be made applicable throughout the kingdom. Co-partnership has lately been denounced as a fraudulent device designed to squeeze labour for the benefit of capital. The extreme political theorists who promulgate this view conceive that the joint reward of the rare initiative and continuous responsibility of enterprise, the helpfulness and sustaining capacity of capital, and the skill and strength of labour, shall be the reward of labour solely. But is such a proposition likely to commend itself as either just or practical to men having any claim to fairmindedness or proper cognizance of the realities of things? If we wish to sustain our supremacy, if we wish to lead the lives of self-respecting Englishmen, worthy of the race from which we are sprung, we must doff the garb of frivolity and cease to view life as a piece of play; we must throw off our personal self-conceit and our national complacency, and become earnest students of our industrial and commercial environment. We must manifest, as never before, initiative, zeal, energy, care, ability, industry. The best available instrument for meeting and overcoming this crisis of our national life is the principle of co-partnership."

Frequency of Suicides by Gas.—Dr. F. J. Waldo, while holding an inquest in the City on the body of a man named Randall who had committed suicide by turning on two gas-jets and stopping the ventilation of the room, remarked that cases of coal-gas poisoning had been progressively on the increase in large cities during the past ten years. Now that it was more difficult to get poisons, people seemed to turn the gas-taps on.

Chesterfield Water Supply.—A Local Government Board inquiry has been held at Chesterfield with regard to an application by the Gas and Water Board for sanction to a loan of £41,000 for reservoir and water-works purposes. The Law Clerk (Mr. John Middleton) said the expenditure authorized by the Board's Act, and under which they acquired possession of the old Gas and Water Company's undertaking, had been exceeded. The Board had constructed a new reservoir, the capacity of which had been increased by 18 million gallons to 238 million gallons by certain additional excavations which were not originally intended, and which were occasioned by the uncertainty which was inseparable from reservoir making. The excess expenditure entailed had been defrayed out of the accumulated profits of the undertaking; and when the loan was granted, the amount would be repaid. Mr. E. M. Eaton (one of the Consulting Engineers to the Board) stated that he was thoroughly satisfied with the manner in which the construction of the new reservoir had been carried out. He had frequently been consulted as to the best methods of dealing with the geological difficulties which had arisen, and which were not made apparent by the trial holes; and the way in which they had been got over was undoubtedly the best. The figures of the cost anticipated to complete the scheme were based on the actual outlay on the work so far; and were perfectly accurate. Mr. W. B. Bryan (the other Consulting Engineer) informed the Inspector that £68,729 had been expended; and that he estimated £3500 would be required to complete the scheme. This could be done within three months. The overflow from the two old reservoirs during nine out of the past ten years had been sufficient to fill the new reservoir once a year.

SOME COMPARISONS OF GAS AND ELECTRICITY.

The "Daily Telegraph" last Tuesday contained an interesting article comparing gas with electricity. It was apparently called forth by the recent announcement by the South Metropolitan Gas Company of a reduction in price at Midsummer. The action of the Company, who, the writer acknowledged in his opening paragraph, have "consistently tried not to be exorbitant," and who, compared with many other suppliers of gas, have been "reasonable, even generous," forced into consideration many points; and these he dealt with as follows:

THE INHERENT VITALITY OF THE GAS INDUSTRY.

Nobody can fail to see that in this step is an indication of an intention to meet and check the advance of electricity as a civic and domestic commodity. A naval parallel might almost be ventured—with improvements. The power-standard of gas has been threatened. For almost a century it was predominant over all other similar agencies combined for lighting or heating. It has now a formidable, energetic rival—electricity. The balance of power is becoming nearer equal day by day. In a few years the scales may possibly be turned. Electricity may dominate and gas be subverted. Apparently this can only be prevented by the inherent vitality and active development of the gas industry. And there are evidences that both exist. In other words, feverish as the attempt has been to overtake and outstrip the old force, the old force is showing itself capable of sustained and even successful resistance. It abides on its merits. Witness the progress of the gas industry of the United Kingdom between 1880 and 1906. The capital employed increased by 125 per cent., the revenue received increased by 100 per cent., the coal used increased by 83 per cent., and the number of consumers swelled by 175 per cent. And during the latter part of this period the uses and advantages of electricity were being advertised with supreme energy. Even later computations show that, notwithstanding variations in the price of residuals, gas dividends have been steady, whereas the dividends of the rival concerns have diminished. In this situation, cool-headed men, like Sir Oliver Lodge, will entertain "great hopes for both;" basing them mainly in the case of gas on its cheapness, and in the case of electricity (for some considerable period, at any rate) mainly on its luxury.

OFFICIAL PREFERENCE FOR GAS.

There is an official view to be regarded on this subject bearing on the cost, on which, granted equality, or even approximate equality, in other respects, ultimate supremacy must depend. Time and again when Government inquiries have taken place into the application of local bodies for power to borrow for electrical undertakings, Local Government Board officials have advised very careful consideration of the advantages of street lighting by gas before adopting electricity. This happened quite recently at Watford, at Bexley, and at Hounslow. Said one: "Electricity means that you are giving less light and charging more for it." Nor does this thinly-veiled official preference bear alone on street lighting. It embraces public institutions. The Parliamentary Committee appointed in 1907 to inquire into (among other things) the lighting and heating of Poor Law institutions, say in the parliamentary paper recently published: "On the whole, it does not seem to them (the Committee) that there is adequate evidence to justify the substitution of electricity for gas at institutions where gas is already in use." And even the most ardent advocate of electricity must concede a very considerable civic endorsement of the official view as here indicated. Numbers of instances can be cited of a trial of electricity for street lighting and its abandonment in favour of the old system, not alone on account of the cost, but also of efficiency. Islington has its own electric works, but finds it cheaper by nearly half to light an additional fifteen miles of streets by gas than by electricity, though its gas has to be purchased from a Company which derives profit from the sale. St. Pancras also has its own generating works; but against £18,000 profits in relief of the rates in the last ten years, it has to set off £35,000 more paid for street lighting in the last seven years. Camberwell is wedded to gas, and lights its streets at a cost of £80 per mile, as compared with an average of £183 per mile for the whole of London. Since it introduced electric street lighting, Long Eaton has increased its burden on this score from £630 to £1367; and Whitby has saddled itself with an additional £600 (from £1000 to £1600). Manchester, Birmingham, Bradford, and other big towns in England and Scotland owning generating works, find it best to employ gas, and use that medium in all their new streets. In Liverpool, the relative cost per mile of gas and electric lighting is £120 and £500. In the City of London we have another illustration. The adoption of electric lighting for a few of the main streets proved so unsatisfactory that gas was re-introduced, and a saving of £400 a year effected. Many people declare also that the lighting is now better. In Fleet Street an experiment is being tried with high-power inverted incandescent gas-burners, and the lighting has this advantage—that it illumines the footways, which most need it.

QUESTIONS OF RELIABILITY AND COST.

There is a third point of importance deserving attention in regard to this literally "burning" question. Cost and efficiency are of first-rate interest; but reliability is not to be ignored, and those who go deeply into the subject are far from underrating it. Naturally they seize upon anything that weighs one way or the other. In this respect they claim to have laid on a substantial fact telling against electricity. What a breakdown or a strike at an electrical generating station means, we all know. The light at once fails, and darkness obtains. If the boilers are not constantly fired, the sources of energy are dispelled, and there is no reserve to be drawn upon. With gas, it is somewhat different. It is a negligent company which has not sufficient supply for a day stored in its holders, so that if a strike occurs or machinery breaks down there is at least a little time in which to fill vacancies and effect repairs. This, however, is a disparity that doubtless time and ingenuity will remove. To narrow the sphere of observation, approach the subject from the shopkeepers' and householders' standpoint. To the shopkeeper two

questions present themselves—brilliance of lighting and expense. At all costs, he must have attractive lighting, if he has a spark of enterprise in him. And the probability is that if the brilliancy he secures brings a return in hard cash, he will not seriously cavil at the cost. The moot point is whether, with the improvements now effected in gas-lighting apparatus, he does not find gas serve him equally as well as electricity. Especially since the inverted mantle made its appearance has he been disposed, when meditating alterations, to try to adapt his existing fittings, rather than be fitted out with electricity. Many estimates have been made as to the cost he may have to meet through his choice between the two mediums. Taking 1500 as the number of hours a shop has to be lighted throughout the year, and the light required to be 1000-candle power, the expense has been worked out at, respectively, £65 for gas and £320 for electricity. This is a wide disparity, sufficient, indeed, to suggest pause to any tradesman, however enterprising. It may be exaggerated. But none venture to say that the difference would not be very considerable, and that, accepting these figures, something more is needed than even a trifling addition of brilliancy to justify the change—the consideration, for instance, of less harm being done to stock by electric light than by gas.

GAS FROM THE HOUSEHOLDER'S STANDPOINT.

Between the rival candidates for power, the real bone of contention is the householder; and strenuous are the efforts made to secure his adhesion. At present the object of the strife is faced by several concrete facts. The electricity he uses for lighting costs him more than gas, and electricity for cooking and heating cannot be supplied to him at anything like a practicable or a reasonable figure. From these facts there is no hiding. Gas holds the field for lighting, cooking, and heating, so far as cost is concerned, at the present moment. Electricity is alleged to have hygienic and physical advantages. But even these are being disputed and met by counter-developments. While the tenant examines with startled eyes his swollen lighting account, the cleanly wife, gazing at the ceilings, endeavours to assuage his alarm by pointing out their pure whiteness. "But," says the scientific gas advocate, "that whiteness cloaks a danger. It is not the fumes from gas that discolour a ceiling, but the upward current of hot air created by the gas, which carries with it floating particles of dust and dirt and lodges them there. And in that upward current you have a means of ventilation which no electric lighting apparatus can supply. Besides, in your room there are numberless bacteria hovering around. There they remain in place when electricity is the illuminant; but a gas-flame draws them to it, consumes them, and saves you from untold ills." This may seem to some the *reductio ad absurdum*; it contains one whole-some point—that gas is a valuable means of ventilation which is too often left out of account. That the healthiness of an apartment is necessarily increased by the substitution of electricity for gas is not a safe assertion. The new Central Criminal Court is an illustration to the contrary. Apparently built on the best known principles, and electrically fitted throughout, it yet arouses bitter complaint on the score of ill-ventilation. Where human bodies are congregated, vitiating elements are exuded which, in the interests of health, should be dispelled. Artificial ventilation is therefore a necessity in all enclosed spaces which are inhabited. Gas, say the advocates of that commodity, ensures ventilation if properly regulated, and electricity does not. Therefore, before electricity can be said to equal gas hygienically, it must be developed in relation to new principles of ventilation.

THE MERITS OF THE RIVALS.

Into these intricacies of rival virtues one might penetrate still deeper, but they go too far away from the broad considerations which influence the average consumer when he is asked to make his choice of one or the other medium of lighting. Given an equality of price between gas and electricity, it may safely be assumed that choice of the latter would prevail on account of its obviously greater cleanliness and convenience, but not on account of its superiority as an illuminant, for invention has annihilated the disparity which manifested itself when electric lighting was first introduced, and, indeed, put gas on quite a new plane of value in this respect. For cooking purposes, electricity is yet in the infant stage. It is infinitely more costly than gas cooking, and cannot even be regarded as in the lists in respect of heating.

So the war will continue, with fluctuating passages. Electricity has made a bold advance and secured a substantial hold; but the movement has not driven away its rival. On the contrary, since the strife began, the uses to which gas may be put have been greatly multiplied, and its inherent qualities improved to an extent which seems just now to ensure it permanent preference in the choice of a very large section of the community. The feasibility of reducing gas prices while the rivalry is so keen is greatly exercising the minds of producers of the more costly commodity.

Water Supply in Chichester Out-Districts.—The Chichester City Council have agreed, on a report from the Sanitary Committee, to an extension of the water-main to Bosham, at an estimated cost of £740, and to Chidham, at the boundary of Westbourne, at an estimated outlay of £1100. A pipe is already laid towards Chidham, and the £1100 will be spent only in the event of the Westbourne District Council intimating their willingness to enter into a contract to take the Chichester water at a charge of 6d. per 1000 gallons. The new districts named are now depending for their water solely upon wells.

Tarapaca Water-Works Company, Limited.—The Directors of the Company report that the net profit for the past year amounts to £56,451, which, added to the balance of £747 brought forward, and allowing £1014 for income-tax, makes a total of £56,184. An interim dividend was paid on Oct. 1 last at the rate of 3½ per cent., absorbing £14,000; leaving £42,184 to be dealt with. The Directors recommend a final dividend of 4 per cent., making 7½ per cent. for the year, and the placing of £20,000 to the reserve fund. This will leave £6184 to be carried forward. The sanction of the Court to the reduction of the capital had not been obtained before the close of the accounts; but, as has already been recorded in the "JOURNAL," it has since been given, and the return of £2 was made on the 10th ult. The final dividend of 4 per cent. will therefore be paid upon £10 per share.

THE AIR-GAS EXPLOSION AT TELGATE.

Explanation by Messrs. Strode and Co.

In the "JOURNAL" for the 23rd of February last (p. 557), we gave some particulars—obtained, as was then stated, from "Carbid und Acetylen"—of a serious explosion at the air-gas works established at Telgate, in Westphalia, for the supply of the town. The works were erected by the Aerogen Gas Company of Hanover, who obtained a concession for the sole public supply of light to the town for a period of thirty years; and the publication of the report of the occurrence in our German contemporary naturally directed attention to the question of the safety of their system. We have received from Messrs. Strode and Co., of Osnaburgh Street, N.W., who, we learn for the first time, are representatives of the Company in this country, a statement they have had from Germany in regard to the matter. It was mentioned in our report that the cause of the explosion had not then been satisfactorily made out. We are therefore pleased to be able to throw some light on the subject by publishing the explanation furnished by Messrs. Strode and Co., which is to the following effect; and, needless to say, we much regret having been misled into publishing a translation of the inaccurate statements of our foreign contemporary.

With reference to the explosion of aerogen gas at Telgate, in Westphalia, on the night of the 2nd of February, the matter has been carefully investigated by unprejudiced experts, with the result that the explosion was found to have taken place in the gasometer house. The attendant, who is described as a periodical drunkard, kept the machine running in spite of the gasometer being full; and, in consequence, the gas blew through the water into the house for hours. His duty was to fill the gasometer late at night, when all the lights are out; but in his unfit state he fell asleep, and at two o'clock in the morning entered the house with an open light. In spite of the great quantity of escaped gas, the effect of the explosion was comparatively weak—damaging the gasometer, and knocking down the walls of the house. The *débris* of the wall damaged part of the machinery. The petrol contained in the plant ran out, and burnt without doing further damage. The underground petrol storage, containing at the time more than 350 gallons, stood the test splendidly, and remained quite uninjured. All the experts agreed that with any other gas the result of the explosion would have been terrible—at any rate, far more disastrous than with aerogen gas. In this case, the plant was repaired in a few days and the gas supply maintained.

The installation, which was erected in 1901, is one of the oldest aerogen installations for town lighting, which, it must be admitted, had not been fitted with the Company's modern safety arrangements; but the plant has been in use continually for more than seven years, and all the town residents were always pleased with the light. There is not one breakdown on record during all the time, in face of the fact that a rather careless person attended to the installation. The aerogen plants of latest construction are fitted with safety mechanism which automatically stops the production of gas at the moment the gasometer is full; consequently, any accidents of a similar nature are now absolutely impossible. After all, aerogen gas has stood this test splendidly when compared with coal gas, to say nothing of acetylene, with which this explosion would have been a terrible catastrophe. Both governmental and municipal authorities have not hesitated for a moment to allow the re-erection of the plant.

The Company who own the installation and run the business in Telgate write as follows:—

Dear Sirs,—As requested, we are pleased to say that the explosion was not due to the quality or to the mixture of aerogen gas. The machine has been in use for more than seven years, and we were always pleased with the results. The cause of the accident can only be carelessness of the attendant, or even malice. We are now practically convinced that it was malice by someone, because only a few days ago we discovered a fire in the plant-house; and, upon investigation, the door to the house, which should always be locked, was found open, and all the petrol taps were open too, so that the petrol had run on the floor and presumably was then set on fire. We hope that the police may succeed in clearing the matter up.

(Signed) The Gas Company, Telgate, Limited.
A. SCHRADER }
NIEMANN } Directors.

In Germany the public now know aerogen gas as the least dangerous of gases. Aerogen gas machines are in use in the Imperial demesne, Cadinen, and in the Imperial castle, Hubertusstock. The National Railway Company of Mecklenburg Schwerin has only recently replaced an acetylene installation with an aerogen machine, at their Kleinen Station. A good many sanatoriums, hospitals, &c.—i.e., places where safety is the first requirement—have aerogen gas. The installation has since been repaired by the Aerogen Gas Company; and the order was placed in face of many most inviting offers on the part of competitors.

LINCOLN CORPORATION WATER SUPPLY.

Proposed New Reservoir and Water-Tower.

At the Guildhall, Lincoln, last Tuesday, Major C. E. Norton, R.E., held an inquiry in regard to an application made by the Corporation to the Local Government Board for sanction to the borrowing of £54,000 for the construction of a reservoir and other works at Bracebridge Heath, a water-tower at Westgate, and for laying mains to connect these works.

The Deputy Town Clerk (Mr. W. T. Page) explained that the original application to the Board was for £60,000, but that it had now been reduced to £54,000. Under the Provisional Order of 1906, the Corporation had power to borrow £200,000; but it was reduced to £70,000. Already £16,000 had been borrowed, and there now remained only

£54,000, which the Council wished to borrow for the longest period possible. The money was required for the construction of a reservoir, with a capacity of 6 million gallons, a water-tower, with a capacity of 300,000 gallons, and water-mains between them. A tower was necessary for the higher parts of the city, in order to get a more adequate supply of water at all hours; and the reservoir was required for storage. The tower was proposed to be enclosed in some suitable materials, having regard to the very public position it would occupy. It would be about 130 feet high and 60 feet wide. The Water-Works Engineer to the Corporation was supplying a number of alternative designs for closing-in the tower, and the estimate for the cost was based upon one of them; but the Corporation were going to confer with an architect of eminence, and it was quite possible that another scheme might be adopted. As far as he (Mr. Page) knew, there was no opposition to the application.

Questions were then put to the Engineer (Mr. N. M'K. Barron), who, in reply to them, stated that under the Corporation Water Act of 1908 the water area had increased by seven parishes; the additional population outside the city being 7600. The area of the old water district and the new one was 50,756 acres. It was not decided to supply water to all the extra-parishes at first. After furnishing particulars as to the storage and consumption of water, Mr. Barron said the borehole at Elkesley was now 550 feet down, and it was intended to carry it to a depth of 600 feet.

Mr. R. Epton, on behalf of the Ratepayers' Association, asked if the Corporation would keep their promise to borrow the required money for as long a period as possible. Mr. Page replied that he might rely upon the Corporation spreading the borrowing of the money over as long a time as they were allowed.

The inquiry then closed; and the Inspector visited the sites of the proposed works.

METROPOLITAN WATER BOARD.

Superannuation Scheme Adopted—Salary for the Chairman.

At the Meeting of the Metropolitan Water Board last Friday, the Finance Committee presented an exhaustive scheme for the superannuation of the staff, and recommended the establishment of a superannuation and provident fund. They also asked for the sanction of the Board to the expenditure of a sum not exceeding £5500 in respect of the establishment of the fund. Lord Welby stated that after the scheme had been settled by the Finance Committee and approved by the General Purposes Committee, they communicated with a Committee of the staff, in order to see whether they had any representations to make. The staff had made certain recommendations; and they had received the Finance Committee's careful consideration. After they had examined a number of local schemes of superannuation, they found that contribution was practically the rule in public bodies. Under these circumstances, they had placed before the Board a voluntary scheme founded upon these conditions. The amount to be contributed by the officers would be £8000, and the Board's contribution would be about £9000. In dealing with the question of pensions, the Committee

decided that a fund should be created so as to realize 3½ per cent., and in twenty-five years, with the whole of the staff, the pensions would amount to from £17,000 to £20,000. At the outset, the Finance Committee reckoned that the charge would be £3500 to £3600, and it would grow each year; but, on the other hand, though it was a very large present charge, the Board were glad to establish such a scheme as would provide for those who had retired from their service. The clauses were then considered *seriatim*, and the scheme was adopted; the recommendations of the Committee being also agreed to.

The General Purposes Committee reported that they had had under consideration a memorandum from the Works and Stores Committee calling their attention to the fact that, under existing conditions, the expense of what might be termed the official hospitality of the Board fell personally upon the Chairman. The Committee expressed the opinion that such a state of things should not be allowed to continue, on the ground that it was wholly unreasonable that the Chairman of a public authority should be called upon to personally bear out-of-pocket expenses which arose consequent upon his official position. The Committee thought the proper course for the Board to pursue was to take advantage of the provisions of section 1 (4) of the Metropolitan Water Act, 1902—viz., that the Board might pay to the Chairman and Vice-Chairman, or either of them, such salary or salaries as might be determined. The Committee unanimously recommended that a salary at the rate of £500 per annum should be paid to the Chairman of the Board (Mr. E. B. Barnard, M.P.) as from April 1, 1909. This was adopted with two dissentients.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We had yesterday the ninety-third meeting of the Waverley Association of Gas Managers. The meeting was held in Edinburgh, and was presided over by Mr. W. Brown, of Lasswade—a protégé of the late Mr. William Young, of Peebles. Mr. Brown gave a concise, thoughtful address, which was adequately criticized; the criticisms showing how widely divergent views are held by gas managers upon the subject—surely a simple one—of the charging of differential rates for gas. Diversity, though not so pronounced, was also revealed in the matter of the conducting of prepayment meter business. Though on neither of the subjects was there anything said of an authoritative or convincing nature, as both subjects are work-a-day ones, the airing of the members' views upon them will probably be helpful to their brethren. The business for which the meeting will be remembered was that in connection with the presentation to Mr. A. Bell, sen., of Dalkeith, who is retiring from duty after a long and honourable career on account of the precarious state of his health (it being considered advisable that he should avoid excitement). Mr. Bell was unfortunately not present at the ceremony of presentation—a circumstance which, while it made the proceedings short and simple, robbed them of much that would have been of interest. Mr. Bell's retirement is a matter of universal regret—more universal than I have ever known with regard to any man in his

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 206.

Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½-18*	..	5 11 1	561,000	Stk.	Feb. 25	10	Liverpool United A. . .	222½-224½	..	4 9 1
298,955	10	"	7	Do. " 7 p.c.	12½-12½*	..	5 9 10	718,100	"	"	7	Do. B. . .	168-170	-1½	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd. . .	52-6	..	5 8 4	75,000	5	Dec. 11	6	Malta & Mediterranean	43-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	41-4½	..	5 15 6	560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne- . .	28½-29½	..	4 14 11	250,000	100	"	4½	Melbourne ½ p.c. Deb.	100-102	..	4 8 3
51,810	10	"	6	mouth Gas) B 7 p.c. .	16½-17	..	4 2 4	541,920	20	Nov. 13	3½	Monte Video Ltd.	121-123	..	5 9 10
53,200	10	"	6	and Water) Pref. 6 p.c.	15½-16	..	3 15 0	1,775,892	Stk.	Dec. 25	4½	Newcastle & G't'shd Con	107-108	..	4 3 4
380,000	Stk.	"	12½	Brentford Consolidated	247-250	..	5 0 0	518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	5½	Do. New . .	187-190	..	5 0 0	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	198-20	..	5 0 0
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	55,940	10	"	7	Do. 7 p.c.	13-13½	..	5 3 8
206,250	"	Dec. 11	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	300,000	Stk.	Nov. 27	8	Oriental, Ltd. . .	140-142	..	5 12 8
220,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	210-213	..	5 0 0	60,000	5	Mar. 31	8	Ottoman, Ltd. . .	6-6½	..	6 8 0
246,320	"	"	7	Do. A Ord. Stk.	152-155	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A. . .	135-137	..	5 0 7
460,000	2½	Apl. 16	10	British . .	42-43	+½	4 13 0	60,000	50	"	13	Do. B. . .	109-111	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	114-117	..	5 2 7	100,000	50	"	12	Do. C. . .	119-121	..	4 19 2
165,700	"	"	4½	Do. do. 3½ p.c.	85-87	..	5 3 6	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	131-133	+½	5 1 10	398,490	5	Oct. 29	7	Primitiva Ord. . .	62-71½	+½	4 16 7
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	796,683	5	Jan. 28	5	Do. 5 p.c. Pref.	5-1½	..	4 15 3
100,000	10	"	—	Cape Town & Dis., Ltd.	42-54	..	—	483,903	100	Dec. 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	5-6	+½	—	1,000,000	10	Oct. 15	8	River Plate Ord. . .	144-14½	+½	5 8 6
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	48-50	..	6 0 0	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	77-79	..	5 13 11	250,000	10	Mar. 31	8	San Paulo, Ltd. . .	134-14	..	5 14 4
157 157	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	62,500	10	"	—	Do. 6 p.c. Pref.	112-12	..	5 0 0
1,493,280	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk.	106-109	..	4 15 5	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	492-502	..	4 19 0
560,000	"	"	5	Do. 3½ p.c. do.	10-103	..	4 17 1	135,000	Stk.	Mar. 12	10	Sheffield A. . .	236-238	..	4 4 0
475,000	Stk.	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	209,981	"	"	10	Do. B. . .	235-237	-1	4 4 4
800,000	Stk.	"	6½	Continental Union, Ltd.	101-103	..	6 6 3	523,500	"	Oct. 10	10	Do. C. . .	234-236	..	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref.	138-141	..	4 19 3	70,000	10	Oct. 29	10	South African . . .	14-14½	..	6 17 11
49,1270	Stk.	"	5	Derby Con. Stk. . .	121-123	..	4 1 4	6,429,895	Stk.	Feb. 11	5½/8	South Met., 4 p.c. Ord.	123-125	+1	4 5 4
55,000	"	"	4	Do. Deb. Stk. . .	103-105	..	3 16 2	1,895,445	"	Jan. 14	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
143,995	"	Mar. 31	5	East Hull 5 p.c. Ord.	97-99	+1	5 1 0	209,821	Stk.	Mar. 12	8	South Shields Corp. Stk.	152-154	..	5 3 11
486,092	10	Jan. 23	12	European, Ltd. . .	23½-24½	..	4 19 0	605,003	Stk.	Feb. 25	5½	S'th Suburban Ord. 5 p.c.	120-122	..	4 10 2
351,060	10	"	12	Do. £7 rds. paid.	174-184	..	4 18 5	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
15,161,545	Stk.	Feb. 11	11/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
2,600,000	"	"	3½	light 3½ p.c. max.	88-89	..	3 18 8	502,310	Stk.	Nov. 13	5	Southampton Ord. . .	109-111	..	4 10 1
3,799,735	"	"	4	and 4 p.c. Con. Pref.	105-107	..	3 14 9	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c.	132-134	..	5 0 9
4,193,975	"	Dec. 11	3	Coke 3 p.c. Con. Deb.	85-86	..	3 9 9	423,940	"	"	5½	Do. B 3½ p.c.	109-111	..	4 14 7
258,740	Stk.	Mar. 12	4½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	149,470	"	Dec. 30	4	Edmonton 4 p.c. Deb.	101-103	..	3 17 0
70,000	"	"	6½	Do. 5 p.c.	117-120	..	5 4 2	182,300	10	"	8	Tuscan, Ltd. . .	82-91	..	8 13 0
82,500	10	Oct. 15	11	Hongkong & China, Ltd.	18-18½	..	5 18 11	149,900	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	100-102	..	4 18 0
123,500	Stk.	Mar. 12	6½	Ilford "A" and "C"	134-136	..	4 15 7	236,476	Stk.	Feb. 25	5	Tynmouth, 5 p.c. max.	105-107	..	4 13 6
65,781	"	"	5	Do. "B"	103-105	..	4 15 3	255,676	Stk.	Feb. 25	6½	Wands- B 3½ p.c.	131-133	..	4 17 9
51,000	"	Dec. 30	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	79,416	"	Dec. 30	3	worth 7 p.c. Deb. Stk.	72-74	..	4 6 1
4,940,000	Stk.	Nov. 13	8	Imperial Continental	183-186	+½	4 6 0	835,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	119-122	+1	4 6 1
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	..	3 18 9
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-119	..	3 13 5

Prices marked * are "Ex div."

station. The reason for this I take to be the wide range of his knowledge and his ready application of it in all situations. He has a fund of illustration to draw upon which is marvellous. He has had a close connection with the Young family; and he can talk for hours of the wondrous attainments and doings of that gifted family. In his retirement—which we all hope may be a happy and comfortable one—he is to reside in Peebles, whither he removes on Tuesday. In that pleasant county town he will have the society of his worthy son, who is Manager there; and he will be surrounded by scenes which will recall, not days of toil, but of relaxation, when he basked in the intellectual radiance of his at one time pupil, but afterwards master—the late Mr. William Young.

The session of the Scottish Junior Gas Association closed to-night; the proceedings taking the form of a lecture upon suction-gas plants by Mr. Henry O'Connor. The Western District are to be complimented upon their selection of Mr. O'Connor as the lecturer. The subject he chose is one of supreme importance to producers of coal gas; and Mr. O'Connor did justice to it. His discourse was specially prepared for the occasion, and brought facts relating to the construction and efficiencies of suction-gas plants into focus in a way which is clear to the uninitiated, and must be exceedingly helpful to the engineer or the student who is brought into contact with this, the latest of gas problems. In treating the subject in the earnest and thorough way he did, Mr. O'Connor did honour to the Junior Association. That is only natural, as part of his work has for years lain among the young men of the profession. And if Mr. O'Connor did honour to the young men, it must be apparent, from the extensive and appropriate remarks which his lecture elicited, that he had also appropriately gauged the spirit, as well as estimated the attainments, of the coming generation of gas managers.

In the Town Council of Glasgow on Thursday, Mr. Galbraith referred to a report by the Town Clerk on the consolidation of the local Acts of Parliament. He stated that the City of Glasgow was governed by 93 local Acts of Parliament, over and above public general Statutes which were applicable to the whole country. These Acts went back to the year 1817. The Town Clerk pointed out that it would be almost impossible to obtain one Consolidating Act for the whole of them. Therefore he had come to the conclusion that it would be expedient to work in the direction of consolidating the local Acts and Orders applicable to the Corporation gradually, and according to departments. He suggested that they ought to begin by consolidating the local Acts and Orders applicable to the Gas Department. There were 36 Acts affecting this department. Mr. Galbraith moved that the report be approved generally, and that it be remitted to the Parliamentary Bills Committee, in consultation with the Gas Committee, to prepare and submit the draft of a Provisional Order for giving effect to the recommendation. The motion was unanimously adopted.

The Hamilton Town Council are about to promote a Provisional Order dealing with several departments of the Municipality. In the Gas Department power is to be asked to reduce the illuminating power of

the gas to not less than 14 candles. At present the minimum is 16 candles, and gas of over 18 candles is supplied. Power is also to be asked to deal in gas-fittings of all kinds. In the finance clauses of the Order, the period sought for the repayment of borrowed money is sixty years. This is double the time that Parliament last year granted to the Edinburgh and Leith Gas Commissioners for the repayment of their loans, and it is doubtful if the Hamilton Corporation will succeed in that part of their application.

An inquiry, ordered by the Board of Trade, has been held in Greenock this week, in connection with an application by the Skelmorlie and Wemyss Bay Gas and Electricity Supply Company, Limited, for a Provisional Order empowering them to supply electricity. Mr. M'Clure, K.C., for the promoters, stated that the Company had for forty years supplied gas throughout the district which it was proposed to make the compulsory area. It was first of all a private Company; but thirty-three years ago it became a limited liability concern, and was accepted by the rating authority in Ayrshire as the authority to supply gas within their area. What was proposed to be done now was to take power to supply electricity, as an alternative to gas, in the event of their consumers wishing it. In the evidence which was led for the Company, Mr. Dunn, the Chairman, said they had ample capital for the undertaking. Lord Inverclyde stated that he at present uses the gas supplied by the Company, and has a private supply of electricity for lighting purposes. From what he knew of the *personnel* conducting the Company, he thought they would be quite a proper body to entrust with the scheme. He was satisfied with their supply of gas. The result of the inquiry has not yet been announced.

A rotary station meter of 30,000 cubic feet capacity has just been installed in the Vale of Leven Gas Company's works, Alexandria, to the instructions of Mr. John Lang, the Company's Engineer, under the supervision of Mr. D. Macfie, of Edinburgh, the agent in Scotland for the Rotary Meter Company.

Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited.—The report of the Directors of this Company for the year 1908 sets forth that the balance of revenue account for 1908 and the interest received from the German Transatlantic Electricity Company amount to £120,189, to which is added transfer fees and the balance brought forward, making £136,128. An interim dividend of 2s. 6d. per share (free of tax) on the ordinary shares has been paid, and £10,000 placed to the general reserve account; and there remains to the credit of the profit and loss account a balance of £44,903. The Directors recommend a final dividend of 4s. 6d. per share (free of tax), making 7 per cent. for the year on the ordinary shares, which will absorb £18,000; leaving £26,903 to be carried forward. There was a steady increase in the demand for cooking and heating stoves during the past year. Considerable extensions were made in new offices at the works and show-rooms, as well as in the distributing system.

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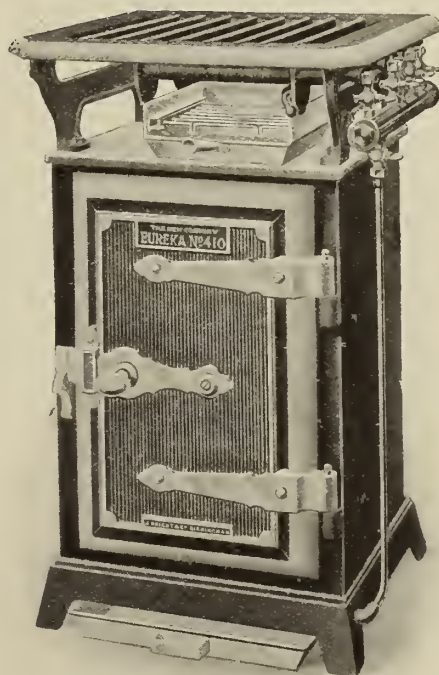
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90 per cent. of the Gas Undertakings in the United Kingdom supply our goods to-day.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, April 24.

The market has been quiet all through the week, and the tendency of prices has again been in favour of buyers. The large makes continue to be delivered against contracts, and the output from gas-works is now a diminished quantity, so that, although fresh direct orders have been scarce, there has been no great depreciation in values. Home demand has been fairly well sustained notwithstanding the approach of the end of the season. The closing prices are £11 7s. 6d. per ton f.o.b. Hull, £11 8s. 9d. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. The forward position remains very much as last reported. There are sellers of July-December at £11 12s. 6d. per ton f.o.b. good ports, and of January-April, 1910, at £12 per ton; but these prices are 2s. 6d. to 5s. per ton above the ideas of buyers, and concessions would have to be made to induce business.

Nitrate of Soda.

The spot market is a shade easier at 10s. 3d. per cwt. for 95 per cent., and 10s. 6d. for refined quality.

Tar Products.

LONDON, April 26.

Tar products have been steady during the past week, and prices were fairly well maintained all round. Pitch is very firm, and manufacturers are advancing their prices. At present, buyers, and those on the Continent in particular, are slow in responding to the advance demanded, and seem to look to a set-back similar to that which took place during the last improvement in October. There are no signs of this, however, in England just now; and it is probable that the market is in a healthier state altogether than was the case then. Creosote is quiet; and though the majority of makers are maintaining their former quotations, yet sales are known to have taken place for fair quantities at a reduction. Benzols and toluol continue very weak. Solvent is steady; and carbolic is improving, with makers disinclined to sell except for near delivery. Crystals are still quiet and difficult to dispose of, but stocks are gradually being reduced. Naphthalene is unchanged; and crude salts are in fair demand. Tar is being keenly competed for.

The average values during the week were: Tar, 13s. 3d. to 17s. 3d., *ex works*. Pitch, London, 24s. 6d. to 25s.; east coast, 24s. to 24s. 6d.; west coast, 23s. 6d. to 24s. 6d. f.a.s. Mersey ports, 24s. to 24s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d.; North, 5d. to 5½d.; 50-90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8¾d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¾d. to 3¾d.; North, 2¾d. to 3¾d.; solvent naphtha, casks included, London, 10¾d. to 11d.; North, 9¾d. to 10d.; heavy naphtha, casks included, London, 10¾d. to 11d.; North, 9¾d. to 10d. Creosote, in bulk, London, 2¾d. to 2¾d.; North, 2¾d. to 2¾d. Heavy oils, in bulk, 2¾d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1d. to 1s. 1½d.;

west coast, 1s. to 1s. 0½d. Naphthalene, £4 to £8 10s.; salts, 35s. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet, and there appears to be very little buying for the end of the month's delivery. The tone is certainly easier, and one would not be surprised to see a slight fall in price. To-day, Beckton prompt is quoted £11 17s. 6d.; but no business is reported to have been done at this figure. For ordinary makes on Beckton terms, £11 7s. 6d. is asked; and £11 7s. 6d. is also the price in Hull. In Liverpool, £11 10s. would be accepted. In Leith, the manufacturers are asking £11 15s., but cannot obtain this figure—in fact, in most cases, the best bid obtainable is £11 12s. 6d.

COAL TRADE REPORTS.

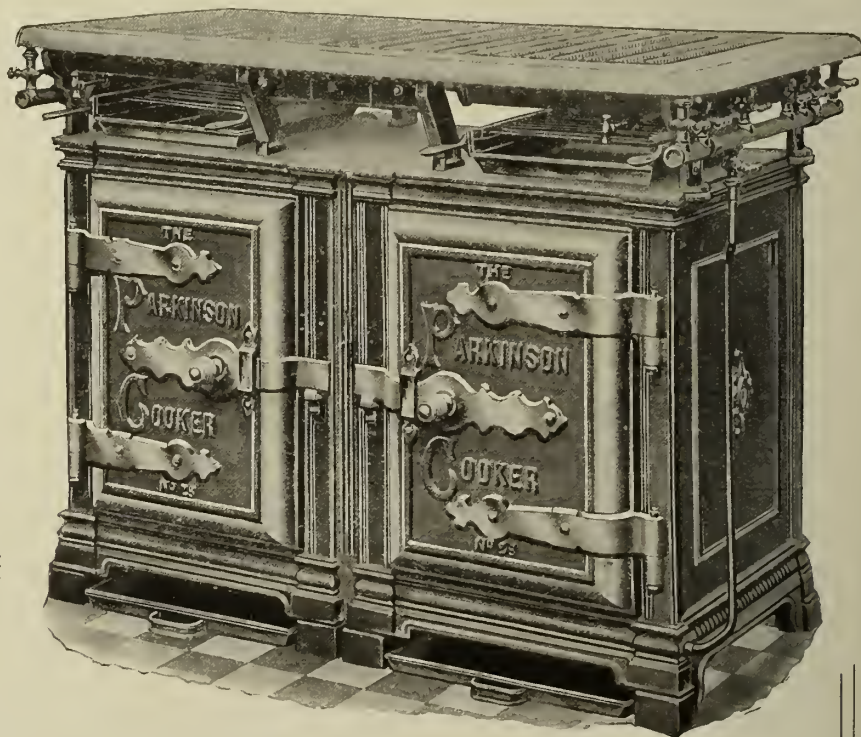
Northern Coal Trade.

There is now much activity in the coal trade; and with the opening of the Baltic season close at hand, there is to be expected a continuance of this briskness. In the steam coal trade, best Northumbrians are now from about 11s. 9d. to 12s. 6d. per ton f.o.b., and second-class steams are from 10s. to 10s. 9d. Steam smalls are in heavier demand for export, and are quoted from 5s. 3d. to 6s. 3d. The production at the collieries is now fully normal, and is well taken up; and the coal-owners have the benefit of the reduction of wages which has come into force. In the gas coal trade, the consumption is good for this season of the year; and the prices are well maintained, especially for best kinds. For Durham gas coal, the general quotation is from 9s. 3d. to 10s. 6d. per ton f.o.b., according to quality; while for "Wear specials," up to 10s. 9d. is quoted. The export demand for good gas coals seems heavy; and this has stiffened the prices. For contract quantities, the request is less for the South of England; but from Italy there is a strong inquiry. A sale has been made for Genoa at as high as 17s. 6d. per ton at that port—the best price for perhaps five months. Other sales are also in course of negotiation, which should strengthen the market. Coke is steadier. Gas coke shows very little alteration—being quoted at 12s. 9d. to 13s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

There is reported to be a slight improvement in trade, though the quotations do not give much strength to the view. Splint is said to be in better demand, but that is for forward delivery. Other sorts show no tendency to advance, but rather the reverse. The prices quoted are: Ell 8s. 9d. to 10s., splint 10s. 3d. to 10s. 6d., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 303,072 tons—a decrease of 599 tons upon the previous week, and 16,338 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,775,675 tons—an increase of 236,409 tons upon the corresponding period.

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(INCORPORATING MAUGHAN'S PATENT GEYSER CO.)

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A Novel Method of Fixing Blame.

On the morning of Saturday, the 10th inst., a fire broke out in a shop occupied by Mr. Isaac Goldman, a general dealer, carrying on business in Fowler Street, South Shields. It occurred among a quantity of small-ware goods in the window, and was put out by the brigade before much damage had been done. The local paper was discreetly silent on the subject of the cause of the fire; but the occupier of the premises was less reticent. He put up a huge placard, extending to more than the width of the shop, apprising the passers-by of the facts in the following terms: "The 'Shields Gazette' did not state the cause of outbreak of fire in my shop window. It was caused by electric live wire burning the bottom of window. Sheer neglect on the part of electric lighting officials. The live wire should not have been there. I do not use electric light. I do not see why this should be kept quiet. This live wire had been for years to the danger of the public. *They have now removed the wire.*" As the shop is situated in one of the main thoroughfares, the placard attracted considerable attention, and crowds of people congregated in front of it. Indeed, the numbers became so great a few days ago that the police authorities deemed it advisable to ask Mr. Goldman to take down the placard, as it was the cause of impeding traffic.

Devon Gas Association.—The third annual meeting of the Association was held at Exeter on Monday last week—Mr. F. Templer Depree, J.P. (the Chairman), presiding. The Association own gas-works at Chagford, Chudleigh, Moretonhampstead, and Brent, all of which were stated to be in first-class order. The Chairman reported a favourable year's working; and a dividend of 5 per cent. per annum was declared. The Association are making increased progress under the new Superintendent (Mr. B. L. Taylor); and the continued prosperity of the concern is hoped for.

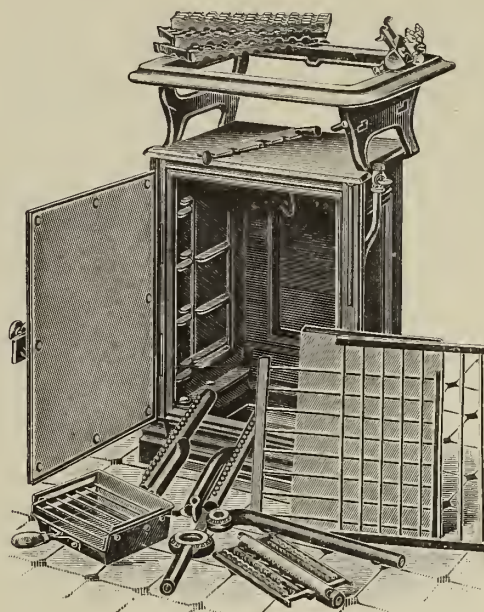
New Joint-Stock Companies.—The Salisbury Light Company, Limited, has been registered with a capital of £10,000, in £1 shares, to acquire the business carried on at No. 124, Long Acre, W.C., as Salisbury and Son, Limited; to adopt an agreement with H. Salisbury and F. Naylor; and to carry on the business of manufacturers of, and dealers in, lamps, &c. The Fraserburgh Gas Company, Limited, was registered in Edinburgh last week. The purpose is to take over as a going concern the Fraserburgh Gaslight Company. The capital is £27,000, in 13,500 shares of £2 each.

Sales of Stocks and Shares.—At the Lion Hotel, Guildford, Messrs. Emery and Sons recently offered for sale £1930 of consolidated ordinary stock and £35 of 5 per cent. preference stock of the Guildford Gas Company. All the lots offered were sold; £118 15s. to £120 per £100 being paid for the consolidated ordinary stock, while the parcel of preference stock fetched £42 15s. At the White Hart Hotel, Lewes, last Tuesday, Messrs. Chapman and Martin sold by auction four lots of five £10 shares (fully paid) in the Uckfield Water Company, at £50 per lot. Two £100 debentures (3½ per cent.) in the Uckfield Gas Company, Limited, were sold for £92 and £97 10s. respectively; another bearing 3 per cent. interest fetching £92. Good prices were obtained for the shares in the Slough Gas Company offered for sale by Messrs. Buckland and Sons, at the Royal Hotel, Slough, on Tuesday last. Four original ordinary £10 shares, carrying a dividend of £11 10s. per cent., fetched £25 each; and forty new ordinary shares, of like nominal value, on which a dividend of £8 1s. is paid, realized £17 5s. and £17 7s. 6d. apiece.

APPLICATIONS FOR LETTERS PATENT.

- 8731.—PUDNEY, F., "Mantles." April 13.
 8735.—WISWEDEL, A., "Gas-fitting." April 13.
 8782.—PAGE, P. C., "Petrol lighting and heating." April 13.
 8796.—MILLER, S., "Pumps and exhausters." April 14.
 8804.—EADIE, A., and TANNAHILL, J., "Pipes." April 14.
 8819.—BROWN, E. S., "Gas-cocks." April 14.
 8848.—HUNT, P. C. H., "Receiving coke from gas-retorts, and delivering or directing such coke into a furnace, or alternatively to a conveyor or trucks for depositing it where required." April 14.
 8855-6.—ROSSBACH-ROUSSET, F., "Controlling gas-burners from a distance." April 14.
 8902.—STEVENSON, T. J., "Gas or other engines." April 15.
 8913.—CLAYTON, L., and CLAYTON, SON, AND CO., LIMITED, "Gas-holders." April 15.
 8914.—FABRY, R. F. F., "Extraction of sulphuretted hydrogen from the gases evolved by coal distillation." April 15.
 8918.—PIESTRAK, C. S., "Gas-engines." April 15.
 8925.—SOCIÉTÉ JULES GROUVELLE, H. ARQUEMBOURG ET CIE., "Gas-intake, enabling gases of an explosion motor to be captured during their explosion, with a view to utilizing the pressure of such gases for various purposes." April 15.
 8930.—DAVEY, H., "Gas-engines." April 15.
 8940.—HILL, F. B., and WESTWOOD, G. J. W., "Making a combustible heating and illuminating gas." April 15.
 8968.—ST. LAURENT, E. J. S. DE, and POLLUX SYNDICATE, LIMITED, "Mantles." April 15.
 8969.—ST. LAURENT, E. J. S. DE, and POLLUX SYNDICATE, LIMITED, "Production of light." April 15.
 8970.—ST. LAURENT, E. J. S. DE, and POLLUX SYNDICATE, LIMITED, "Alloys." April 15.
 9015.—WOODALL, H. W., and MOON, P. G. G., "Regenerator gas-fire." April 16.
 9057.—MASTERS, E., and HANSFORD, J., "Charging and discharging gas-retorts." April 16.
 9139.—EHRICH AND GRAETZ, "Incandescent lamps." April 17.
 9149.—WAHL, G., and BAYERWALTES, A., "Inverted burners." April 17.

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- (2) OVEN BURNERS
- (3) BURNER CARRIER
- (4) GAS BAR

INTERCHANGEABLE

and Removable, without Screws.

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
 London Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
 General Offices and Works: WARRINGTON.

Suicide by Gas at St. Helens.—Last Friday, a sensation was caused in the district of Cowley Hill, St. Helens, by the discovery of a double tragedy at the residence of a glass-worker named George Mason. He was living in the house with his son, a boy eight years of age; his wife having left him. He had been for several weeks in poor health, and was in reduced circumstances owing to absenting himself from work; and the neighbours noticed that he was very depressed. As no one was heard moving about the house, suspicion was aroused, and the police entered the building, and found both occupants dead in bed. The man's head was enveloped in a pillow-case, and near his mouth was the end of an india-rubber tube attached to the gas-bracket. It was assumed that he had first taken his son's life and afterwards committed suicide.

The St. Ives Town Council have accepted the tender of the Staveley Coal and Iron Company, Limited, for cast-iron pipes, at £5 19s. per ton, and £10 for specials.

The Directors of the Buenos Ayres (New) Gas Company, Limited, recommend a final dividend of 4 per cent.; making, with the interim dividend, 7 per cent., free of tax, for the past year.

The Gas and Electricity Departments of the Rochdale Corporation will hand over from profits £14,000 in aid of the rates this year, or £1000 more than was contributed last year. The rates of the borough have been fixed at 7s. 10d. in the pound, or an increase of 1d.

The fusing of an electric wire set fire last Saturday morning to a private house in Colchester; and it was to the plucky action of a maid in climbing out of her bedroom and walking along a high parapet to give the alarm that the other inmates of the premises owed their rescue.

The Clacton Urban District Council have unanimously agreed that the whole of the street-lamps be provided with incandescent burners; an experiment tried on a certain number of lamps having proved very satisfactory. The Council are the owners of the electricity undertaking; but the current is not utilized for public lighting.

The Bridlington Gas Company, under the general supervision of Mr. J. Kelly, the Secretary and Manager, recently arranged with the Richmond Gas Stove and Meter Company, Limited, to thoroughly canvass the whole of their district; and, in conjunction, an exhibition of domestic appliances was held in the Peoples Palace. Over 100 stoves were hired out—making a total of more than 1500 cookers in use. Messrs. Richmond have secured the renewal of their contract for the supply of cookers, &c., to this Company for a further period of five years.

The following is a copy of an advertisement that the Hornsey Corporation Electric Light Department are parading through the streets by means of six sandwich-board men: "In spring instal electric light. Results: Decoration expenses lowered; clean house; convenient and economical lighting; healthy atmosphere. Particulars: Electrical Works, Tottenham Lane, Hornsey, N." On the other side, these words appeared: "Instal electric light when spring cleaning."

The Gas Committee of the Manchester Corporation have discussed the position of the department in reference to the Territorial Force. It has been decided that members of the department who are in the force shall receive full pay while in camp; but the Committee state that they are anxious they should be informed when men propose to join the force, in order that arrangements may be made to enable the work of the department to proceed without interruption during the time the men are in camp.

Among recent orders which Messrs. Joseph Taylor and Co. have in hand are saturators of their latest make for the British Gaslight Company (Hull station) and the Ipswich Gas Company; also three solid-plate lead saturators, with acid-tanks, draining-tables, and all accessories, for Messrs. Simon-Carvès, Limited, Manchester. They have had further orders for saturator and drainer, acid-tanks, &c., for the Coal Distillation Company, of Middlesbrough, and for a 5 ft. 6 in. diameter circular self-emptying saturator for the Mitchell Main Colliery Company, Limited. Other orders for saturators have been received for chemical works and coke-oven plants.

A gas exhibition, to remain open a fortnight, was recently opened at Hull by Mr. John Young, the Engineer and Manager of the British Gaslight Company's works. After calling attention to the features of the exhibition, he said Yorkshire ladies were noted for their cooking; but many of them had not yet realized the fact that the perfection of cooking could be obtained by gas. It could be turned on and off when required, and was not only economical, but cleanly. It had been said that the days of gas for lighting were numbered; but he claimed that it was still easily first. For a pennyworth of gas used through an incandescent burner, they could have a light equal to 60 candles for ten hours. A pennyworth of gas would cook a dinner for eight persons, or it would heat a room for an hour-and-a-half. A pennyworth of gas would produce 2-horse power in a gas-engine for an hour; or used on the high-pressure lighting system, it would give a light equal to 4500 candles for half-an-hour. The exhibition contains all the latest features of such shows—including an excellently got-up suite of fitted rooms.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY AND MANAGER. Crewkerne Gas Company. Applications by May 5.
TRAVELLER (GAS PLANT). No. 5088
MAINTENANCE OF INCANDESCENT BURNERS, &c. Staines and Egham Gas Company.
FITTINGS AND METER INSPECTOR. Bangor (Wales) Gas Department. Applications by May 5.

Situations Wanted.

AGENCY. No. 5087.
GAS-FITTER. No. 5086.
GAS MANAGER OR ASSISTANT. No. 5089.
SECRETARY, MANAGER, OR ACCOUNTANT. Minnamack, St. Paul's Cray, Kent.

Plant, &c. (Second-Hand), for Sale.

BOILER (VERTICAL). Devonport Gas Department.
HYDRAULIC MAIN, VALVES, MOUTHPIECES, &c. Whittington Gas-Works.
HYDRAULIC MAINS, ARCH PIPES, MOUTHPIECES, &c. Lichfield Gas Company.
PURIFIERS, &c. Sutton Gas Company.
PURIFIERS, &c. Uxbridge Gas-Works.
RETORT FITTINGS, CONDENSER, SCRUBBERS, EXHAUSTERS, PURIFIERS. Cardiff Gas Company. Tenders by May 1.

Patent Licences.

MANTLE MANUFACTURING MACHINES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Capital to Invest (Gas or Water Company).

No. 5085.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. May 18.
BROMLEY AND CRAYS GAS COMPANY. May 11.
CHIGWELL, &c., GAS COMPANY. May 18.
CROMER GAS COMPANY. May 11.
EASTBOURNE GAS COMPANY. May 11.
GOSPORT GAS COMPANY. May 17.
GUILDFORD GAS COMPANY. May 11.
HORNSEY GAS COMPANY. May 11.
ILFORD GAS COMPANY. May 11.
LEA BRIDGE GAS COMPANY. May 11.
MAIDSTONE GAS COMPANY. May 11.
PINNER GAS COMPANY. May 11.
ROMFORD GAS COMPANY. May 11.
SOUTHEND GAS COMPANY. May 11.
SOUTHGATE GAS COMPANY. May 11.
TENDRING HUNDRED WATER COMPANY. May 18.
WANDSWORTH AND PUTNEY GAS COMPANY. May 11.

TENDERS FOR

Coal and Cannel.

BURTON-ON-TRENT GAS DEPARTMENT. Tenders by April 30.
CONGLETON GAS DEPARTMENT. Tenders by May 8.
CRANLEIGH GAS COMPANY. Tenders by May 8.
DENTON GAS DEPARTMENT. Tenders by May 3.
DROITWICH GAS DEPARTMENT. Tenders by May 8.
EASTBOURNE GAS COMPANY. Tenders by May 6.
HEYWOOD GAS DEPARTMENT. Tenders by May 11.
MATLOCK BATH AND SCARTHIN NICK GAS DEPARTMENT. Tenders by May 8.
PAIGTON GAS COMPANY. Tenders by May 8.
RANSFORD GAS DEPARTMENT. Tenders by May 10.
SHREWSBURY GASLIGHT COMPANY. Tenders by May 22.
TOMMORDEN GAS DEPARTMENT. Tenders by May 15.
WAKEFIELD GAS COMPANY. Tenders by May 1.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

General Stores - Block Tin, Plg Lead, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by May 7.

Meters.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL. Tenders by April 30.

Oxide (New and Spent).

BLACKBURN GAS DEPARTMENT.
HINCKLEY GAS DEPARTMENT. Tenders by May 3.

Pipes, &c.

WINSFORD GAS DEPARTMENT. Tenders by May 11.

Retort-House and Retort-Stack Construction.

KNUTSFORD LIGHT AND WATER COMPANY. Tenders by May 12.

Retorts and Furnaces, &c., Resetting.

WINSFORD GAS DEPARTMENT. Tenders by May 11.

Sulphate of Ammonia Plant.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by May 7.

Tar and Liquor.

DENTON GAS DEPARTMENT. Tenders by May 3.
MATLOCK BATH AND SCARTHIN NICK GAS DEPARTMENT. Tenders by May 8.
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For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

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ANY QUANTITY. ANY PORT. ANY STATION.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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FOR list of Installations, see "Journal,"
April 20, p. 1. of Centre.
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
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Address No. 5087, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Traveller for Coal-Gas
Making Apparatus to REPRESENT a Firm of Contracting Gas Engineers in South Wales and Midland District, or Southern and Eastern Counties. Applicants must have had previous Experience.
Apply, by letter, Stating Age and Salary required, to No. 5088, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FITTINGS AND METER INSPECTOR.

THE Bangor (Wales) Corporation Gas
Department require the Services of an Energetic Young MAN, of Good Address, to INSPECT Meters, Gas-Stoves, Incandescent Burners, &c., on Consumers' Premises. Men of Experience only need Apply. The Appointment to be for Six Months at 30/- per Week.
Apply, in own Handwriting, stating Experience, and with copies of not more than Three Testimonials, not later than May 5, 1909, to PRICE F. WHITE, Manager.

STAINES AND EGHAM GAS COMPANY, LIMITED.

REQUIRED by the above-named Com-
pany, a Smart, Intelligent, Young Man of Good Address, who thoroughly understands Interior Gas-Fittings, for the MAINTENANCE OF INCANDESCENT GAS-BURNERS, &c. competent to Advise Consumers and make himself Generally Useful. Wages, 55s. per Week.
Apply, by letter, stating Age, Experience, if Married, and References, to the SECRETARY, Gas Company's Offices, Causeway, STAINES.

CREWKERNE, SOMERSET.

THE Directors of the Crewkerne Gas
Company are prepared to consider APPLICATIONS for the Post of SECRETARY and MANAGER of their Works.

The Make of Gas is about 20 Millions.
The successful Candidate will be required to devote his whole time to the duties of the Office.

Salary, £120 per Year, with a good House and Garden, Coal, and Gas free.

Applications, with recent Testimonials, to be sent to Mr. G. Slade, the Deputy-Chairman, on or before the 5th of May next.

Gas-Works, Crewkerne,
April 22, 1909.

FOR SALE—A 10 I.H.P. Vertical Boiler
by Cochrane and Co., 6 ft. 6 in. high, 3 ft. diameter, Complete with necessary Fittings. In Good Condition.
Apply to W. P. TERYET, Corporation Gas-Works, DEVONPORT.

FOR SALE—Four 12-foot Square
PURIFIERS, complete with Centre Valve, Connections, and Traveller; also another 12-foot Square BOX and One 18-foot by 12-foot BOX, with Valves and Connections.
Offers to the MANAGER, Gas-Works, UXBRIDGE.

FOR SALE—Three Purifiers, by Newton,
Chambers, and Co., 20 ft. square by 5 ft. deep. Planed Joints, 18-inch Valves and Connections, with Bye-Passes, Travelling and Lifting Gear. In Good Condition. Being Removed for Extension.
Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE—Cheap, two lengths of
Section of Wrought-Iron HYDRAULIC MAINS, 25 ft. 6 in. by 2 ft. by 1 ft. 6 in., for Six Beds of Sixes, Dip Pipes, Arch Pipes, and Ascension Pipes Complete. Take-off at One End, with Two 8-inch Disc Valves; also Eighteen Self-Sealing Eccentric Screw Cast-Iron MOUTHPIECES, 20 in. by 15 in.
Apply to the MANAGER, Gas Company, Lichfield, STAFFS.

FOR SALE, Cheap, the undermentioned
GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkin's VALVES, 12-inch, 10-inch, 6-inch.
Apply to SAMUEL WHITE and Son, 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—Four Lengths of Steel
HYDRAULIC MAIN, 8 ft. 9 in. long, 18 in. by 20 in., with Division Plates and Dip Pipes for One Bed of Sevens, Two Beds of Sixes, and One Bed of Fives; also H Pipes and Ascension Pipes for same. Four 6-inch SEAL VALVES, TEES, and CONNECTIONS for 12-inch Foul Main, and TEES and COCKS for 6-inch Tar-Main. All in First-Class Condition. Also quantity of 22-in. by 16-in. Self-Sealing MOUTHPIECES.
No reasonable Offer refused.
Apply, H. H. EVEREST, the Gas-Works, Whittington, near CHESTERFIELD.

MANUFACTURING PLANT FOR SALE.

THE Directors of the Cardiff Gaslight
and Coke Company invite OFFERS for the Purchase of PLANT, in good Working Condition, at their Bute Terrace Works, comprising:

RETORT FITTINGS,
CONDENSER,
AMMONIACAL LIQUOR SCRUBBER,
TOWER SCRUBBER,
ONE PAIR OF EXHAUSTERS,
ONE SET OF FOUR PURIFIERS.

The whole suitable for Gas-Works producing Half-a-Million Cubic Feet per Day.

Schedule, containing detailed Measurements and all Particulars, may be obtained on Application to Mr. H. Morley, C.E., Gas-Works, Cardiff.

Tenders to be received not later than the first post Saturday, May 1, next.

THE Romford Gas and Coke Company,
Limited, invite TENDERS for the Surplus TAR, both Coal Gas Tar and Carburetted Water-Gas Tar, for Disposal from their Works during a period of Twelve Months.
Particulars may be obtained on Application to the Manager, Mr. W. D. CHILN, Gas-Works, Romford, ESSEX.

THE Sutton-in-Ashfield Urban District
Council invite TENDERS for Dry, Ordinary, and Automatic METERS, for their requirements during the Year ending April 30, 1910.

Tenders, endorsed "Meters," must arrive here not later than April 30, 1909.
For any further Particulars, Apply to T. ROBINSON, Gas Manager, Sutton-in-Ashfield, NOTTS.

COUNTY BOROUGH OF BLACKBURN. (GAS DEPARTMENT.)

TENDERS wanted for the Purchase of
about 400 Tons of SPENT OXIDE OF IRON containing not less than 50 per cent. of Sulphur.
Offers to state a price per unit of Sulphur per ton for the Material put into Trucks at Blackburn.

SAMUEL R. OGDEN,
Engineer and Manager.
Municipal Offices, Blackburn,
April 19, 1909.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for
the Supply of COAL and CANNEL.
Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.
Sealed Tenders, endorsed "Coal," to be sent to me not later than Tuesday, May 11, 1909.

By order,
GEO. G. BOUCHIER,
Town Clerk.
Municipal Buildings, Heywood,
April 15, 1909.

HINCKLEY URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

THE above Council invite Tenders for
the Supply of 100 Tons of OXIDE OF IRON, and also for the Purchase of 150 Tons of SPENT OXIDE.
Full Particulars may be obtained from Mr. Fred Lee, Gas Manager.
Endorsed Tenders to be sent to me not later than Monday, May 3, 1909.

By order,
A. S. ATKINS,
Clerk.

WAKEFIELD GASLIGHT COMPANY.

THE Directors of the above Company
invite TENDERS for Screened GAS COAL and NUTS.

Sealed Tenders, endorsed "Tender for Coals," and addressed to the Chairman and Directors, to be sent in on or before Saturday, May 1, 1909.

Forms of Tender may be obtained on Application to the undersigned.

The lowest or any Tender not necessarily accepted.
H. TOWNSEND,
Engineer and Manager.
Gas-Works, Wakefield.

BOROUGH OF TODMORDEN.

THE Gas Committee invite Tenders for
the Supply of COAL and CANNEL.
Specification and Form of Tender may be had on Application to the undersigned.
Sealed Tenders, endorsed "Coal," to be sent not later than the 15th day of May, 1909, addressed to the Chairman of the Gas Committee, Town Hall, Todmorden.

By order,
H. TALBOT,
Engineer and Manager.

CRANLEIGH GAS AND COKE COMPANY, LIMITED

THE Directors of the Cranleigh Gas and
Coke Company, Limited, invite TENDERS for the Supply of 1000 Tons of Good GAS COAL, to be Delivered at Cranleigh Station (L.B. & S.C. Rly.) as may be required during the Twelve Months from July 1, 1909, to June 30, 1910.

Tenders, endorsed "Coal," to be sent to the Secretary on or before May 8.

The Directors do not bind themselves to accept the lowest or any Tender.

No Form of Tender supplied.

H. J. HAYMAN,
Secretary.
Cranleigh, Surrey.

WINSFORD URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

THE above Council are prepared to re-
ceive TENDERS for the Supply of 800 Yards of 4-inch and 1100 Yards of 3-inch CAST-IRON PIPES, with Spigot and Socket Joints, Bends, Syphon Boxes, &c.

Tenders, endorsed "Gas-Mains," to be delivered to the undersigned on or before the 11th of May, 1909.

The Council are also prepared to receive TENDERS for RE-SETTING RETORTS and FURNACES, &c.

Tenders, endorsed "Gas-Retorts," to be delivered to the undersigned on or before the 11th of May, 1909.

Specifications and Forms of Tender may be obtained on Application to Mr. F. Sidwell, Manager, Gas-Works, Winsford.

The Council do not bind themselves to accept the lowest or any Tender.

JNO. H. COOKE,
Clerk to the Council.
Council Offices, Russell Street,
Winsford, Cheshire, April 23, 1909.

DENTON URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for
TAR, the same to be sent in on or before the 3rd of May prox.

Particulars may be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lanc.
The Committee do not bind themselves to accept the highest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk of the Council.

April 19, 1909.

DENTON URBAN DISTRICT COUNCIL. (GAS DEPARTMENT.)

COAL.

THE Gas Committee invite Tenders for
the Supply of COAL, the same to be sent in on or before the 3rd of May prox.

Specification and Form of Tender to be obtained from the Gas Engineer, Mr. J. Chadwick Smith, Gas-Works, Denton, Lanc.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM RICHARDS,
Clerk of the Council.

April 19, 1909.

DROITWICH CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to re-
ceive TENDERS for the Supply of 1800 Tons of Best Screened GAS COAL or NUTS, to be delivered to Droitwich (G.W. Rly.) as required during the Twelve Months ending June 30, 1910.

The Committee reserve the right to accept Tenders for the whole or any portion of the Quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," to be sent to the Town Clerk, Droitwich, not later than the 8th prox.

Forms of Tender to be obtained from the undersigned.
F. SHEWRING,
Manager.

Gas-Works, Droitwich,
April 20, 1909.

URBAN DISTRICT COUNCIL OF MATLOCK BATH AND SCARTHIN NICK. (GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Council are prepared to receive
TENDERS for the Supply of 2000 Tons of Best Screened GAS COAL, to be Delivered at Matlock Bath Station during the Year ending the 30th of June, 1910, in Quantities as required.

The Council reserve the right to divide the Quantity into one or more Contracts.

Tenders to be accompanied by Working Analysis.

No Special Form of Tender; and the persons whose Tenders are accepted will be required to enter into the usual Contracts for the due performance thereof.

Tenders, sealed and endorsed "Tenders for Coal," should be sent to the undersigned not later than Saturday, the 8th of May.

E. RANDLE.

Council Chambers, Matlock Bath,
April 21, 1909.

URBAN DISTRICT COUNCIL OF MATLOCK BATH AND SCARTHIN NICK. (GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Council are prepared to receive
TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for the Twelve Months ending the 30th of June, 1910.

Tar (approximate Quantity), 120 Tons; Liquor (approximate Quantity), 220 Tons, not less than 5° Twaddel. Price scaled on 3° above, and delivered into Buyer's Tanks at Matlock Bath Station.

The Persons whose Tenders are accepted will be required to enter into the usual Contracts for the due performance thereof.

Tenders, sealed and endorsed "Tenders for Residuals," should be sent to the undersigned not later than Saturday, the 8th of May.

E. RANDLE.

Council Chambers, Matlock Bath,
April 21, 1909.

PAIGNTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Paignton Gas
Company are prepared to receive TENDERS for the Supply of 4000 Tons of best approved GAS COALS, to be delivered in such Quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weighbridge.

Tenders to be accompanied by Practical Working Analysis, stating the Price of the Coal Delivered at Paignton Station (Great Western Railway), free of all Charges.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars may be obtained from Mr. C. G. Dawson, Gas-Works, Paignton.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of Coal, to be sent on or before the 8th day of May next, addressed to the undersigned, at the Gas Offices, 1A, Victoria Street, Paignton.

F. W. PUNNICOMBE,
Secretary.

Paignton, April 20, 1909.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for
the Supply of GAS FUEL.
Forms of Tender and any other Particulars can be obtained from the undersigned.
Sealed Tenders, endorsed "Gas Fuel," to be delivered at the Office of E. A. Plant, Esq., Town Clerk, Congleton, not later than Saturday, May 8, 1909.
The Committee do not bind themselves to accept the lowest or any Tender.

J. SMITH,
Engineer and Manager.

Gas-Works, Congleton,
April 21, 1909.

BOROUGH OF BURTON-UPON-TRENT.

THE Town Council of this Borough invite TENDERS for:—

GAS COAL.

The Supply of 30,000 Tons of GAS COAL, to be delivered at the Gas-Works during the Twelve Months ending June 30, 1910, in accordance with the Form of Tender and Conditions which may be obtained from the undersigned.

Tenders, endorsed "Coal," are to be delivered to the Assistant-Manager, at the Gas-Works, Burton-upon-Trent, on or before Friday, the 30th day of April inst.

The Council do not bind themselves to accept any Tender.

T. N. WHITEHEAD,
Town Clerk.

Town Hall, Burton-upon-Trent,
April 24, 1909.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gaslight Company invite TENDERS for the Supply of about 19,000 Tons of Screened GAS COALS, to be delivered free at the Great Western or London and North Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1909, and ending June 30, 1910.

The Directors reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on Application at the Company's Works or by post, and must be sent to the undersigned on or before the 22nd day of May, 1909.

By order,
WM. BELTON, A.M.I.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
April 24, 1909.

RAMSGATE CORPORATION.

(GAS DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the Supply of 20,000 Tons of Best Quality Soft Caking and Gas Producing Screened Durham or other COAL, delivered free into Carts on the Quay at Ramsgate Harbour, or free into the Stores at the Gas-Works.

Deliveries to be in Twelve Monthly Quantities as set forth in the Printed Particulars, and are to commence as from Aug. 1, 1909.

Tenders to be sent in not later than Noon on Monday, May 10, 1909, addressed to the Chairman of the Gas and Water Committee, Gas and Water Offices, Boundary Road, Ramsgate, endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender on Application to the undersigned.

WM. THOMSON,
Engineer and Manager.

Gas and Water Offices,
Ramsgate, April, 1909.

THE Knutsford Light and Water Company are prepared to receive TENDERS for the Work and Materials required in the CONSTRUCTION and ERECTION of a RETORT-HOUSE and RETORT-STACK.

The Drawings may be seen at the Gas-Works, Knutsford, and the Bill of Quantities obtained from William Newbigging, Engineer, 5, Norfolk Street, Manchester, on deposit of Two Guineas, returnable on receipt of a bona-fide Tender.

Sealed Tenders, to be endorsed "Contract No. 2," and to be sent so as to reach the undersigned not later than Noon on Wednesday, the 12th day of May, 1909.

The Company do not bind themselves to accept the lowest or any Tender.

W. S. INMAN,
Secretary.

Offices, Church Hill,
Knutsford, April 23, 1909.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive TENDERS for the following:—

- 1—BLOCK TIN and PIG LEAD for the Five Months ending the 30th of September, 1909.
- 2—SOLID PLATE LEAD SATURATOR for Sulphate of Ammonia Plant.

Form of Tender can be obtained for No. 1; and in the case of No. 2 Plan and Specification can be inspected, and Form of Tender obtained, upon Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Tin and Lead" or "Saturator" as the case may be, and delivered at my Office not later than Ten a.m. on Friday, May 7, 1909.

The Contractors will be required to pay the Standard Rate of Wages recognized in the district.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre,
Rhondda, April 23, 1909.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors invite Tenders for the

Supply of about 4000 Tons of Screened and Unscreened GAS COAL delivered at Wilmslow Station (L. & N.W. Rly.) in such Quantities as may be required for the Year ending the 30th of June, 1910.

Further Particulars can be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Coal," together with a recent Working Analysis, must be delivered by the 10th of May, 1909.

No Form of Tender will be supplied.

W. H. WELSH,
Secretary.

52, Brown Street, Manchester,
April 20, 1909.

EASTBOURNE GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive

TENDERS for the Supply of 30,000 Tons of Clean, Dry, Unscreened, Fresh-Wrought GAS COALS, delivered at Eastbourne Railway Station during the Year ending the 31st of August, 1910.

The Deliveries to be in about equal Monthly Quantities.

Payment in Cash Monthly.

Particulars and Forms of Contract may be obtained from the Secretary.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Company, at the Offices, 10, Sussex Gardens, Eastbourne, on or before May 6th next.

By order,
JAMES S. GARRARD,
Secretary.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late Chas. Edwin Layton, Esq.

GAS STOCKS AND SHARES

OF THE TOTAL

CAPITAL VALUE OF ABOUT £18,000

IN THE

WANDSWORTH AND PUTNEY GASLIGHT

AND COKE COMPANY,

HORNSEY GAS COMPANY,

LEA BRIDGE DISTRICT GAS COMPANY,

ILFORD GAS COMPANY,

ROMFORD GAS AND COKE COMPANY, LIMITED,

SOUTHEND GAS COMPANY,

BROMLEY AND CRAYS GAS COMPANY,

MAIDSTONE GAS COMPANY,

SOUTHGATE AND DISTRICT GAS COMPANY,

PINNER GAS COMPANY, LIMITED,

GUILDFORD GASLIGHT AND COKE COMPANY,

CROMER GAS COMPANY,

EASTBOURNE GAS COMPANY.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the

Mart, E.C., on Tuesday, May 11, at Two o'clock, in

Lots.

Particulars of Messrs. GOLING, HARGROVE, and

GOLDING, Solicitors, 99, CANNON STREET, E.C., and of

the AUCTIONEERS, as above.

By order of the Directors of the

ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF £3900 FOUR PER CENT.

PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the

Mart, E.C., on Tuesday, May 18, at Two o'clock, in

Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY

CIRCUS, E.C.

By order of the Directors of the

TENDRING HUNDRED WATER-WORKS COMPANY.

(Supplying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the

Mart, E.C., on Tuesday, May 18, at Two o'clock, in

Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY

CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £3000 CONSOLIDATED ORDINARY STOCK,

AND

£2000 FOUR PER CENT. PERPETUAL

DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will

SELL THE ABOVE BY AUCTION, at the

Mart, E.C., on Tuesday, May 18, at Two o'clock, in

Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY

CIRCUS, E.C.

GOSPORT GAS AND COKE COMPANY.

SALE BY TENDER OF £6000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

PARTICULARS and Conditions of

TENDER may be obtained at the Company's Offices, Gosport, or will be forwarded by post, and must be deposited with the Company not later than Twelve o'clock (noon) on Monday, the 17th day of May, 1909.

By order,

ALFRED LOACH,
Secretary and General Manager.

142, High Street, Gosport,
April 14, 1909.

THE Proprietors of the Patents No.

24,218 of 1901, and No. 83 of 1901, for "IMPROVEMENTS RELATING TO MACHINES FOR THE MANUFACTURE OF MANTLES EMPLOYED IN INCANDESCENT LIGHTING," and "IMPROVEMENTS RELATING TO MACHINES FOR THE MANUFACTURE OF INCANDESCENT GAS-MANTLES," are desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

Price 10s. 6d., Green Cloth, Gilt Lettered.

VOL. CV.

OF THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, &c.

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from the

**GRASSMOOR COLLIERIES,
CHESTERFIELD.**

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

**THE
"BOYS"
CALORIMETER**

for determining the calorific
value of gases

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SHEAF WORKS, SHEFFIELD,

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Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

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LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD (GAS COAL) COLLIERIES
RAYENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

JAMES OAKES & CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our manufactures, on application.

Works: BIRTLEY, CO. DURHAM.

London Offices:

46, CANNON STREET, E.C.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

COLONIAL & FOREIGN GAS & WATER COMPANIES & MUNICIPALITIES

BEFORE PURCHASING

will find it of advantage to communicate with

JOHN COATES & CO., LTD.,

Engineers and Merchant Shippers,

who have had 25 Years' Practical Experience in the Designing, Buying, Inspection, and Shipment of Machinery and Plant, and invite Correspondence on the Subject.

Head Office: Suffolk House, LONDON, E.C.

(Near Cannon Street Station.)

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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,

NEWBATTLE COLLIERIES,

NEWTONGRANGE, MIDLOTHIAN.

Testing Instruments.

ALEXANDER WRIGHT & CO., LD.
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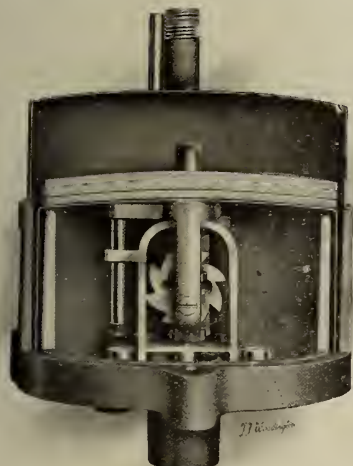
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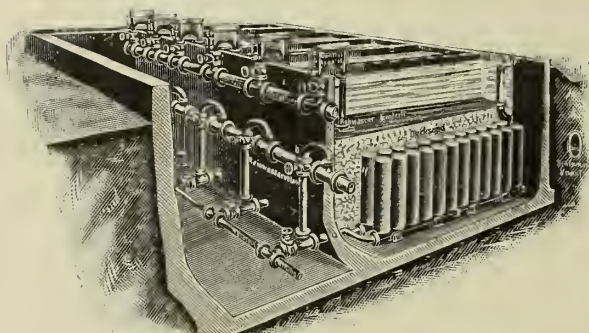
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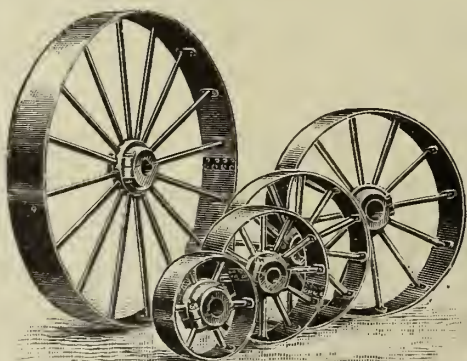
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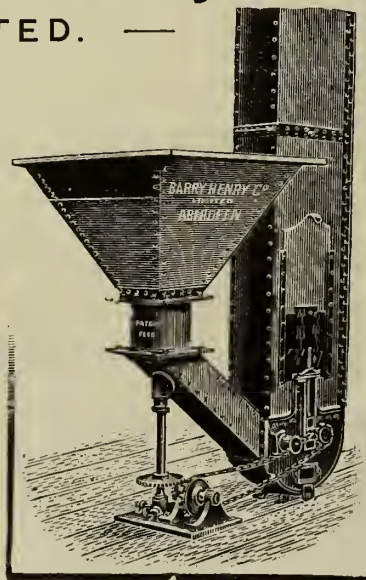
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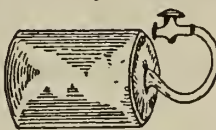
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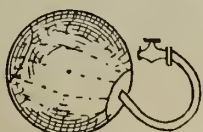


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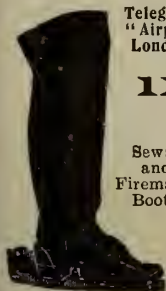
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Why Gas Companies should adopt the above Process:—

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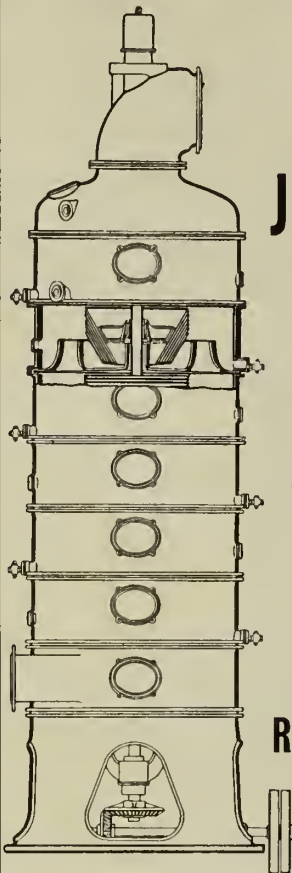
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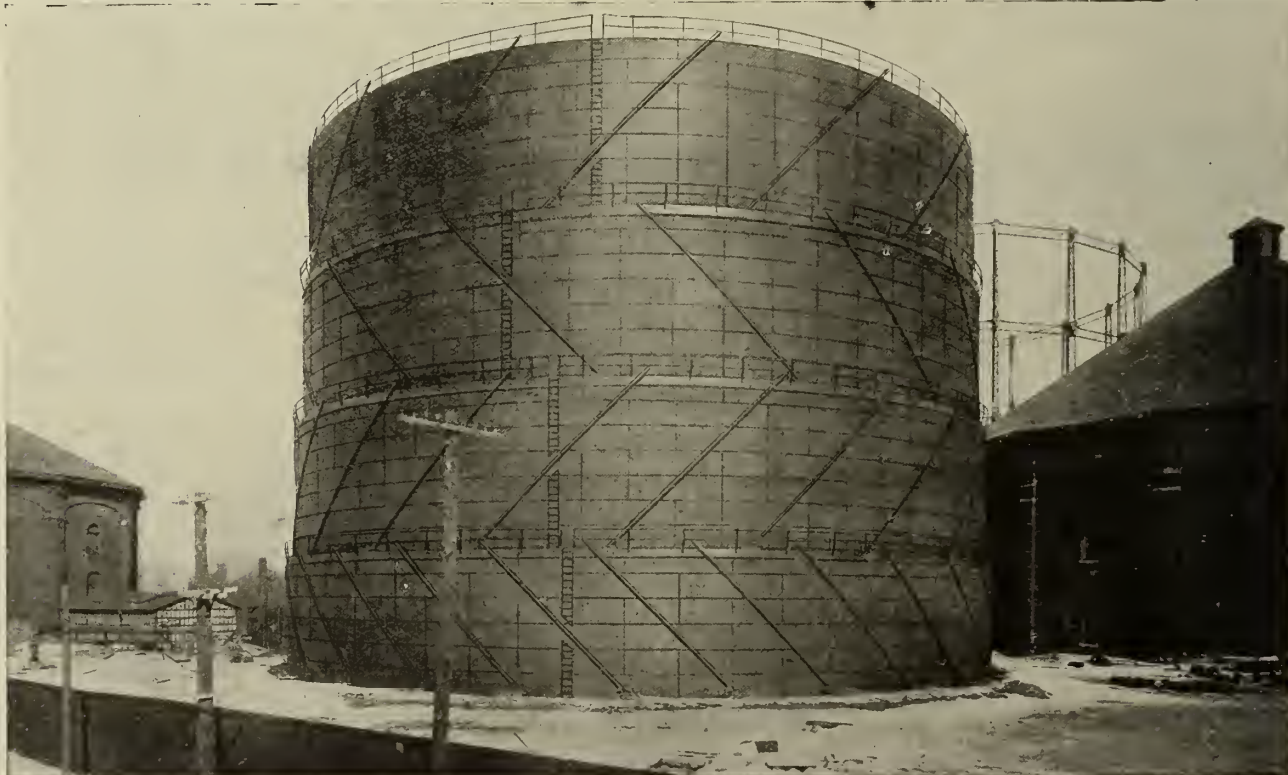
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LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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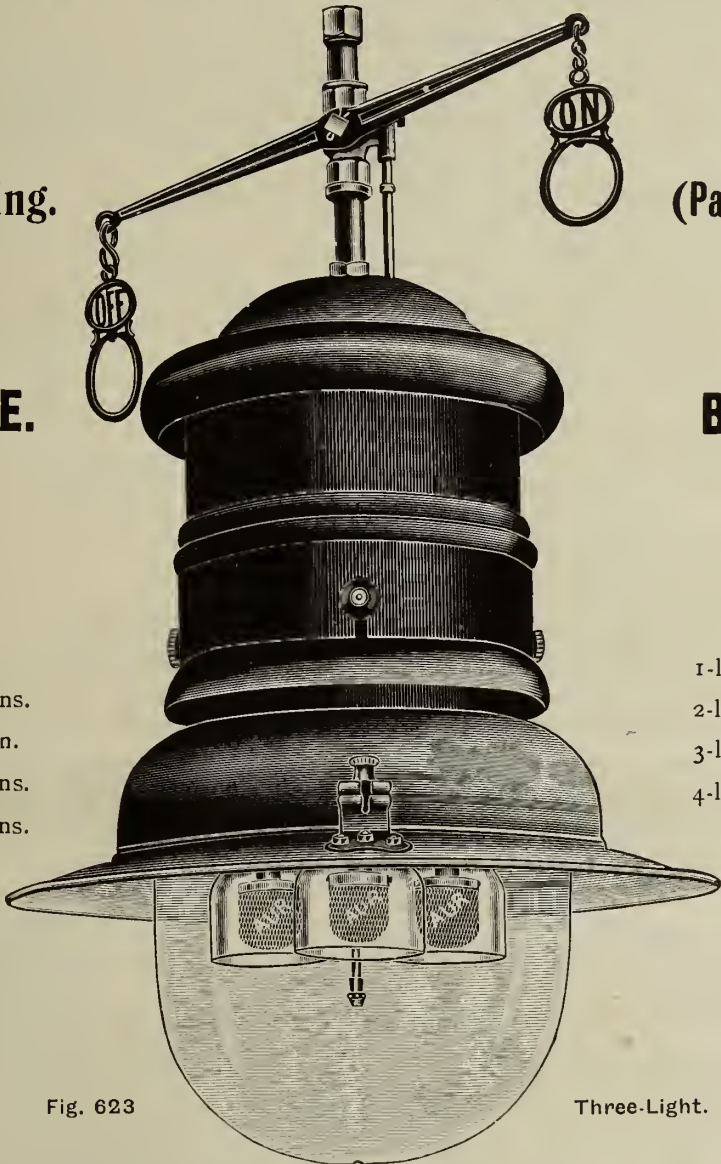


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 1 in.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 4 ins.
3-light	. . .	1 ft. 6 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	4/-	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " " In Case lots per dozen.	19/6	42/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made.
Case contains	80	48	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

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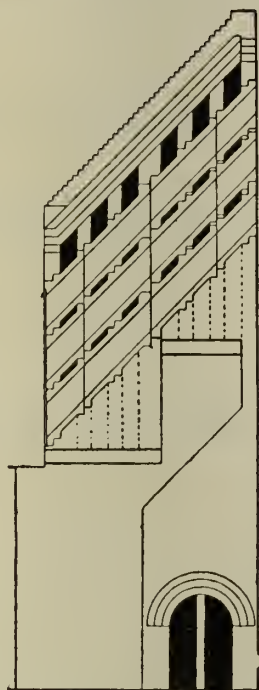
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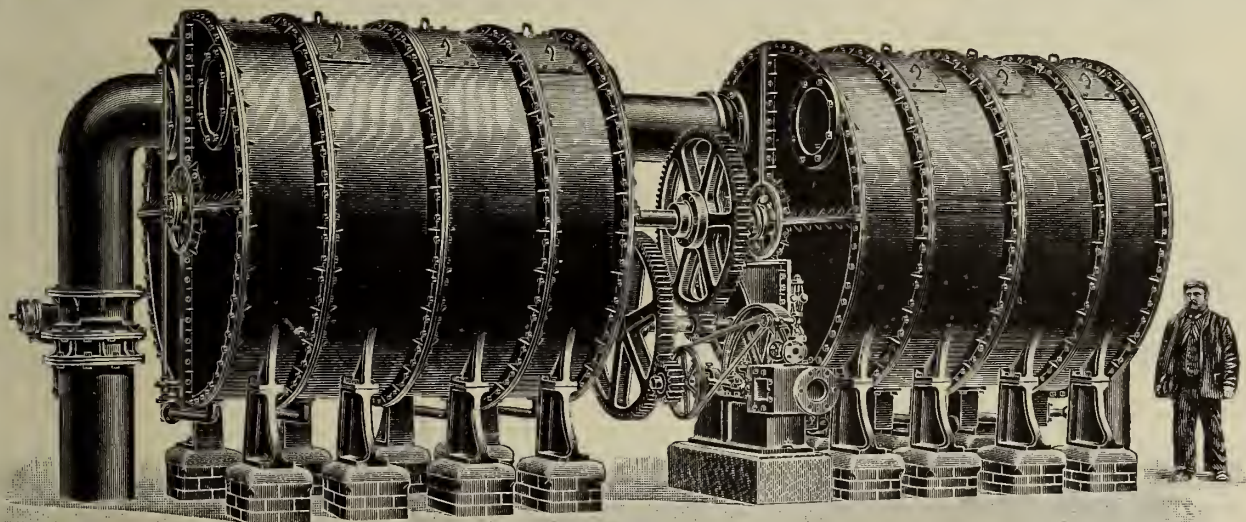
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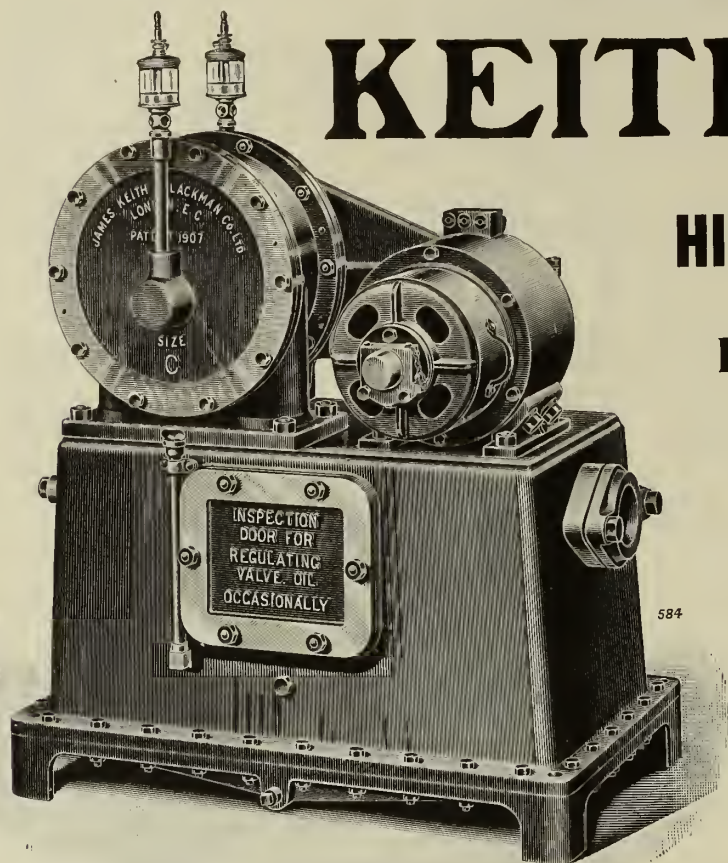
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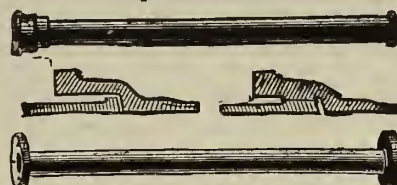
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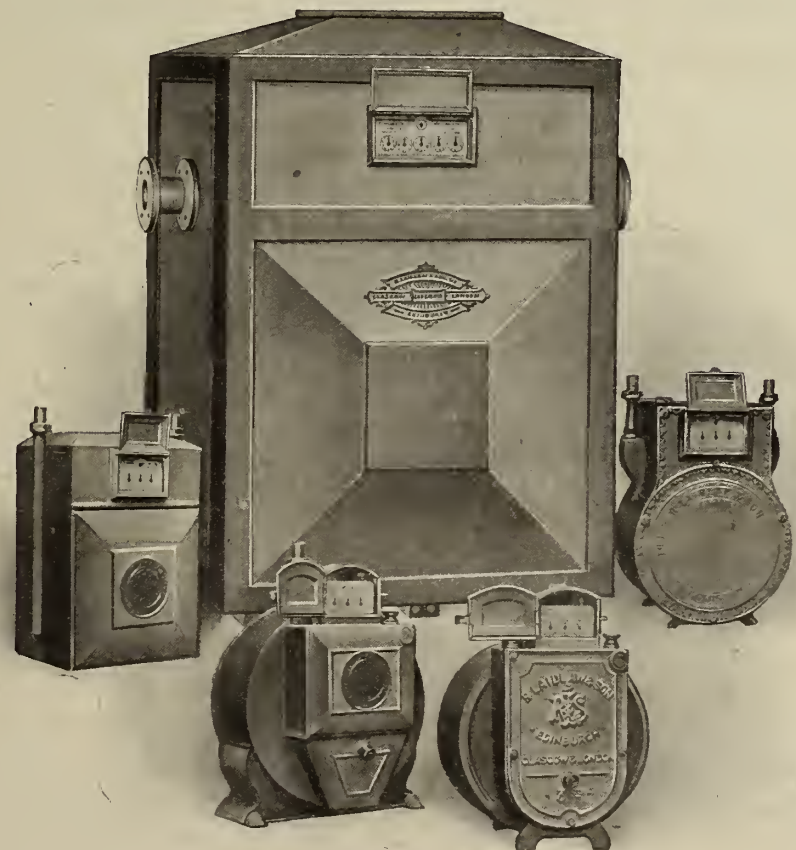
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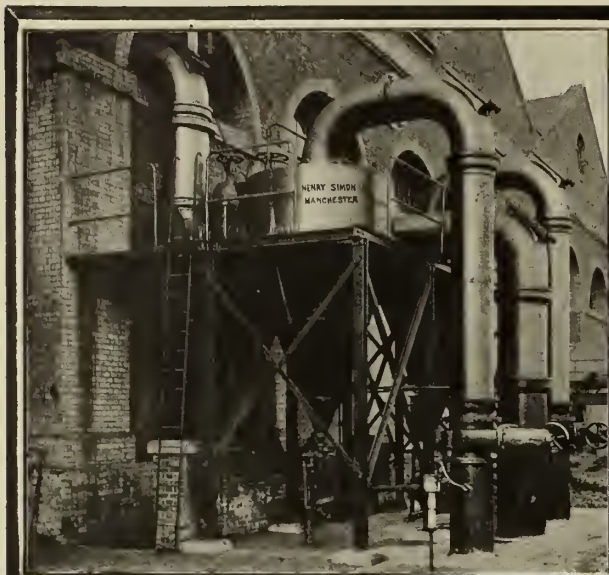
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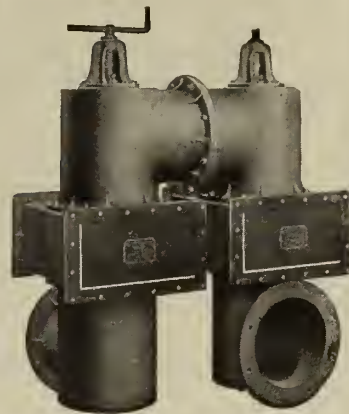
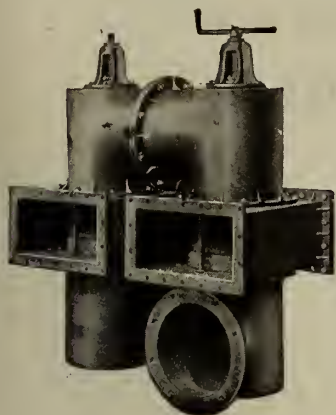
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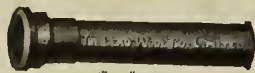
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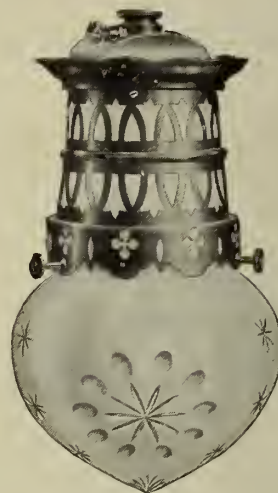
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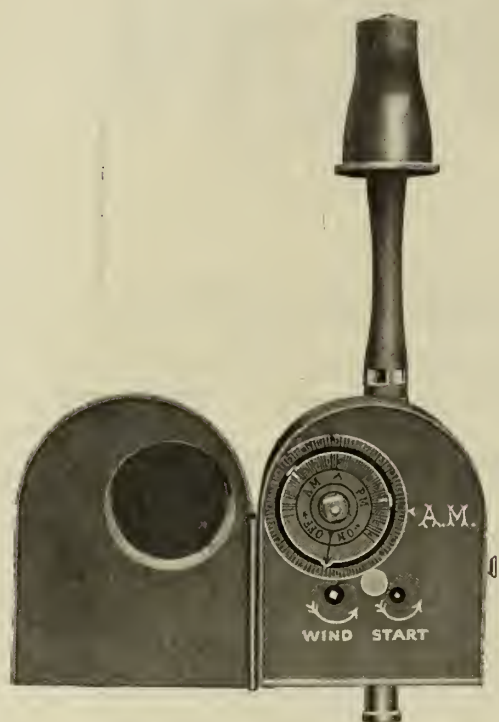
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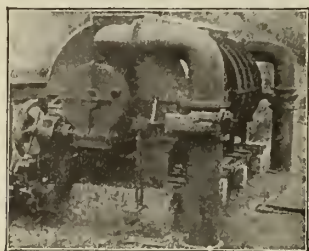
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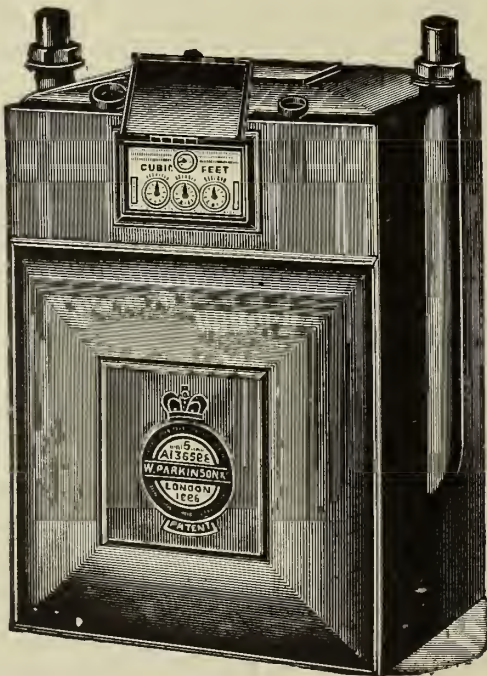
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VOL. CVI., No. 2399.—TUESDAY, MAY 4, 1909.

EDITORIAL NOTES—GAS, &c.

The Budget—Investment and Other Topics.

THERE was only one imposing subject of interest last week, and that was the Budget, with the scheme of the Chancellor of the Exchequer for meeting the startling deficit of nearly 16 millions sterling shown by the nation's balance-sheet. The methods that Mr. Lloyd George has propounded for straightening out matters have been variously received. A socialistic budget is the verdict of all who are not extreme upholders of the Government; and when the proposals for rectifying the deficiency are examined one by one, the verdict does not appear to be against the weight of evidence. To satisfy requirement, the Chancellor dips his hands freely into capital, attacks industry, adds to the burden of investment, and sets up a further obstacle to the spirit of thrift. The Budget throughout has been designed on the principle that the burdens of the nation ought to be—not equally, but unequally borne. Among much for regret, there is one thing the gas industry are grateful for, and it is that the rumoured tax on coal (which idea was very properly ungraciously received by the country) has not materialized.

On the other hand, there is the increase in the stamp duties in connection with dealings in securities, which must have an influence in the direction of the restriction of investment at home, and in diverting capital to other countries. The man who saves money, upon the interest derived from which he hopes to live in old age, pays well for the privilege of being allowed to look forward to a little rest and leisure later on in life. He is taxed for earning an income, he is taxed for investing a portion of it, and he is taxed perpetually on the proceeds of the investment. The proceeds are misnamed "unearned" income; and he is now to be taxed on this—not at 1s. in the pound, but at 1s. 2d.; and those who have unearned incomes on the higher scale are to pay still more by way of a super-tax. We will not go into details, as they are already well known. Among others, shareholders in gas companies will have to bear at any rate the 1s. 2d. impost, because—the distinction is a nice one—though the profits are earned by the shareholders in their corporate capacity, they are unearned by them individually. There is a fear, too, as the announcement of the Chancellor of the Exchequer stands, that all joint-stock concerns making profits of above £5000 will have to pay the super-tax. If so, it will mean that the greater part of the income of the country from joint-stock enterprise will have to bear a tax of 1s. 8d. in the pound. This is only a surmise as to intention; but if it should prove correct, the detrimental influence on industry and finance will be something appalling. At the moment, only anticipating the smaller of the two evils, all this taxation tends to make investment of savings—large and small—in joint-stock enterprise more and more unattractive; and, in exact proportion as it does this, so commercial enterprise and industry in this country are injured, and the country itself suffers.

Then there is the tax on motor vehicles and petrol. Here, perhaps, the gas industry has some small reason for congratulation. The motor waggons that are being increasingly used by gas-works for carriage about their districts are—being trade vehicles—exempt from the additional tax; and they will come under the remission for such vehicles of half of the tax on petrol of 3d. per gallon—that is to say, it will be 1½d. per gallon. There is not the slightest doubt, however, that even the 1½d. tax on petrol for these heavy class vehicles will cause a slackening in the rate of their adoption, until anyway improvements are made that will allow the use of a substitute for petrol. Already some of the heavy motor cars are fitted with carburettors capable of using petroleum; and petroleum will probably become largely the fuel for the heavy trade vehicles. The advocacy of benzol and alcohol as competitors with petrol has also been

revived; and gas men will watch with keener interest than ever the trend of events under the new order of things. The Chancellor of the Exchequer estimates that the yield of the tax on motor cars and on petrol will be about £750,000; Sir John M'Donald at the road conference last week estimated that the petrol tax would, within five years, yield a revenue of £1,500,000.

These are only estimates; but about them the most interesting point is the proposal to set aside from the income £600,000 a year as a subsidy for main road maintenance. There has been so much complaint about the nuisance and damage caused by the fast moving private motor cars that some time ago the members of the Royal Automobile Club, and we believe of other clubs, announced their readiness to be reasonably taxed for the particular purpose of improving the roads, in view of the changed conditions of traffic. But, now that the taxes have come, it is thought the Chancellor of the Exchequer has taken an undue advantage of the suggestion. However, the Bucks County Surveyor calculates that the £600,000 that is to be set aside from the revenue derived from the new motor car and petrol taxes will just about cover the tar painting of the rural main roads of the country. "It's an ill wind that blows nobody good." Under this particular head, gas managements will not feel disposed to quarrel with Mr. Lloyd George, if the taxes in question mean a freer consumption of their tar for road purposes.

Suction Gas Competition.

"MAN, know thyself," is a good injunction that can be extended to many of the affairs of business life. "Man, know thy business," is a sensible adaptation of the precept; and "man, know thy competitors in business," is another. A man does not know his business thoroughly unless he at the same time knows all about the advantages and disadvantages of his competitors. There are a few generous souls in the gas industry who say that suction gas and electricity have come to stay, and that the best thing the gas manager can do is to leave them alone, and let them do their best or worst on their own merits, while town gas should do the same. There is a big mistake here; and those who pledge their actions to such lines will find that they are their own enemies. Suction gas is at the moment the competitor in view; and there are those who are interested in suction-gas plant who do not hesitate—the personal experience is the common one—to decry town gas to manufacturers. They know full well which strings to play upon in connection with town gas, and which to leave untouched, in gaining the ear of the manufacturers, and possibly in persuading them to forsake town gas and turn to suction gas. The cognate knowledge—knowledge as to the advantages and disadvantages of the suction-gas plant—should be in the possession of the town gas man; otherwise he is placed in an inferior position in the contest for the power business. But we are enjoined by some not to talk of the frailties of the suction-gas competitor, as in such talk are the incitants to a quickening of the competition. The gas industry need not be afraid of that; and no man should be so generously inclined as to aid and abet the competitor in winning custom by assisting vendors of these plants in keeping dark its disadvantages in use. The old-fashioned notion that if one cannot speak well of a rival for business, then say nothing about its weak points, does not fit these competitive days when it is every business man's interest—so long as he does it fairly and honestly—to make the best of his opportunities.

The lecture published in last week's "JOURNAL," delivered by Mr. Henry O'Connor to the Western District of the Scottish Junior Association, is one that is timely; and it should be the means, through the practical points and research incorporated in it, of arousing a general determination to get at the actual performances of the rival as contrasted with the claims made on its behalf—claims that in the matter of cost alone (without any of the collateral

expenses and disadvantages being brought into the calculation) are put into direct comparison with town gas. These claims are widely disseminated by the makers of suction-gas plants, whose primary business is the manufacture of gas-engines; and their statements are in brief that so much saving can be effected on the town-gas bill for power by adopting their plants. The engine makers are pleased enough to enjoy the substantial pickings that the gas industry puts in their way. But in the propagation of their own business, they have step by step destroyed all outward or visible association with the gas industry. In such advertising and exhibiting as they now indulge in, they give prominence to the suction-gas plant, and assert the combination to be preferable. This should not be. The gas industry has done its part—and it has been a large part—in establishing the gas-engine makers; and the gas-engine makers should not now divorce themselves so completely from the gas industry, which is shaping itself more than ever to meet the requirements of power users. Perhaps they will in time again give evidence of a desire to work for the mutual advantage of themselves and the gas industry, as well as prosecute the business in suction-gas and power combinations. They know full well that the gas industry cannot do without them; but they evince no outward inclination to be helpful to the gas industry. We will not discuss the reason. It is so obvious as not to need discussion. But the knowledge as to the drawbacks of suction-gas plants is cumulative, and use must be made of it in defence of town gas. Some of the knowledge is to be found in Mr. O'Connor's lecture.

Credit, however, can be given to suction-gas plant for having shaken the gas industry into a more enlightened recognition of the potentialities of the power business, and what must be done to cultivate it. In a majority of places, gas at the old prices was entirely out of the question for power; and we have the evidence of towns where low gas prices exist for day power and industrial uses, of the suction-gas plant makers finding their pleadings for business there altogether unavailing. Mr. O'Connor gives some sound reasons why gas can be supplied during the daytime for this class of business at prices below the ordinary without detriment, but with benefit, to the lighting consumer. He shows, too, wherein town gas, not of the richer varieties (because, as Professor Hopkinson has demonstrated, there is a difficulty with the higher grades of rich gas in getting a proper and speedy admixture with the air), is the superior in many points of suction gas; he describes the causes of the losses there are between the working efficiency of an engine when running on town gas and when running on suction gas; he also mentions the time loss in starting up, as well as the losses necessitated by intermittent running. These are not the matters that are brought to the notice of power-gas users by the suction-gas plant makers; but they are as important to the user as—if not more important than—the fuel costs per brake horse power. The universal remedy for the delay in starting up is not such a simple matter as was suggested in the discussion of Mr. O'Connor's lecture, or else the makers of the plant would not, with such a modest remedy at hand, allow point to be given to the rival town gas by not making provision for that remedy, nor would there be so much need for the provision of a town-gas stand-by, except for emergency use. This question of the provision of a stand-by is a somewhat serious one for gas suppliers. The Edinburgh Gas Commissioners have ensured themselves against partial loss by refusing to supply meters for town gas where suction-gas plant is installed; the consumer having to provide his own meter. In Glasgow, there are so many stand-by meters that the Gas Committee have had to make a special charge for them. The hint might be taken by others, until Parliament gives power to gas suppliers, as Parliament gives power to electricity suppliers, to cover themselves, on the expenditure involved in making the provision, by a charge on those deriving advantage from having the stand-by. In the Mountain Ash Gas Bill this session, the Local Legislation Committee of the Commons have passed a clause empowering such a charge to be made; and it is hoped that the clause will stand through the remaining stages of the measure, and that there will be no difficulty in future in obtaining such power.

We will not traverse the whole of the points of Mr. O'Connor's lecture. It has been before our readers for a week; and many have, without doubt, derived not only interest but instruction from it. It emphasizes our first submission, that as much as possible should be learned by gas men of the weak side of suction-gas plants, so as to assist

town gas in the competition for power business. The question alone of cost per brake horse power with such gas plant has a seductive influence. It appealed to at least three Glasgow manufacturers, whose plants have now been cleared away and town gas substituted. This was done because the plants were not reliable. It is an advantage of town gas that it is reliable, that its composition is approximately uniform, that it is always available, and that there are no starting-up or breakdown losses, nor losses due to intermittent working.

Influence of Surface upon Gaseous Combustion.

PRESSURE of time between the receipt and printing in our columns of the reported lecture delivered by Dr. W. A. Bone, of the Leeds University, to the North of England Gas Managers' Association, on Saturday, prevents any proper examination of the subject being made in the present issue; and, as a matter of fact, effectual criticism and comment on such a topic as the "Influence of Surface upon Gaseous Combustion" could only be made by a peer of the learned lecturer in the realms of science, and moreover by one who had conducted investigation along the same intricate paths. Accompanied by all the detail that is necessarily incorporated in, and is in fact a part of, such a question as this, the subject appears to the layman to be one of great complexity; but it is quite easy to get at the central idea of the lines of research that Dr. Bone has set his hand to by, in effect, reproducing from his deliverance certain definite statements. And having grasped the meaning of these, it will be all the easier for those engaged in the daily work of gas manufacture and use to appreciate the lines on which Dr. Bone is pursuing inquiry, simultaneously with certain Continental contemporaries, into this matter, and which inquiry must, we have no hesitation in believing, have in its results great practical value.

It is a somewhat singular fact that this subject of the influence of surface upon gaseous combustion has remained so long an unattractive field of research to physicists and chemists, though from the pursuit of a correct understanding of such influence should, the practical mind realizes, ensure valuable effects. As far back as the period between 1816 and 1836, it was established that all solids have the power of accelerating combustion under suitable conditions; but the work of that period was confined within very narrow bounds. And it is only really within the last dozen years or so there has been a revival of the study, with the object of revealing that which the earlier investigators had left latent. We know the part that Professor Bone has taken, and is taking, in this and kindred investigation; and the gas profession are proud of their closer association than has hitherto obtained with the aims of one who seeks to point out the way to greater practical utility by his own exploration in the higher spheres of science. In the lecture he delivered before the Institution last year, Dr. Bone indicated how surface accelerates the decomposition of methane when at high temperature; and he also pointed out the function of the charge in retorts, of the hot tar, and the heat of the walls of the retort, in promoting decomposition of methane into carbon and hydrogen. But in the present lecture we go into the influences of the heated surfaces of solid bodies in promoting combustion. To paraphrase Dr. Bone's own statement, when we consider the number of industrial operations which are more or less necessarily conducted in furnaces enclosed or bounded by solid walls, and also more or less packed by solid materials, the importance is at once seen of the influence of hot solids; and, though often overlooked, that importance can hardly be over-estimated in dealing with the applications of gas for heating purposes.

The work in the early part of last century shows the long existence of the recognition of the marked influence of heated surfaces in accelerating not only combustion, but chemical interchanges in gas generally; and this brings us to the cardinal points that Dr. Bone sought to convey on Saturday to the gas engineers who were privileged to hear him. Consider that in a flame certain chemical changes are proceeding, and that these chemical changes are slow compared with what might be produced under suitable conditions. Appreciating this, it will be seen that there may be scope for accelerating action, and consequently of promoting the heating efficiency of the gas, if a substance can be found to accelerate combustion. A hot surface accelerates certain chemical changes in the gas, which changes would otherwise be slow. Therefore,

if we have a mixture in process of combination brought into contact with a nearly red-hot heated surface, combustion takes place with greater rapidity in the neighbourhood of the solid than away from it, heat is developed at that surface more rapidly, and thus a greater intensity is achieved. In short, "the function of the surface is to render one or other of the gases active by loosening or dissolving the bonds which hold the atoms in the molecule together; so rendering it an easy prey to the action of the other gases." In these points as extracted from the lecture is the starting-point of Dr. Bone's researches—already partly prosecuted, and still to be continued, until more that is definite has been acquired. The main objective in his view—opposed to Mr. Frederick Siemens's radiation theory in the matter of the proper heating of furnaces—is to get the greatest efficiency out of heating by gas by inducing as much surface combustion as possible, by getting the combination of the gas to take place, as far as possible, at the actual contact with the hot surface.

To the more practical side of the question. Experiments are being conducted by Dr. Bone into many materials, to find out the various degrees of action exerted by them in promoting surface combustion; and he is carrying the same line of research to the incandescent mantle. It can readily be appreciated how such knowledge as this may be of considerable value in all forms of heating in which combustion of gases occurs in enclosed places such as furnaces, in gas-fires, and so forth. It is a small matter; but perhaps in what Dr. Bone now puts before us, there is the explanation of the increased illuminating power given by mantles when the supporting prop is fitted by one of the Cash-Eady fire-clay cones (described in the "JOURNAL" for July 14 of last year), which, when the cone becomes heated, possibly has the described effect of accelerating surface combustion and promoting heating intensity. The gas engineers who heard the lecture on Saturday were instructed; but they recognized that Dr. Bone had a large portion of the field before him still to explore. Further, they also recognized more than ever the inestimable value of the association of science and practical work. There are few—perhaps there is no one—directly concerned in the practical work of the gas industry qualified, in such matters as this, to bring to light the value that still lies hidden in the unexplored and unknown. By every fresh effort of those scientifically associated with our industry, the truth of this becomes the more deeply impressed upon the practical mind.

The Public Utility of Tar.

THE appreciation of tar not as yet in market value, but as a useful material for a purpose of public utility, without any particular encouraging efforts being put forth by gas managers, is an experience both gratifying and novel. Significant indeed is the amount of attention that is being given to the utilization of this plentiful product of coal carbonization by those whose business it is to construct and maintain roads, and by those who use them for mechanical locomotion. The British Road Conference held in London last week was attended by men influential in several directions—socially, in local government, and as chief officials to the authorities in whom reposes the responsibility of the maintenance of our highways and byways generally. Of the forty papers presented to the conference, something like one-fourth introduced, in greater or less degree, the question of the use of tar, either in the construction of roads, or for their top dressing; and it may be said that the technical testimony, as well as that of the users of the roads, was favourable to the greater employment of the commodity which the gas industry will be pleased enough to supply. It was the dust nuisance which raised public clamour against the motor car. Both this and the mud nuisance motorists are equally pleased to see allayed; and for both these desirable ends, as well as the better maintenance of roads, the responsible authorities and their officials devoutly wish.

Tar is voted by the great majority of road experts to be the specific for both nuisances, and the best road preservative. The formerly approved form of constructing macadamized roads is no longer approved. It is defective under the new traffic conditions; and the specification for a road now is that, while it must be of sufficient strength, it must also be impervious to moisture and be practically mudless and dustless. In the construction of roads, the experts agree that tar is the best binding material. But we fail to see that there is any need to go to the expense of adopting

any costly form of patented tar macadam. Road authorities have quite sufficient work to carry out in the way of road construction and repairs to be their own producers of macadam, using tar as a binder. The costs quoted in the papers, however, show that the expenditure for this form of construction is prohibitive, except for main thoroughfares through urban districts. On the other hand, there are no two opinions as to tar macadam being preferable to a simple top dressing; but no justification can be submitted for the expense of the former save in special situations. In all situations, therefore, where expense will not allow of tar macadam, the surface dressing by tar is praised and commended as effective, not only for minimizing the nuisances of dust and mud, but for preserving the road. Controversy is very keen, however, as to the relative benefits of tar spraying and hand work. Generally speaking, spraying is found the cheaper method; hand work the more durable. In different districts, however, experiences vary as to costs in a somewhat remarkable manner. In one of the papers presented at the conference, it is seen that spraying, in the West Riding of York, worked out to $\frac{7}{8}$ d. per superficial yard; and adding the cost of sweeping and sanding, the total was 1 $\frac{1}{4}$ d. In another paper, dealing with Glamorgan, the cost of two coatings of tar by hand, including sanding, came out to just under 1d.; while tar spraying cost $\frac{3}{4}$ d. per yard for two coatings. There is not much difference between the cost of handwork in Glamorgan and spraying in Yorkshire, and between the two systems in Glamorgan; but the hand work is found to be the more lasting. Where, however, the cost of spraying is found to be less, it can be done more frequently, without increasing the cost over hand labour, besides which there are to be taken into account rapidity and the reduced time-obstruction to the use of the road. In saying this, it is merely to point to the advantages and disadvantages of the two systems; but we would urge that, if the conditions permit, for the sake of the employment, recourse should be had to manual labour.

There is another point of which sight should not be lost; and it is that the cost of surface dressing ought not to be put entirely to the account of the suppression of the dust and mud nuisances. Mr. F. G. Carpenter, in dealing with experiences in the West Riding of York, asserts that the treatment of roads by spraying prolongs their life by about 20 per cent.; while Mr. H. E. Stilgoe, the City Engineer and Surveyor of Birmingham, avers that the top dressing lessens wear and tear, prevents damage by the suction of pneumatic tyres, and generally increases the life of the road. Therefore, a proportion of the cost ought fairly to be placed to maintenance. These are all interesting points. The conference should give a filip to the application of tar for these purposes; and the decision of the Government to allocate the major part of the new taxes on motor cars and petrol to road maintenance should also have an effect in the same direction.

Manchester and the Rates

AS was more than half feared would be the case, the Manchester Corporation Gas Committee have yielded to pressure brought to bear upon them, and have consented to increase their contribution to the city fund for the present year from the figure of £26,495 at which they originally fixed it, to the (for them) more usual sum of £50,000. This, however, it must be noted, can only be done by adopting the expedient of "anticipating profits"—which is apparently the course selected in preference to raising the price of gas. While a week ago it appeared that the citizens would be called upon to pay increased rates to the extent of over 6d. in the pound, the careful revision that has since taken place—together with the further call on the trading departments—has brought the increase down to practically 3 $\frac{1}{2}$ d., which, as is remarked in our news columns, is roughly the amount needed for the Ship Canal. With regard to this revision, it may be here pointed out that the additional contribution now arranged to be given by the Gas Committee is equivalent to a rate of 1 $\frac{1}{4}$ d. in the pound. So far, the discussion that has taken place in the city on this vexed question of the rates has been mainly among the different Committees and by the ratepayers themselves. The final words of the Council on the whole subject are still to be uttered; and it will be surprising if a good deal more is not heard from that direction. In fact, the following remarks in a local paper are highly significant: "Apart from the state of

public opinion in regard to the rates on the present occasion, the Finance Committee now fully realize that if the rates are to be kept within reasonable limits a check will have to be placed on certain departments. There is reason to believe that in the report which the Committee will present to the Council certain recommendations of a drastic nature will be made. In unofficial quarters there is some talk again of the desirability of appointing an Advisory Committee; but whether any suggestion bearing on the matter will be made to the Council is not known." Whether the Finance Committee have been longer than should have been the case in realizing what they realize now, or whether they ever would have done so but for the public outcry that has been raised, need not be inquired into too closely by the citizens. More solid gratification will be derived by them from the thought that now, at all events, a really serious attempt is to be made to grapple effectively with "the question of the rates."

Gas Matters in Birmingham—The Accounts.

The report and accounts of the Birmingham Corporation Gas Committee for the twelve months ended March 31 last, which are noticed in another column to-day, contain several points of interest in regard to what the Committee point out is "the largest commercial department of the Corporation, and the largest gas undertaking in the Provinces." The period was one of bad trade generally; and therefore, Birmingham being a manufacturing centre, the ratepayers will have been expecting to learn that there was some falling off in the quantity of gas sold. It must be a gratification to them under these circumstances to find that the amount sold and used on works was 6978 million feet, as compared with 7042 millions in the preceding year, which represents a drop of less than 1 per cent. Even this slight reduction has not been reflected in the surplus profit, which constitutes a record; the amount being £71,459, as compared with £61,313 the previous year. In addition to this sum, which is handed over to the Finance Committee in aid of the improvement rate of the city, the department contribute various other amounts for public purposes; the improvement rate also benefiting to the extent of £4000 interest on the reserve fund, while £15,440 is put down as "in aid of public and court lighting"—making a total of £90,890. Looking at the revenue account, it is seen that the receipts came to £935,636, compared with £980,089 the year before; while the expenditure was £745,335, as against £800,126. Thus the decrease in expenditure was over £10,000 more than the falling off in the receipts—which is an eminently satisfactory state of affairs.

The Committee's Report.

Turning to the Committee's report, it will be noted first of all that No. 2 retort-house at the Adderley Street works is under reconstruction, and that it is intended to instal therein the Fiddes-Aldridge charging and drawing machine. Next comes an interesting statement under the heading of distribution—namely, that the Committee have arranged to lay down a trunk main that will be worked at a pressure of about 2 lbs. to the square inch, with off-takes at various points, where the pressure, regulated by governors, will be reduced so as to maintain the supply at the normal or required pressure to the premises of consumers; and, in laying down the system, the route of the main will be arranged so as to supply gas at high pressure for public lighting along the main streets in the centre of the city. The streets that will in the first instance be served by the main are enumerated; and the estimated cost of the scheme is given at £15,000. Birmingham has for some time past enjoyed the benefit of an excellent high-pressure gas installation in the neighbourhood of the Council House; and it is not surprising to find that there is a desire to grant a similar boon to other of the leading thoroughfares. A considerable portion of the report is devoted to the subject of organization; reference being first made to the appointment twelve months ago of the Engineers of the various works to the more responsible position of Engineers-in-Charge. It is stated that the system then inaugurated has worked so smoothly and well that the Committee are unanimous in their opinion that its continuance is in the best interests of the undertaking; and the Council are recommended to fix a maximum salary for the Engineers-in-Charge of £1000 a year. Mr. G. Hampton Barber, who is at present Secretary of the department, the Committee recommend should be appointed Secretary and Manager of the

undertaking, with a maximum salary of £2000 a year. The Committee propose forthwith to increase his remuneration from £1400 to £1600 per annum. But the amount will not permanently remain at this figure; for the only conditions to further advances within the maximum named are Mr. Hampton Barber's "continued efficiency and the prosperity of the undertaking."

Free Gas for Public Purposes.

Our researches into the question of the legality of the use of free gas for the purposes of lighting the streets and public buildings of Oldham were naturally limited to the records available, and the remarks made on this point last week were put forward tentatively in the hope of drawing further information. There has since been an opportunity of seeing what occurred in 1865, when the Corporation obtained an Act, in which the right was given to use gas for the "public advantage." That power for more reasons than one ought to have been explicitly determined when the limitation of profits was imposed in the Act of 1886. In the first place, though the Council do not appropriate in actual money more than the amount to which they are entitled under the 1886 Act, they are, by taking advantage of the 1865 provision to an extent only limited by requirement, setting at naught the profit limitation imposed by the Act of 1886. Gas costs money; and it represents money. Moreover, there is a vast difference between the quantity of gas that is used now for public purposes and the quantity that was used in 1865. The quantity consumed now in this way, and the burden of which the gas-consuming section of the ratepayers alone has to bear, could never have been contemplated in 1865. In effect, this taking of free gas for public purposes to such extent as now, detracts from the value of the limitation clause of 1886. It is to be hoped that Parliament will say that what the Corporation are now doing in this regard is in excess of the powers given by this clause.

The Out-Districts and Free Gas.

There is another point. In 1886, Parliament ordained that the charge for gas outside the borough to ordinary consumers should be the same as the charge for the time being within. Now this abolition of the differential charge is in a measure defeated by the use of free gas by the Corporation within the borough. The consumers generally have to pay for this free gas. The consumers outside Oldham, therefore, pay their share of the cost of the gas used free in Oldham, and they also have to pay (as ratepayers) their share of the gas used for the public lighting of their own areas. The differential prices may have been abolished; but differential positions have been maintained, through this unjustifiable appropriation of gas on the part of Oldham. The out-districts are now asking Parliament for the repeal of the power in the 1865 Act, as being, to all intents and purposes, a violation of the profit limitation clause of 1886. We are not, however, so much concerned about the out-districts, as for the consumers generally, who we consider are inequitably treated through having to pay for this free gas for public purposes, as compared with those ratepayers who are not gas consumers. Equity demands that the cost of all public services shall be borne proportionately.

The Disturbed South Wales Area.

The masters and men in the South Wales coal-field seem to be no nearer a settlement of the dispute that has arisen as to whether or not the coming into force of the new Eight-Hours Act will automatically terminate the wages agreement which, under ordinary conditions, would remain in operation until March 31 next. Each side has sought Counsel's opinion; and these opinions are diametrically opposed. The employers have consulted Sir Robert Finlay, K.C., Mr. Eldon Bankes, K.C., and Mr. Montagu Lush, K.C.; and they all expressed the view that the Act would terminate the agreement. The workmen's representatives, on the other hand, contend that they have a mandate from the general conference of South Wales to brook no interference with the wages agreement until it has run its normal course; and they are not prepared to submit to any modification of the agreement unless the change is universal throughout the Welsh and English coalfields, inasmuch as the Act operates in both coalfields in precisely the same manner. The owners suggested, at a meeting of the Conciliation Board which was held last week, that the Solicitors on both sides should prepare a joint case to be sub-

mitted to one of the Law Lords or to a Judge of the High Court, to be selected by the Lord Chief Justice; and while the men's representatives promised to consider this, they put forward a counter-proposal that a Joint Sub-Committee of the Conciliation Board should settle the points in dispute. Though it is much too early to say definitely that the long-feared struggle will be obviated, these suggestions seem to give at any rate some promise that a peaceful solution of the difficulty may be ultimately arrived at.

The Law and Reckless and Dishonest Speculation.

The Attorney-General (Sir W. S. Robson, K.C.) is not enamoured of the position of company law. There has been a lot of consolidation, patching up, and extension of the law relating to companies; but, in the Attorney-General's view, there has not been amendment. This is a serious reflection on our Legislature; but it is still more serious to hear of the facility with which company law can be made to serve the purposes of fraud. At the annual meeting of the Bar, Sir W. Robson made some pointed remarks on the subject; and it is not unlikely that, in his official capacity, he has been indulging in a fairly broad survey of the fields in which the malversation of a certain type of company promoter has play. An attempt, he says, will have to be made to deal with this question of the company law serving the purpose of fraud. The sooner the attempt is made, the better; for the difficulties are great, and the longer there is delay in facing the situation with deliberation, the worse it will become. Fraud seems to betray a fondness for corporate form; and in corporate or co-operative companies it is rampant. "We are," said Sir William, "all anxious to bring reckless and dishonest speculation within the purview of either the civil or the criminal law." The sooner that anxiety shows expression in deed, the earlier will there be greater hope of the community being protected from the parasites who commit the frauds that the Attorney-General had in mind.

An Unpromising Speculation.

The Selsey Water Company is a speculation with very little hope of success. It is a concern with little that is solid to justify existence on a big capital. We remember that when the Selsey Water Bill was before a Parliamentary Committee, the Hon. J. D. Fitzgerald, K.C., described those who were promoting the measure, or those who were in the front of the promotion, as men of straw; and it would be a bit interesting to hear what description he would apply to the business on which the Directors are now trying to raise thousands of pounds of capital. Certain it is that the learned Counsel has not risked any of his money in the concern. Almost precisely a year ago, we were calling attention to a prospectus of the Company, in which the public were asked to confide £12,000 to the Directors to supply water to the undeveloped district of Selsey, which is connected up with civilization merely by a sort of tramway ending at Chichester Station. It was wondered at the time what so much as £12,000 was required for, seeing that the Company have no pumping works to construct, but only a distribution system—the water being purchased in bulk from the Chichester Corporation. The promoters' share was doubtless for such a concern somewhat heavy; but there is no public information on that score. Nor is it known by us to what extent the public responded to the appeal for capital then made. Whatever the amount was, the Directors are again asking the public to show confidence in them and the undertaking by subscribing £5000 more in ordinary shares and £1000 in debentures of £25 each. The present prospectus states that the issue of capital is being made for the purpose of carrying out various extensions, and the laying of distributing pipes, "in order to meet the urgent demand for water supplies and for other purposes." How was the money spent that was last raised? The prospectus states that the "works" were only recently officially opened. There have been no works to construct, other than the laying of a line of 5-inch cast-iron pipes and the distribution system. A large amount of such work can be done for a very few thousand pounds when the distribution pipes are no larger than those laid at Selsey. There is room for more disclosure as to the expenditure of the capital raised before more money is sunk in this project by the public. The well-recognized bait is offered of a year's guarantee of interest; and although the prospectus was not published until towards the end of the fourth month of this year, a full six months' interest on July 1 is promised on the amounts paid. The Board is an interesting composition.

There is upon it Alderman J. O. Holt, Mayor of Chichester, and Chairman of the Corporation Water Committee; Luther Clayton, Director of the Petersfield and Selsey Gas Company; Edwin R. Painter, Chairman of the Petersfield and Selsey Gas Company; and W. B. Martin, Director of the same Company. Mr. Martin has had a decent experience as a Director, including the ill-fated Amman Valley, the celebrated Laindon, and the North Pembroke-shire, New Toddington, and Cobham Companies.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£ s. d.		
April	26	Previously acknowledged	915	6 1
	28	Thomas A. Guyatt, Ely	1	1 0
	29	Herbert Lees, Hexham	2	2 0
May	1	Long Eaton Gas Company	5	5 0
	3	Charles Wood, Bradford	5	5 0
	3	John Hughes, West Kirby	10	6
Total			£9165	9 7

PERSONAL.

Mr. LEWIS MITCHELL, M.Inst.C.E., has been appointed Engineer of the Bolton Corporation Water-Works Department, at a salary of £500 per annum. Mr. Mitchell was Joint Engineer for the Bolton Corporation with the late Mr. R. H. Swindlehurst.

Mr. R. S. GARDINER, who has for many years had considerable experience in connection with foreign gas undertakings, and, as our readers are aware, is a member of the Committee of the Société Technique de l'Industrie du Gaz en France, has been elected a Director of the European Gas Company, Limited, in the place of Mr. E. F. WHITE, who has resigned through ill-health after being on the Board for upwards of thirty years. Mr. Gardiner, it may be remembered, recently received the decoration of the Legion of Honour.

Those of our readers who are acquainted with the gas undertakings in the eastern counties are probably aware that the gas-works at Sudbury were held on lease by Mr. C. W. Grimwood, who had been connected with them since 1868, in which year he took charge of the office work for Mr. R. A. Starke, of Woolwich the then lessee. He became lessee in 1881. On the expiration of the lease a short time ago, the Gas Company decided to carry on the works themselves; and they appointed Mr. C. G. GRIMWOOD (Mr. Grimwood's son) Manager and Secretary. His immediate predecessor in the latter office was Mr. H. Bridgman, who recently resigned on account of failing health. The Company was formed in 1836; and the first Secretary was Mr. J. F. S. Gooday, father of the present General Manager of the Great Eastern Railway Company.

OBITUARY.

The death occurred on Saturday, the 24th ult., after a fortnight's illness, of Mr. J. WALKER, who for many years had held the position of Manager of the Budleigh Salterton Gas-Works. He was greatly respected by all with whom he was associated; and the Directors of the Gas Company always regarded him as a valuable and capable servant. He leaves a widow and an only daughter, for whom much sympathy is felt.

The "Journal für Gasbeleuchtung" of the 1st inst. reports the death, on the 16th of April, of Herr KARL VOLBEHR, who retired in 1899 from the position of Manager of the Hamburg gas undertaking. Deceased was born at Kiel in 1838. After experience at the gas-works in that town and in Ansbach and Bâle, he was appointed in 1864 Assistant to Herr J. H. Schilling, the State Inspector of Lighting at Hamburg, on whose death a few months later he was promoted to the inspectorship. When the gas-works passed in 1892 into the hands of the State of Hamburg, he was appointed Manager. Since his retirement, enforced by ill-health, he had resided in the neighbourhood of Berlin.

We are informed by the Hon. Secretary (Mr. Octavius Thomas) that the half-yearly meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, instead of taking place at Barry to-morrow, has been postponed until Wednesday, the 19th inst.

Alderman Leonard Wild, ex-Chairman of the Bolton Corporation Gas Committee, and Mrs. Wild celebrated their diamond wedding on Saturday. Before he retired from business a few years ago, Alderman Wild was one of the best-known figures on the Manchester Royal Exchange.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 324.)

THE week just closed was not a very active nor a particularly exciting one on the Stock Exchange. It was a short one (the Exchange being closed on Saturday; and it was account week, with its attendant settlement, which was not a formidable affair. Movements were very irregular and variable, up and down in the course of the day; the advances of the morning being often seized for realizing in the afternoon. Budget considerations were a factor on the closing day, and influenced special lines. Thus, petrol-using cars were flat, but competing electric rails were strong. The tone at the opening on Monday was calm, business was fairly active, and most markets held firm. But some of the best gilt-edged were rather shaky, and Consols fell $\frac{1}{16}$. The Foreign Market was firm. Business fell much quieter on Tuesday, and movements were slight and irregular. Wednesday was a long time getting into swing. It afterwards developed firmness; and the leading markets closed quite strong. This attitude continued through the early part of Thursday; but business became dull, and realizations brought prices down. Friday was to a great extent a repetition of the preceding day—things moved up and then down again. Consols, however, closed unchanged. In the Money Market, the pronounced condition of ease was continued, though the requirements for the Stock Exchange settlement and for the month-end caused a better demand at the close. Business in the Gas Market was, on the whole, reduced in volume; but there was considerable activity in Argentine undertakings in view of the prospect of a fusion of interests. These scored further improvements in quotation; and the general tendency all round was good. In Gaslight and Coke, the ordinary was quieter at unchanged figures; transactions ranging from 103 to 104. The secured issues were steady—the maximum fetching 89; the preference from 105 free to 106; the debenture 85 and 85 $\frac{1}{2}$. South Metropolitan was not active, but was inclined to rise, changing hands at prices ranging from 123 $\frac{3}{4}$ to 124 $\frac{1}{2}$. The debenture marked 85 $\frac{1}{2}$. Commercial were very quiet; only the 4 per cent. showing any business, and fetching from 107 to 109. The Suburban and Provincial group were not much in evidence. Alliance and Dublin old was done at 17 $\frac{3}{4}$, British at 42 $\frac{1}{2}$, Portsea "A" at 138, and West Ham at from 119 $\frac{1}{2}$ to 120 $\frac{1}{2}$. On the local Exchanges, Liverpool "A" recovered its lost points; but Sheffield "B" lost 2. The Continental companies were remarkably inactive. The one transaction in Imperial was at 185 (a rise of $\frac{1}{2}$), ditto debenture was done at 96 and 96 $\frac{1}{2}$, and European fully-paid at 24 and 24 $\frac{1}{4}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at from 13 $\frac{3}{4}$ to 14 $\frac{3}{8}$ (a rise of $\frac{1}{2}$), both Melbournes at 101, Monte Video at from 12 $\frac{3}{4}$ to 12 $\frac{5}{8}$, Oriental at 141 $\frac{1}{2}$, Primitiva at from 7 to 7 $\frac{1}{4}$ (a rise of $\frac{1}{4}$), and River Plate at from 15 to 15 $\frac{1}{2}$ *cum div.*, and from 14 $\frac{3}{8}$ to 14 $\frac{3}{4}$ *ex div.*

ELECTRICITY SUPPLY MEMORANDA.

The New Charter of the Electric Industry—Some of the Proposals—Compulsory Land Powers—Municipal Pettiness—An Instance from Bath—Crude School Lighting Tests.

THE electricity industry badly wants the Electric Lighting Acts (Amendment) Bill. They have attributed much of their ill-fortune to the operation of the existing General Electric Lighting Acts, and to the difficulties created by them. The new Bill is expected, when passed, to remedy many of the disabilities under which the industry is supposed to have been labouring through the want of foresight on the part of Parliament in the early days of general electricity supply. The healing measure has, however, been on the carpet, and then has been packed away again, in so many sessions that those who earnestly desire its existence as a positive instrument of usefulness have abandoned all signs of delight at seeing it again in its initial stages, and are now reserving their prayers until the measure can actually be called an Act, and so have effect. The Bill, as has been stated before in the "JOURNAL," has been brought forward again this session; and it was seriously discussed in the House of Lords on Tuesday night. One object of the measure is to confer greater dispensatory powers on the Board of Trade; and to enable promoters to get through the Board certain powers that at present can only be obtained by a Bill. The present practice is that promoters are not allowed to proceed by Bill for electricity powers in cases where they can do so by Provisional Order. There are cases, however, in which promoters are obliged to proceed by Bill, because they are seeking for powers (such as to purchase land compulsorily, or to supply energy in bulk) which the Board of Trade cannot confer under the present Acts. The Bill in part gives effect to certain recommendations of a Joint Committee of 1908; and the remaining clauses are intended to either generalize provisions usually inserted in Local Acts dealing with electric supply, or to remove further difficulty that has been experienced in the working of the Electric Lighting Acts.

The Bill indeed will, on being passed, give very wide additional powers to the Board as to granting authorization for compulsory acquisition of land for generating-stations, for supply in bulk, for supply to premises outside the area of supply, and for the formation of Joint Boards for electricity supply. Among the

more general matters are provisions for the revision of the maximum price, for certification of meters, and protection to undertakers in the matter of stand-by supplies where private plant exists. There is, too, the power (similar to the new model clause) regarding the provision of fittings, whereby the fittings business is to be separately treated, and be made to pay for itself. There is also a clause which gives exemption from stamp duty to agreements for the supply of electricity; and other matters are dealt with. Regarding two or three of these latter points, and first as to the certification of meters, this is good so far as it goes; but in the interests of electricity consumers, the more stringent and compulsory provisions of the Sales of Gas Act should be applied. While gas men would like to see electricity undertakings put on a level with gas legislation in this regard, they would also like to see their own undertakings put on a level with electricity concerns in respect of stand-by supplies. The model clause for the fittings business already applies to both gas and electricity undertakings now seeking powers in this respect, with the limitations proposed in the Bill. Electric lighting contractors are, however, anything but satisfied to find that in the Bill the Board of Trade are not proposing a form of clause that makes it compulsory in the case of municipal undertakings to do the work through them.

The land powers in the Bill are looked upon as very important; and they received the principal attention in the discussion in the House of Lords. The clause proposed to give the Board of Trade unconditional rights to authorize the compulsory acquisition of any land for the purpose of a generating station, whether or not the land was situated within or outside the area of the electricity undertaking. When the measure was previously under discussion, there was opposition on the part of the Gas Companies' Protection Association and the London Gas Companies; and the result was the protection from compulsory acquisition under the measure of land "which, at the date of the first publication of the notice for the Order, belongs to any gas undertakers, and is used or authorized to be used by them for the purposes of their undertaking." Beyond this, on the motion of Lord Balfour, the powers of the Board have been further restricted by adding to the land clause provisions making the purchase procedure more in accord with that affecting gas-works. Lord Balfour's addition provides that it is not to be lawful for any undertakers, except with the consent of the Board, to construct any generating-station on land acquired by them unless the construction is authorized, and the land is specified, in a Special Act or Provisional Order; and the Board are not in any case to give consent until notice has been given by advertisement or otherwise (as the Board may direct) to owners and lessees of land situate within 300 yards of the land on which the generating station is to be constructed. The 300 yards radius already under the Standing Orders applies to gas-works. As Lord Balfour says, a generating station is not altogether a thing of beauty, but "an evil in almost any district." It might come under the category of those things which are necessary evils, which must be endured if they cannot be got rid of. At present the chief remedy is the law of nuisance; but that is not satisfactory, because it takes no account of amenity, which is important in some districts. It is possible to quote several instances where generating-stations have been put up in close proximity to buildings, which would have been much better without their new neighbours. There was an attempt made by Lord Avebury when considering the question of the auditing of electric companies' accounts, to make the section applicable to the accounts of local authorities, in view of the strong impression abroad that local authorities do not make proper provision for depreciation and reserve. There was no doubt Lord Avebury would have carried the House with him; but he was strongly pressed, through the mouthpieces of the Government, to withdraw the proposal. This he did on Lord Hamilton of Dalzell, who was in charge of the measure, saying the Government were anxious to secure an efficient audit, and he would be glad to consult with Lord Avebury before the next stage of the Bill. These are some of the interesting points of the measure, and of its present position. Whether it will be more fortunate this year than in previous ones, no one cares to predict.

There is a fresh development from municipal trading in electricity supply; and the worst of it is that it is a development showing an amount of deterioration of the dignity of municipal councils, with a simultaneous growth of petty behaviour that would be highly amusing were it not a matter to be deplored. Can anyone conceive of any municipal department, not many years ago, being so paltry as to give instructions that the advertisements of a gas company were not to be received for the backs of tramway tickets, because such advertisements were detrimental to the interests of the municipal undertakings? Yet such a thing actually happened in one of our London suburbs not long since. One hardly knows how to find expression suitable for such stupidity and little mindedness. A tramway run under the administration of a local authority is a public possession for the public convenience; and there ought to be no preference given to local advertisers who are prepared to pay for the advertising facility offered by the tram-tickets, or for the matter of that in the cars themselves. Another piece of paltry action is found in the report of a recent meeting of the Bath City Council. The Corporation own the electric lighting undertaking. Just recently they were hoping they would get rid of the wretched nightmare to the Somerset and District Electric Power Company. But the parties were buffeted from pillar to post over the matter; and at

every turn an unclimbable obstacle was found in the path. That, however, is not pertinent to the question of the growth of petty action among municipal authorities as a result of trading in electricity. The lighting of Victoria Park at Bath is required on the three nights during the thirteen summer weeks when the band is playing. The Electric Lighting Committee made an offer to the Park Committee to supply and light 38 100-candle power lamps for 2s. an hour if the Park Committee paid a sum of upwards of £600 to meet the first outlay for mains, lamps, &c. Subsequently a revised offer from the Electricity Committee quoted an inclusive sum of £60 per annum. The Gas Company's offer was an inclusive charge of £40 per annum to light 35 250-candle power lamps for two hours per night and for three nights weekly for the thirteen weeks of the season; and for any extra nights a charge of 6s. per night.

Those are the facts; and here comes in the childlike behaviour on the part of the ruling authority—in 1909—of the ancient and historical city of Bath. The Corporate Property Committee offered the Park Committee a grant of £60 per annum if electricity were used. But the Park Committee, in the interests of the ratepayers, preferred the £40 tender of the Gas Company, thus saving £20 a year; and the 8750-candle power they offered as compared with the 3800-candle power of the Electricity Committee. The Committee therefore reported that a grant £20 less than had been suggested on behalf of the Council would suffice. Certain of the members of the Council (we are not acquainted with them personally, but we believe they are all adults) seriously discussed the matter in a sort of "If you do this, I won't play" spirit. Mr. Colmer, the Chairman of the Corporate Property Committee, moved the withdrawal of the recommendation as to a grant; and later on said "he did not think for a moment his Committee would recommend any grant if the park was lit with gas." Then Mr. Hatt, the Chairman of the Electric Lighting Committee, must have been violently agitated to have made such a remark as this: "If the Council, instead of supporting its own undertaking, offered a subsidy to provide another form of lighting, the Committee would be justified in considering whether it was worth while trying to make a success of the electricity undertaking." This gentleman wished to make sure that there should be no mistaking the narrow-minded views of the Council by adding to the grant-withdrawal motion "that no grant be made for any other form of illuminant." Then Dr. Preston King valiantly said: "They stood by the offer of £60; but they were not going to pay money out of the rates for gas." The end of the discussion was that because of the sin of the Park Committee in adopting lighting not involving a heavy capital expenditure, but saving the ratepayers £20 a year, and obtaining an illuminating power nearly 5000 candles greater than would have been the case by electricity at £20 more, the order went forth that the grant was not to be allowed. Can anyone imagine anything more puerile or silly from a body of men entrusted with the local government of such an important city as Bath? It shows the state of mind to which trading in electricity is bringing some of the members of our local governing bodies. Is the race of municipal councillors degenerating?

A report presented recently to the Local Government Board on the subject of the management of poor-law institutions, it will be remembered, stated that there was no sufficient justification for, where gas is installed, changing the system of lighting to electricity. Change of this kind costs a substantial sum; while the most modern thing in gas lighting can be applied to existing fittings at a comparatively small expense. The Woking School Managers have been trying a crude sort of experiment as to the relative costs of gas and electric lighting; but we strongly recommend them to carry their research a little farther than they have done, to ascertain the relative initial and annual cost of obtaining improvement by modern gas-lamps and Osram electric lamps, as well as the relative illuminating power realized for the total amount of money to be spent. We do not understand that the school managers have irrevocably pinned themselves to one system or the other; but, in a report that has been referred to the Education Committee, it is proposed that certain schools be lighted by Osram lamps and others by improved gas-burners. The only tests that have been carried out show a great advantage in favour of improved gas lighting both in cost and illuminating power. One school was lighted by four 300-candle power self-intensifying gas-lamps, three "best" lights (the description does not suggest an acquaintance with these lamps), and one inverted outside light. The running of these for twelve hours only cost 2s. 2³/₄d., including maintenance. At another school twelve Osram 50-candle power lamps running twelve hours cost 3s. 9d., or (say) 1s. 6d. more. But these were only giving a total illuminating power of 600 candles. On the three points of capital cost, running expense, and illuminating power, we suggest to the school managers of Woking that they have not penetrated the subject sufficiently for them to arrive at a proper conclusion.

Corrosion of Steel and Wrought-Iron Tubes.—The volume of "Proceedings" of the American Society for Testing Material contains a paper by Messrs. H. M. Stowe and Bradley Stoughton on "Corrosion of Steel and Wrought-Iron Tubes." They examined a large number of specimens, and carried out various severe tests of their own; and their opinion is that good modern steel is more resistive than wrought iron.

NOTES FROM WESTMINSTER.

THE Gaslight and Coke Bill is still "held up" by Mr. Thorne. From week to week, when the Bill has been introduced for third reading, he has formally objected, and there has been further postponement. It will again come up this evening. Whether Mr. Thorne will follow the same tactics, or put his amendment to the vote and let the House decide the fate of the measure, cannot be said. We rather think, however, Mr. Thorne is in agreement with us, that, if the matter is put to the vote, the Bill will proceed without any further hindrance. The principal matters that came before Committees of the two Houses during the past week are dealt with in the succeeding paragraphs. Fresh Committees will be meeting to-day; and among the Bills expected (at the time of writing) to be almost immediately under consideration is that of the Dublin Gas Company. The measure is well backed.

Salford Illuminating Power and Profits.

The old illuminating power question is being fought with renewed vigour on the Salford Corporation Bill, which was before Lord Donoughmore's Committee during part of their sitting on Wednesday and the whole of Thursday and Friday. The Bill, as our digest of the provisions early in the year showed is (*inter alia*) for an extension of the works, further capital, and the reduction of the standard of illuminating power from 17 to 14 candles, tested in accordance with modern practice. The number and status of Counsel engaged was indicative of the importance attached by the opponents to the proposals of the Corporation. The Lancashire County Council, the Manchester and Eccles Corporations, the Salford Board of Guardians, the Swinton and Pendlebury and Worsley District Councils, and the Barton Rural District Council, were all ranked in opposition. This is a compact hostile force. But the fight is really on the part of the out-districts; and if it were only "candles" they were contending for, we should say that the expense and trouble to which they have been putting themselves have been ignorantly misapplied. But as a matter of fact, we think Mr. Balfour Browne, K.C., leader for the Salford Corporation, touched the true point of their opposition when he said that the out-districts were, in effect, demanding that they should have a share of the gas profits of the Corporation, or that the profits should be devoted to reducing the price of gas to the consumers, and not be taken in aid of the Salford rates. There is a big controversial point here, and a point that has never reached such importance as it presents to-day. The views of the "JOURNAL" have always been favourable to the profits of municipally owned gas undertakings—after sinking fund and interest have been duly satisfied, and provision made for maintenance and depreciation—being devoted to the general reduction of price. There is greater reason for this now that there is electrical competition, and unequal contribution of gas and electricity profits to the rates. We will let the matter rest there now that, at the end of the week, the battle between the parties is but half way through. Among the witnesses called for the Bill, in the order in which they appeared, were Mr. W. W. Woodford (Gas Engineer to the Salford Corporation), Professor Vivian B. Lewes, Mr. S. Y. Shoubridge, Mr. Charles Carpenter, and Mr. H. E. Jones. Mr. Corbet Woodall, we believe, has also been consulted by the Corporation. Mr. Charles Hunt, Mr. E. H. Stevenson, Mr. Isaac Carr, and Mr. William Cash are looking after the interests of the opponents. With regard to the witnesses for the promoters, it will be seen, from the report of the evidence in our "Parliamentary Intelligence," that the principle of profit appropriation for the rates was not specifically dealt with by those who are concerned in private enterprise.

Yorktown v. Aldershot. The Yorktown and the Aldershot Companies are securing largely extended powers by their appearance in Parliament this year; and they have every reason to rejoice over their good fortune so far. No doubt the Aldershot Company feel a little aggrieved that the Yorktown Company scored a success over them, after the discussion before Mr. Rose's Committee, in regard to the small area respecting the rights to which they were at issue, as explained in the "Notes" last week. It will be remembered that this area contains the War Office Staff College, which was within the limits of the Aldershot Company, but which area they have not supplied. But the Yorktown Company are supplying under contract gas in bulk into the War Office holder at Sandhurst (within the Yorktown area); and the War Office carries the gas to the College for consumption there. The Yorktown Company sought to repeal the Aldershot Company's powers in this small area; and the Aldershot Company quite naturally assumed the defensive. But the Yorktown Company's position was a strong one, in view of the fact that the Aldershot Company have not taken their mains (though their powers have existed for some years) into the area in question. The Yorktown Company have, as we expected would be the case—having in view parliamentary precedents in which the position of the parties had an approximate similarity—succeeded in securing the right to supply in the contested area, and the Aldershot Company's powers cease to apply. But, after all, the Aldershot Company lose nothing but the unexercised powers, excepting, of course, any prospective business that retention of these powers might have brought them. However, this is another instance of Parliament just now being opposed to gas authorities

having dual powers of supply in any district, and of their want of sympathy with undertakings having powers of supply which have for a considerable length of time continued dormant. The decision of the Committee was not given until both Bills had been discussed; and not a small amount of the time on Monday and Tuesday was devoted to the electric lighting powers that both Companies are seeking. Electrical experts gave it as their opinion that it is advantageous for electricity supply to be in the hands of gas companies, from the point of view of the economies to be derived from the two supplies being under one administration. On the other hand, the Easthampstead Rural District Council (opposing the Yorktown scheme) contended that, in the interests of the consumers, it was better the electricity supply should be in different hands, so that all the benefits of competition might accrue. A further ground of disagreement with the proposal was that the admitted loss from the electricity supply during the early stages would fall upon the gas consumers. In this connection, the Committee gave the Companies the powers they sought, save that the supply areas for electricity are to be strictly divided. The Yorktown Company have had a little extension put upon them of the compulsory area within which electricity is to be supplied within the period of five years. With respect to their desired authorization to supply power gas, the Aldershot Company have obtained what they wished for; but the business is to be kept as separate as possible, so that no loss shall fall on the shoulders of the gas and water consumers. The Company are already using power gas for water-pumping purposes; and there are likely customers in mills in the neighbourhood of their pumping-station. Save for the changes that have been made by the Companies in satisfying opponents, and those made under the decision of the Committee, the proposals of the two Bills stand.

Lisburn Purchase. The Lisburn Gas Company and the Lisburn District Council have both had Bills in Parliament this year—the former seeking to be re-incorporated and to be invested with extended powers, the latter to obtain power to buy up the Company's property and business. The Bill of the Council was in a group that was to come before a House of Lords Committee last Tuesday; but prior to this stage being reached, the Company and the Council had arrived at an agreement, which allows the latter's Bill to proceed unopposed, and necessitated the withdrawal of the Company's measure. The experts retained by the parties included Mr. Charles Hunt, Mr. E. H. Stevenson, and Mr. Frank Jones. There may have been others; but anyway a trip taken across to Ireland by Mr. Hunt and Mr. Stevenson appears to have been largely instrumental in expediting a settlement.

Ammanford Gas. Those who went to the Committee-rooms on Tuesday morning, anticipating that there would be something worth hearing as to the exploits of the promoters of the Amman Valley Gas Company were disappointed. Some time since, it was announced in these columns that those holding the reins of the Amman Valley concern—a concern with gas-manufacturing works and no power to distribute the product—at No. 99, Cannon Street, had agreed with their adversaries, finding themselves in a tight corner with the District Council, practically friendless in the locality, and with creditors hotly in pursuit. The adversaries were the promoters of the Ammanford Bill, who were desirous of releasing the Amman Valley shareholders from the domination of the No. 99, Cannon Street promoting coterie, of obtaining from the latter any moneys or shares that they may have received in excess of their deserts, and of placing the undertaking on a better foundation. The agreement with the promoters of the Ammanford Bill meant the withdrawal of the Amman Valley Bill, by which No. 99, Cannon Street had hoped to overcome the disabilities imposed upon them, and legally, by the District Council. The agreement provides for the transfer of the Amman Valley works and such property as may attach to them on terms to be settled by arbitration. The District Council have been satisfied by the adoption of a maximum price for gas of 4s. 3d., instead of a standard of 3s. 9d., with sliding-scale, and a reduction of the dividend from 10 to 8 per cent. Perhaps it is better things should have ended as they have done so far as the people of Ammanford and the deluded shareholders of the Amman Valley Company are concerned; but it would have been an excellent thing to have had the whole story of the promotion of the Amman Valley concern brought out before a Parliamentary Committee. It would have served as a public warning.

A Matter of Practical Politics. Though Bills may be unopposed, or reach that happy state during their progress, it does not follow that there will be no change in the conditions incorporated in the measures during their examination by the authorities of the House. In recent sessions, more than in prior ones, there have been some material changes made in Bills when before the Lord Chairman or the Unopposed Committee of the House of Commons. The Heckmondwike and Liversedge Gas Company's Bill was before Mr. Alfred Emmott and his colleagues on Thursday. The Company were applying for power to supply Mond gas; and the Committee were desirous of learning if there was any evidence as to such gas being in demand. It was pointed out that the Company supply a large manufacturing area, and that there is a field for such gas. This was not enough; and, though authority has been given to other Companies (Aldershot only a day or two before) to supply power gas, the Committee, in this instance, decided that the authorization could very well wait until the matter becomes one of

"practical politics." This does not mean a perpetual refusal, or that other cases would not succeed. In connection with the adoption of a standard price and sliding-scale in place of a maximum price, the standard in the Bill stood at 3s. 3d.; but—the Committee seemingly being inclined to think this was a bit too high—Mr. E. H. Stevenson suggested that 3s. would do no injury to anybody. So the proposed standard has receded 3d.

Water Bills. The South Staffordshire Water Company's Bill has aroused a considerable amount of interest before the Committee presided over by Lord Ribblesdale. Three days were devoted to it last week; and a tremendous mass of evidence had been laid before their Lordships. But when the Committee on Friday relinquished their labours for the week-end, the opposition was still proceeding. A further reference will be made to the proceedings when the Committee's decision is known. The Cardiff Corporation Bill is really under the consideration of the Local Legislation Committee; but the water section was specially referred to Sir Luke White's Committee. It occupied two sittings, although once it looked very like monopolizing considerable time. Certain influential landowners, however, had been conciliated; and there only remained the Merthyr Corporation and the Dinas Powis Rural District Council in opposition. The new water scheme that Cardiff has in hand is one that will, when carried out, suffice for some thirty years' needs—so far as can be predicted. The cost will be some £272,000. A central feature of the project concerns the Llwyn-on reservoir—a proposed structure forming part of a previous scheme, but not brought into existence. On its site, it is in contemplation to construct a much larger reservoir, which will be capable of storing 1075 million gallons—nearly 400 millions more than the one formerly designed. This will give the Corporation a reserve for summer use. About six years will be absorbed in the construction of the reservoir; and it will be available for use none too soon, according to the figures presented by Mr. C. H. Priestley, the Corporation Water Engineer. The evidence of Mr. Priestley (which was supported by some of the foremost water experts) put the matter plainly before the Committee. It is unnecessary to notice the opposition of the Dinas Powis Rural District Council or that of the Merthyr Corporation. It was quite clear that they had no ground for complaint; and that they were before the Committee seeking to take an advantage of an opportunity to get for their areas something, if possible, to which they could show no title. The Committee passed the preamble of the Bill. Earl Camperdown is noted in the Committee rooms for the practical view he takes of most measures that come before him. A hint from him last Wednesday made short work for his Committee of the Wakefield Corporation Bill, soon after Mr. Balfour Browne, K.C., had opened for the promoters. The Corporation have not constructed three of the reservoirs authorized in 1889—the Oxgrains, the Booth Dean, and the Linsgreave—but they do not wish to lose the right to them. They therefore asked for an extension of time for ten years. The estimated cost of these works is £149,560. The Rishworth District Council were in opposition, though they had been offered by the Corporation a supply of water at 6d. per 1000 gallons. It was clear to Earl Camperdown that the point at issue was a very small one; and he told the parties so. He adjourned the sitting for the purpose of allowing them to come to a settlement. There was no escape from this; and the parties went out, and settled their differences, whereupon the Bill was allowed to proceed. Fresh portions of the water section of the Oldham Corporation Bill were considered last week—the subjects being the protection of the water supply from pollution, and water charges in the out-districts.

Important Gas Plant Extensions in Contemplation at Leeds.—A deputation of the Gas Committee of the Leeds Corporation have lately been inspecting vertical retorts in operation in Berlin and other places on the Continent; and last Tuesday they presented to the full Committee an unofficial report on the matter. Important extensions of the plant at the Meadow Lane Works will be necessary before long; and it is understood the deputation are perfectly satisfied, after what they have seen, that if the vertical retort system is installed it will entail a great saving in the cost of manufacture, that there will be better results in the way of gas production, and that the residual products will come out much better than under the present system. The further consideration of the subject was adjourned.

Increased Consumption and Reduced Price at Reading.—The Directors of the Reading Gas Company have reduced the price of gas to ordinary consumers to 2s. 6d. per 1000 cubic feet, the reduction to date from the beginning of the current quarter. The Chairman (Mr. J. Okey Taylor, J.P.), who has held this office since the incorporation of the Company in 1862, and was a Director for some years of one of the two old Reading Gas Companies which were then merged into the present Company, has had the pleasure to announce successive reductions in the price of gas from 5s. 6d. to 2s. 6d.—an experience which it is safe to say has fallen to the lot of few, if any, chairmen of gas companies. An interesting fact, too, is that at 5s. 6d. per 1000 cubic feet no dividend was paid; whereas at the present figure the maximum dividends are assured. This is eloquent testimony to the great expansion that has taken place in the sale of gas, and the cheaper methods of gas production which have been evolved during the past half century.

THE NEW GAVETTE GAS-WORKS AT GENOA.

Dessau Vertical Retorts.



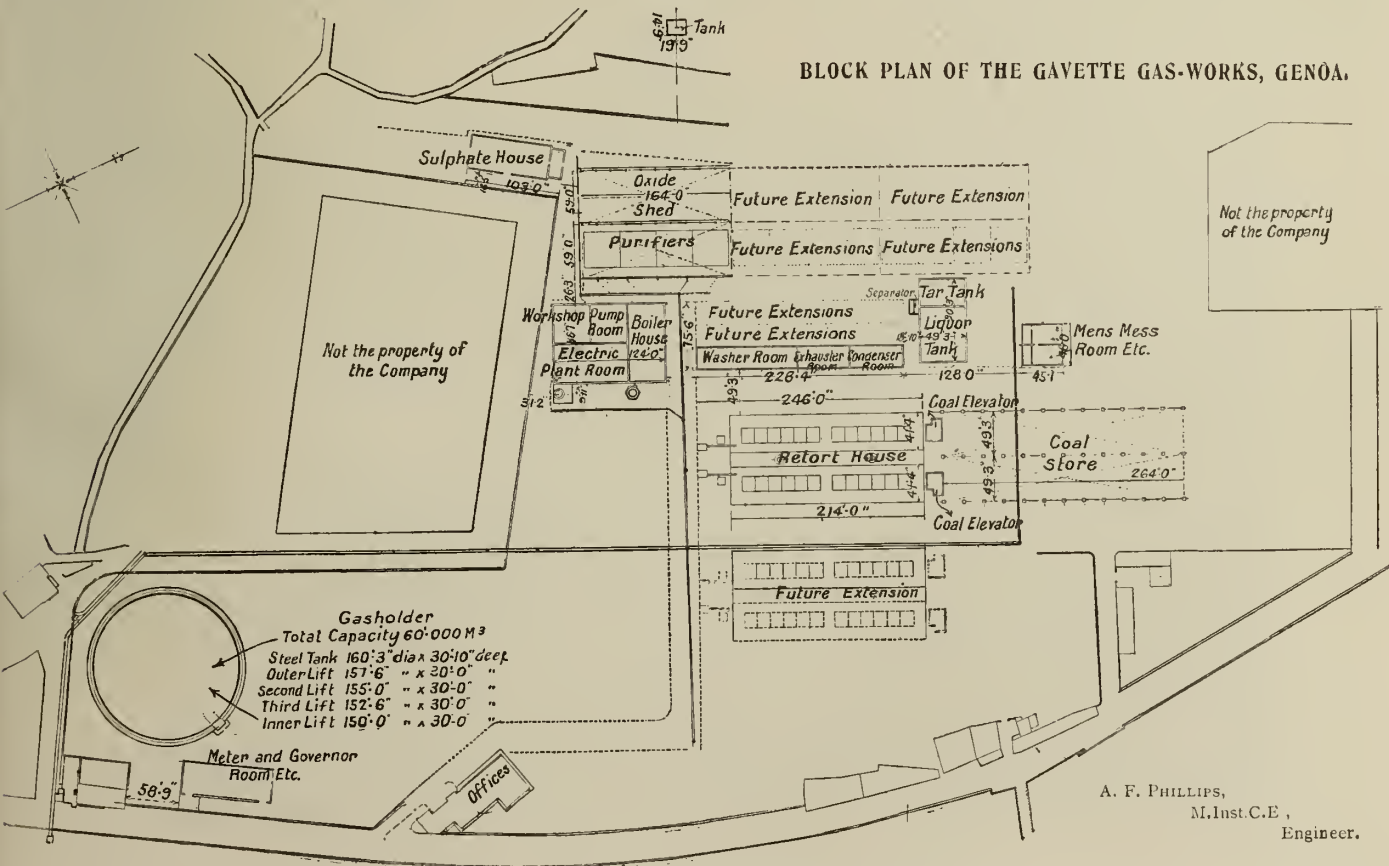
General View of the Works, with the Meter and Governor House in Front of the Gasholder.

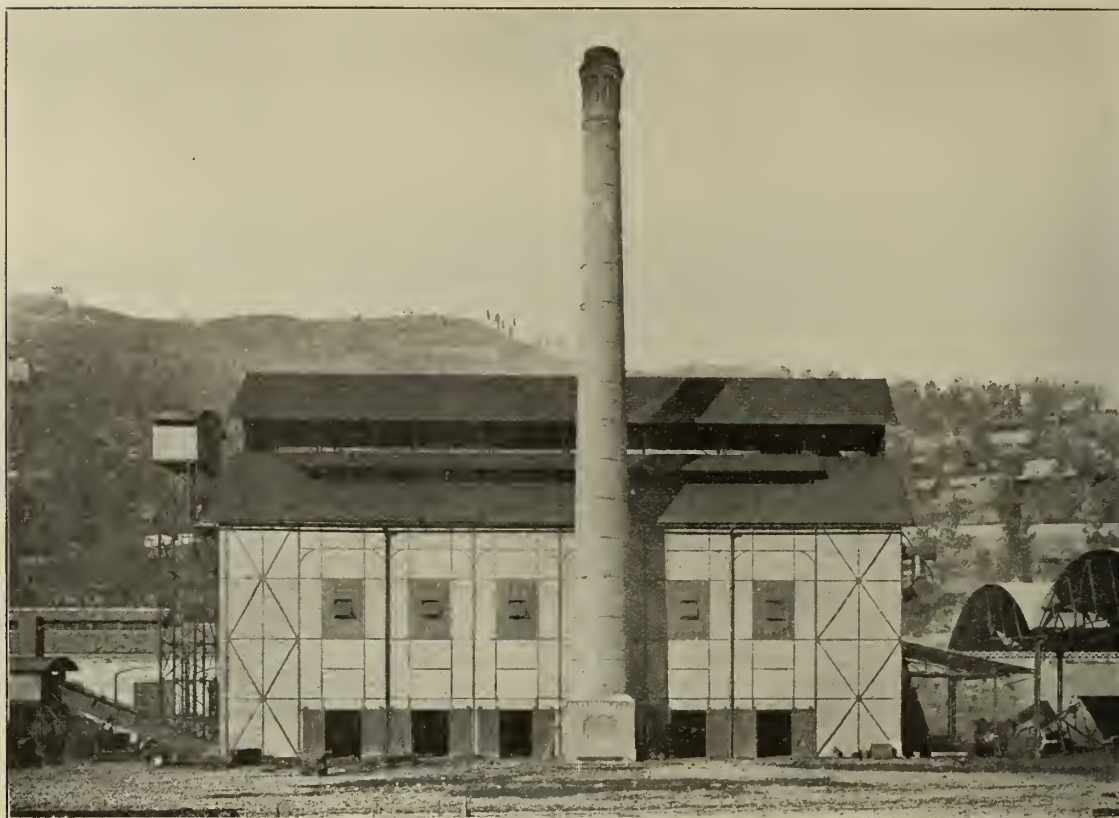
THE City of Genoa has developed greatly during the last twenty-five years; and the increase and improvements continue at a surprising rate. Old narrow streets are cleared out; and, in their place, new wide streets are made, on either side of which fine new buildings are erected. The formation of fresh roads on the outskirts of the city is rapidly adding to the area by the latter. With this development, the increase in the consumption of gas continues, notwithstanding the keen competition with the Electric Light Company. The Union des Gaz, who are the proprietors of the concession for the gas lighting, are continually called upon to make additions to the gas-works.

The original gas-works at Bisagno were erected by a French Company in 1847. They were purchased by the Union des Gaz in 1858, when the sale of gas was only about 68 million cubic feet per annum. The works are situated at the foot of a hill; and, the flat surface being soon covered, they had to be extended up

the hill, so that there are now practically three levels. As may be supposed, they are exceedingly cramped and inconvenient for the moving of material. They were added to till the annual output of gas amounted to some 220 million cubic feet. About 1851 a gas-works was erected by an Italian Company at Sampierdarena, on the West of Genoa. These, too, were purchased by the Union des Gaz in 1864, who acquired additional land adjoining; and on this site the extensions necessary to meet the additional consumption have been made for some years past, till the output in the year 1907 was 567 million cubic feet from this works alone. The Company's service extends through Genoa and to all the communes, from Sestri on the west to Quarto on the east—a distance of about 8 miles. There are 41,600 private consumers and 5011 public lamps, with an additional 3593 lamps on stairs and in courts.

Such was the flourishing position when it became necessary to make further provision for meeting the growing demands. There was, however, no room for any extension of the Sampierdarena works; and it was impossible to obtain more ground—the sea

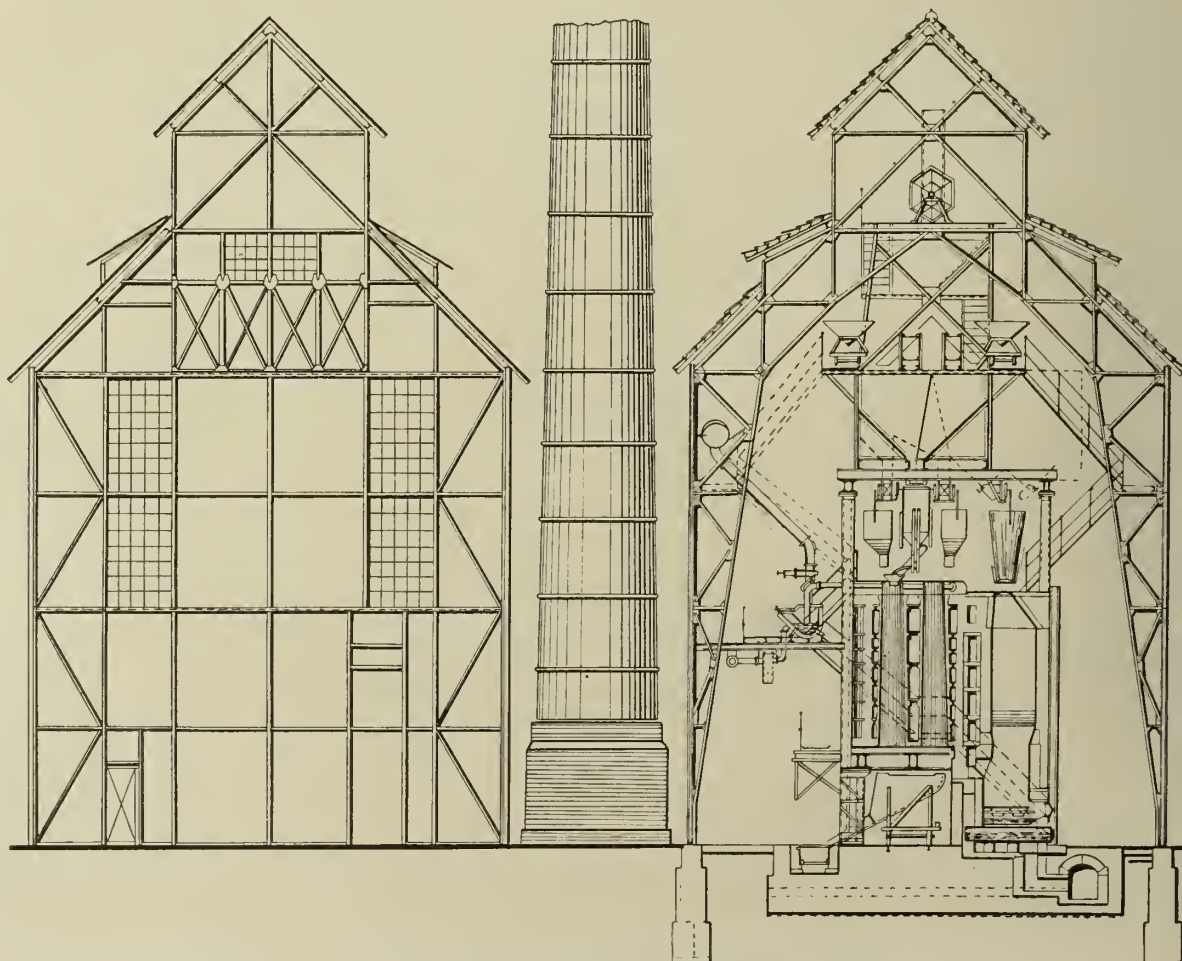




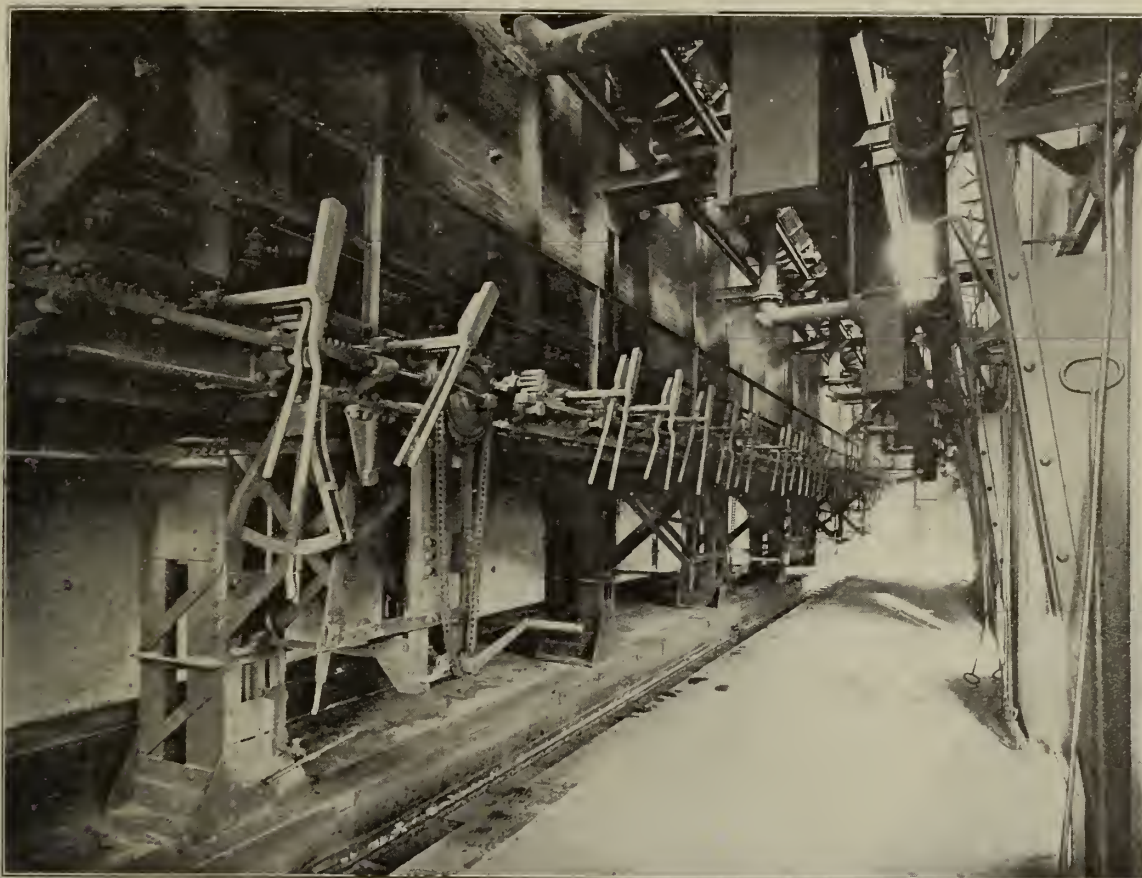
Side View of the Retort-House.

being on one side, the railway on another, and on the other two sides important engineering works. The Company were, therefore, compelled to look out for a site for a third works. But the greatest difficulty was experienced in selecting a position. Genoa is surrounded by hills, the ground below which is all occupied. It was necessary to explore the valleys. In the Sampierdarena valley up which the railway passes to Alessandria, no suitable ground could be found. The Company found themselves eventually obliged to go up the Bisagno valley, about $2\frac{1}{4}$ miles beyond the present works, where a site was purchased, of which an area of 23 acres is at present taken for the works. Unfortunately, the

communication is not good. There is a steam tramway on the road passing the works; but for the present coal is carted from the port. The Government propose making a railway through this valley to relieve the Sampierdarena Railway of some of its traffic. When this is completed, the gas-works will obtain a communication. The River Bisagno runs in front of the site of the works, which site was formerly inundated at flood times. Considerable work was therefore necessary to raise the level of the ground 6 feet clear of the flood-line. The material was provided by excavating into the hill, which work has given an additional area of flat surface.



Cross Section of the Retort-House at the Gavette Gas-Works, Genoa.



Floor of the Retort-House, Showing the Coke Conveyor and Discharging Apparatus.

THE DESSAU VERTICAL RETORTS.

The new works are of peculiar interest, inasmuch as in them have been incorporated the first vertical retorts to be set up in the country. Before entering upon the description, it should be mentioned that the whole scheme was designed by Mr. A. F. Phillips, M.Inst.C.E., and the works were carried out in accordance with his plans and specifications. The erection of the works and the execution of all the incidental detail have been superintended, in a most able manner, by Mr. P. S. Morton, the Company's Engineer at Genoa, in whom will be recognized the son of Mr. Robert Morton.

The plan that we publish of the works will show the disposition of the plant; and from it, too, the dimensions of most of the buildings can be obtained, with additional details from the interesting cross section of the retort-house. The works, it will be observed, have been designed for two retort-houses, each

capable of carbonizing 240 tons of coal a day, with all the necessary accompanying plant. There is a vacant space at the side of the prospective second house, into which, at some future time, a third house might, if required, possibly be squeezed. Each house will contain four benches of six beds of ten vertical retorts on the Dessau system. Dessau vertical retorts were adopted by the Company, after a most searching investigation by their Engineers, in consequence of the high cost of labour in carbonizing at Genoa. The first bench of sixty retorts was completed, and set to work last January. This brings us to the interesting point of a suitable building for vertical retort-settings in such a hot climate. If the photograph which shows the retort-house on the right hand side is consulted, it will be remarked that the building is an iron-framed one, with brick panelling. But in the photograph only one-half of the house is shown; the other half is to be built on the right-hand side,



Conveyors over the Continuous Coal-Hoppers in the Retort-House.



Back of Apparatus House, Boiler House, and Purifier and Oxide Sheds.

with the chimney shaft between the two sections. The space between the two ranges of vertical retorts will be left completely open straight to the sky for purposes of ventilation. Including



Top of Retort-Bench, Showing Hydraulic Mains.

this open space, the whole area covered by the house to contain the 240 vertical retorts, with a carbonizing capacity of a ton per day per retort, will be 214 feet by 100 feet. It should

be explained that the reason the whole of the retort-settings were not erected at once was that the Company naturally desired to make a test of the first sixty retorts before irrevocably committing themselves to their further installation. But practically everything has now been arranged for proceeding with the work.

The retorts are 13 ft. 3 in. long, with a section of 22 in. by 10 in. at top, and 27 in. by 14 in. at bottom. The coal is elevated to a breaker on the top of the retort-bench, where it is screened and delivered into a double line of hoppers (with a capacity of 280 tons, or rather more than sufficient for a day's supply) running the whole length of the bench—screened coal being on one side, and fine on the other. The measuring-chambers and travelling charging-shoots (two to each bench) are arranged so that an equal quantity of screened and fine coal is delivered into the retorts; the object being to prevent a lot of dead coal lying at the bottom, and producing undue pressure there. There is also a hopper for storing the breeze placed, to the extent of about 6 inches, in the bottom of the retorts before being charged; and another hopper for the coke for charging the furnaces. The coke and breeze are elevated in trolleys by a lift erected outside the opposite end of the retort-house to the coal-elevator; the trolleys delivering into the breeze and coke hoppers, which are both situated at one end of the continuous line of coal-hoppers. From the coke-hopper, a travelling shoot carries the coke to the producers. The hot coke, on being discharged from the retorts, is removed by a De Brouwer conveyor.

The retorts are charged every twelve hours, each with about $\frac{1}{2}$ ton of coal. At first some difficulty was experienced in adjusting the heating of the retorts to produce gas of the illuminating power required—105 litres to the carcel lamp. Since this has been accomplished, the work has gone on perfectly satisfactorily, both as regards yield and quality of the gas. But in regard to quality, it may be said that no steam has been introduced into the retorts. Everything proceeds with the greatest ease and comfort; and the work is expeditiously performed—thirty retorts being charged by three men with 14 tons of coal in the remarkably short space of 26½ minutes.

The Stettiner Company are under contract to work the whole installation for a time; and they are at present doing the work comfortably with seven men per day, working three shifts. The Directors of the Union des Gaz propose to allow ten Italians for the same work—three for each shift, and an extra one to look after the machines.



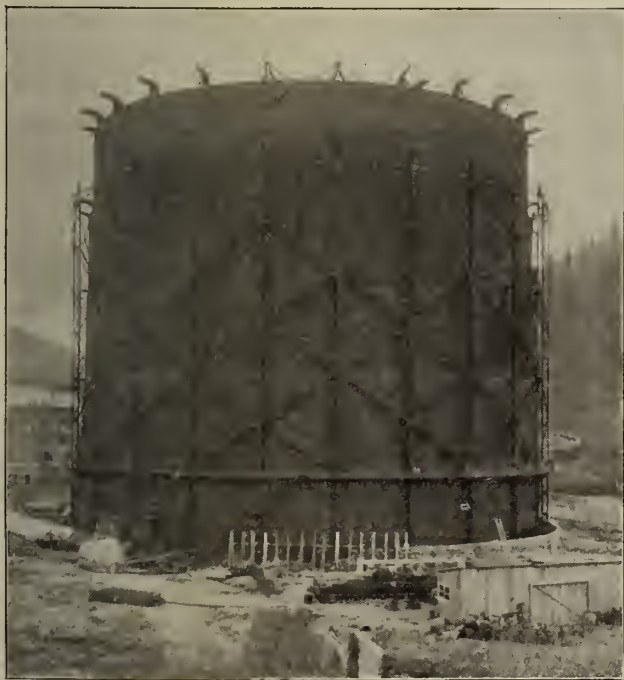
End View of the Retort-House, with the Apparatus House on the Left.



Electrical Plant Room.

SUCCEEDING THE PRODUCING PLANT.

The rest of the plant has all been erected for the complete house, which it will be recollected will be capable of carbonizing 240 tons per day. The gas first passes a set of atmospheric condensers (contained in a covered house), consisting of four tubes, 39 feet high by 8 ft. 6 in. external diameter. From the condensers, the gas passes to the exhausters—one set being a single exhauster for 120,000 cubic feet per hour, and the other set a pair of 60,000 cubic feet per hour; the object of the arrangement being that one may be run should only half the house be working.



The Gasholder of 60,000 Cubic Metres Capacity.

From the exhausters, the gas travels to the Pelouze tar extractors, the naphthalene washers, the water-condensers, and the "Standard" ammonia washers. This plant is all arranged in one line of buildings, with the connections in a cellar below, so that any part of the plant may be bye-passed, if desired, without difficulty.

The purifiers comprise a set of four, 40 feet square by 5 feet deep, fitted with slide-valves. They are placed under cover, with sheds alongside for the revivification of the oxide of iron.

The gas is registered by a station meter capable of passing 100,000 cubic feet per hour, situated in the same building as the 24-inch and 10-inch governors and the compressing plant for forcing the gas through the 24-inch main to Genoa.

The gasholder is a four-lift one, of 150 feet diameter, and 30 feet deep, and is accommodated in a steel tank. The capacity of the holder is 2,120,000 cubic feet.

The motive power throughout the works, except for driving the exhausters, is electricity. The plant for providing the electric current is in duplicate. There are three boilers of 250-horse power. Two continuous current dynamos, each of 40 kilowatts, driven by two compound vertical engines of 65-horse power. An accumulator is provided sufficient for working the retort-house motors during the night, and so avoiding the necessity of running the electrical plant.

MISCELLANEOUS FEATURES.

Among miscellaneous features, it may be mentioned that there is a large covered space for the coal, with a line of rails and Decauville waggons for taking coal to the hoppers. A separate building has been provided for the workmen. It contains washing rooms, bath, dining-room, and other accommodation. At the entrance to the works is a range of buildings with offices and stores on the ground floor, and residence for the Manager on the first floor. The works are lighted throughout with high-pressure gas on the Selas system.

THE CONTRACTORS.

The retort-house and the retort-settings were erected by the Stettiner Company, of Stettin. The exhausters were supplied by the Bryan Donkin Company, Limited; the condensers, the tar-extractor, and the washers, by MM. Siry, Chamon, and Co.; and the purifiers and sheds, by Messrs. C. & W. Walker. The station meter and governors were made by Messrs. Parkinson and W. & B. Cowan, Limited; and the gasholder by Messrs. Samuel Cutler and Sons. The boilers were supplied by the Stirling Boiler Company; and the electrical plant by the A.E.G. Thomson-Houston Company. The buildings were erected by Sig. Garbarino and Sig. Musante, of Genoa. The whole of the contractors for the plant did their work in the excellent manner for which they have made their reputations.

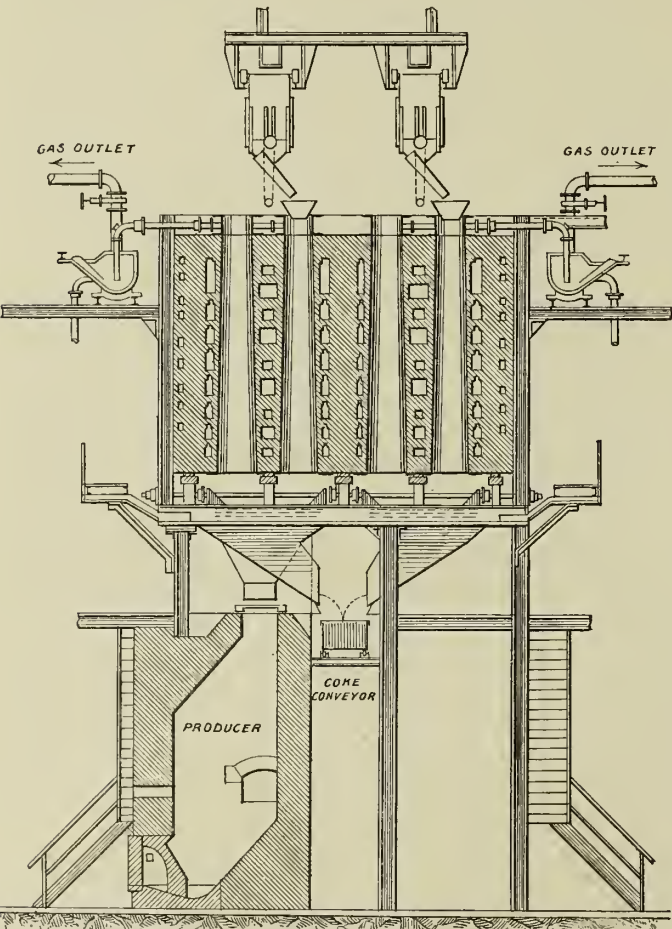
Institution of Civil Engineers.—At the election last Tuesday of President and Council of the Institution of Civil Engineers for the ensuing session, Mr. H. E. Jones was elected a member of the Council. We are pleased to make this announcement, as the representation of the gas industry upon the governing body of the Institution, which ceased on the death of Sir George Livesey, will now be continued.

Southern District Association of Gas Engineers and Managers.—We learn from the Hon. Secretary (Mr. A. F. Browne, of Vauxhall) that the spring meeting of the Association will be held at Redhill on Thursday, the 13th inst. The members will leave Charing Cross Station by the 10.50 a.m. train, and on arriving at Redhill will assemble at the gas-works, where a business meeting will be held for the confirmation of the provisional vote of the members at the annual meeting in March to contribute 40 guineas to the Livesey Memorial Fund. At the close of the business, the works will be inspected under the guidance of the President, Mr. James Paterson, the Engineer and General Manager of the Redhill Gas Company. The members will subsequently partake of luncheon at the Market Hall, on the invitation of the Chairman and Directors of the Company. In the afternoon, there will be a drive to Box Hill, and "high tea" will be served at the Burford Bridge Hotel. The return will be from Box Hill Station.

RESULTS WITH VERTICAL RETORTS AT TRIESTE

In a recent number of our Italian contemporary, "Il Gaz," we see that (under the date of December, 1908) there is an interesting contribution, with tabulated figures and diagrams, from Sig. Ing. E. Sospisio, the Engineer and Manager of the Municipal gas-works at Trieste (Austria). The article records the results of some experiments on a new bench of twenty vertical retorts at the gas-works; and from it the following translated particulars and information have been taken.

Since 1906, the question of what kind of retort-settings should be adopted at the large new works that were proposed to be built, had been considered by those in charge of the Communal gas undertaking at Trieste. When the matter was first studied, the experimental results with the Dessau and Mariendorf vertical retorts using German coal were known; but little information was possessed as to results with these retorts when English coal was exclusively used in them. It was of the greatest importance to know: (1) The way English coal would behave in vertical retorts; and (2) if continuous carbonization of coal was practicable upon a large scale. In order to ascertain the facts on these points, and before launching out on expensive experiments, investigations were begun on one vertical retort only, provided with specially designed charging and discharging machinery. The results obtained from this experimental plant led to the conclusion that "English coal was quite suitable for carbonization in vertical retorts, but in the present state of technical knowledge it was not advisable to put up a large plant of vertical retorts with continuous machinery for charging and discharging."



The Bolz Arrangement of Vertical Retorts.

This much having been ascertained, it was then decided to erect a complete bed of vertical retorts to determine exactly what the results would be with English coal. While the investigations were going on with the Dessau type of vertical retort, Herr Christian Bolz, the Manager of the Buda-Pesth Gas-Works, conceived a new arrangement for such retorts, which offered the following advantages: (1) Double make of gas per bed; (2) possibility of feeding the producer with hot coke; (3) producer independent of the setting; (4) accessibility of regenerators in any part; (5) possibility of having only one conveyor for a double make of gas; (6) saving in first cost of bed and building; and (7) saving in labour.

The advantages promised by the Bolz arrangement led to the construction of one such bed, so as to test it in all its details; and the work was given to the Stettiner Chamotte Fabrik. The design of the bed is shown in the accompanying illustration. The bed was first put into fire on March 30, 1908, but was let out on May 11 following to make a small modification to the producer. It was lighted up again on June 10, 1908, and up to the end of the year—247 days—it had perfectly carbonized 4,693,900

kilos (say, 4694 metric tons) of English gas coal of different qualities, using 852,400 kilos (or 852.4 metric tons) of coke for fuel, which corresponds to 17.95 kilos of coke per 100 kilos of coal carbonized, including scurfing of retorts, closing down, fuel in clinker, &c.

The arrangement of the plant not allowing of the make of gas, yield per ton, calorific and illuminating power of the gas to be taken separately from the other retorts, the following tests were carried out so as to arrive at results approximating to those under normal conditions of working.

TEST No. 1.

This test had for its object the ascertaining of the make of gas, its calorific power, lighting power, and density, charging the retorts at the same time, and with twelve-hour charges, with English coal of Pelaw Main quality of the following composition: Water, 0.9 per cent.; ash, 10.8 per cent.; volatile matter, 30.1 per cent.; carbon, 58.2 per cent. The results of the test were as follows:—

	Actual.	Standardized.*
Coal carbonized	10,640 kilos	—
Gas made	3,444 cubic metres	3161 cub. metres
Gas made per ton	323 cubic metres (or 11,590 c. ft.)	297 cub. metres (or 10,657 c. ft.)
Calorific power {	max., 5,745 calories	6386 calories
aver., 5,081 "		5308 "
min., 3,549 "		3945 "
Illuminating power {	max., 15.5 Hefner candles	17.2 Hefner candles
aver., 9.9 "		11.3 "
Density of the gas {	max., 0.426	
made (air=1)	aver., 0.376	
min., 0.284		

* Reduced to 0°C. and 760 mm.

The temperatures in the different parts of the bed, measured with the Wanner pyrometer, were as follows:—

	Degrees Centigrade.
At the bottom	1298 — 1240
" " middle	1160 — 1141
" " top	915 — 902
In the flue going to chimney	550

TEST No. 2.

The object of this test was to find out the make and quality of gas produced from Pelaw Main coal in twelve-hour charges, but in the last hour-and-a-half injecting steam into the lower part of the retort, so as to make water gas.

	Actual.	Standardized.
Coal carbonized	10,560 kilos	—
Gas made	3,821 cubic metres	3524 cubic metres
Gas made per ton	361 c.m. (12,954 c. ft.)	333 c.m. (11,949 c. ft.)
Calorific power {	max., 6,026 calories	6752 calories
aver., 4,673 "		5207 "
min., 2,906 "		5256 "
Illuminating power {	max., 19.2 Hefner candles	21.5 Hefner candles
aver., 9.3 "		10.6 "
Density	max., 0.466	
aver., 0.369		
min., 0.302		

Comparing the second with the first test, it will be seen that the water gas produced per ton of coal carbonized was 333 cubic metres less 297 cubic metres = 36 cubic metres, equal to 10.9 per cent. of the gas made.

TEST No. 3.

The third experiment was carried out with the bed in ordinary working with twelve-hour charges made alternately, with Pelaw Main coal, without the introduction of steam. This test and the succeeding ones were made under real normal conditions of working, while the first two had the special object of arriving at the make and the quality of the gas during a period of carbonization. In this third test was also taken, in consecutive hours, the pressure in the retort. This pressure varied from a maximum of 190 millimetres (about 75.10ths) shortly after the charge, to a minimum of 5 millimetres (2.10ths) at the end of the distillation.

The results of the third test were:—

	Actual.	Standardized.
Coal carbonized	21,200 kilos.	—
Gas made	6,877 cubic metres	6385 cubic metres
Gas made per ton	324.4 c. m. (11,640 c. ft.)	301.2 c. m. (10,808 c. ft.)
Calorific power	4,984 calories	5540 calories
Illuminating power . . .	10.1 Hefner candles	11.2 Hefner candles
Density	0.381	
Coke made per ton of coal carbonized—		
Large	693 kilos.	} With water.
Medium	43 "	
Dust	20 "	
	756 kilos	653 kilos (dry 100°C.)
Fuel per ton of coal . .	—	134.0 "
Fuel per 100 cubic metres of gas (actual)	—	41.3 "

The gas produced was of the following composition:—

	Per Cent.
Carbonic acid (CO ₂)	1.0
Heavy hydrocarbons (C _n H _n)	2.2
Oxygen (O)	0.5
Carbonic oxide (CO)	5.3
Hydrogen (H)	60.8
Methane (CH ₄)	25.5
Nitrogen (N)	4.7
	100.0

The composition of the producer gas included: CO₂, 7·4 per cent.; CO, 23·8 per cent. The analysis of the products of combustion gave: CO₂, 17·7 per cent.; CO, 0·8 per cent. The coke consisted of: Water, 7 per cent.; combustible matter, 77·9 per cent.; ash, 15·1 per cent.

TEST No. 4.

This was carried out under the same conditions as No. 3, but in the last hour-and-a-half of carbonization steam was introduced into the bottom of the retort. The results were:

	Actual.	Standardized.
Coal carbonized . .	21,200 kilos	.. —
Gas made	7,560 cubic metres	.. 7047 cubic metres
Gas made per ton . .	356·5 c. m. (12,792 c. ft.)	.. 332·4 c. m. (11,928 c. ft.)
Calorific power . .	4725 calories	.. 5862 calories
Illuminating power .	7·1 Hefner candles	.. 7·9 Hefner candles
Density	0·401	..
Coke made per ton of coal carbonized—		
Large	635 kilos	} With water.
Medium	49 "	
Dust	52 "	
	736 kilos	.. 660 kilos (dry 100° C.)
Fuel per ton of coal carbonized	—	.. 131 "
Fuel per 100 cubic metres of gas (actual)	—	.. 36·7 "

The gas made was of the following composition:—

	Per Cent.
Carbonic acid (CO ₂)	1·8
Heavy hydrocarbons (C _n H _n)	4·6
Oxygen (O)	0·0
Carbonic oxide (CO)	9·2
Hydrogen (H)	58·7
Methane (CH ₄)	21·1
Nitrogen (N)	4·6
	100·0

TEST No. 5.

Test No. 5 was made with New Pelton Main coal of the following characteristics: Water, 0·8 per cent.; ash, 8·1 per cent.; volatile matter, 34·6 per cent.; carbon, 56·5 per cent. There was no introduction of steam. The results were:—

	Actual.	Standardized.
Coal carbonized . .	20,400 kilos	.. —
Gas made	6,767 cubic metres	.. 6348 cubic metres
Gas made per ton . .	331·4 c. m. (11,892 c. ft.)	.. 311·2 c. m. (11,167 c. ft.)
Calorific power . .	4,797 calories	.. 5278 calories
Illuminating power .	8·8 Hefner candles	.. 9·7 Hefner candles
Coke made per ton of coal carbonized—		
Large	638 kilos	} Dried in air.
Medium	51 "	
Dust	14 "	
	703 kilos	

The maximum pressure in the lower part of the retorts directly after the charge was 240 millimetres (95·10ths).

TEST No. 6.

This was the same as the preceding one, but in the last hour-and-a-half steam was admitted into the bottom of the retort. The figures were as follows:—

	Actual.	Standardized.
Coal carbonized . .	20,000 kilos	.. —
Gas made	7,998 cubic metres	.. 7453 cubic metres
Gas made per ton . .	399·9 c. m. (14,353 c. ft.)	.. 372·6 c. m. (13,370 c. ft.)
Calorific power . .	4,529 calories	.. 5036 calories
Illuminating power .	6·0 Hefner candles	.. 6·6 Hefner candles
Coke made per ton of coal carbonized—		
Large	619 kilos	} Dried in air.
Medium	46 "	
Dust	28 "	
	693 kilos	

The maximum pressure in the lower part of the retort immediately after the charge was 190 millimetres (75·10ths).

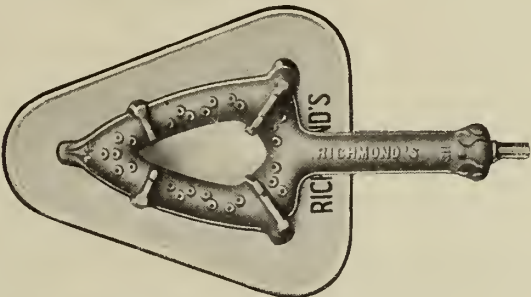
CONCLUSIONS.

- 1.—From the working of this bed of vertical retorts, and from the foregoing experiments, it can be said that English coal lends itself very well to carbonization, not alone in these retorts, but also from previous experiments by Dr. Bunte on the same bed with Moravian coal; and the result is that English coal is particularly suitable for carbonization in vertical retorts.
- 2.—The coke made from English coal is of the best quality, bright, metallic, of large size, and better than that made from Moravian coal, and well adapted to domestic uses.
- 3.—In the present state of technical information, this type of retort-bed can with every confidence be adopted by gas-works, and will lead to considerable economies in costs of installation and working.
- 4.—It is to be ascertained from new experiments and further investigations if there really is any advantage in directly producing water gas in vertical retorts at the end of the coal carbonization, because, observing the results of Tests Nos. 4 and 6, and comparing them with Tests Nos. 3 and 5, there is to be noted a reduction in the illuminating power of the gas which is not proportionate to the amount of water gas produced—a reduction the cause of which is not yet known, and which was also noticed in the auto-carburetting of the water gas. It is further to be ascertained if the eventually larger amount of fuel required for the heating of

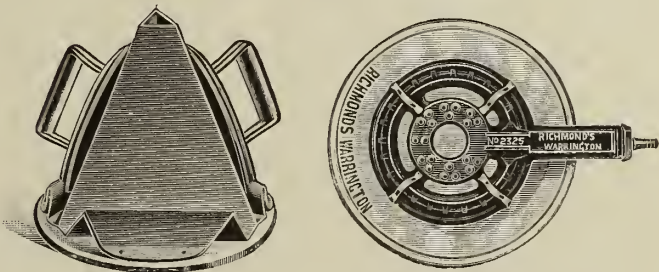
- the bed and the greater wear and tear of the retorts are not such as to render it advisable to make the water gas in apparatus specially designed rather than produce it in the retort itself.
- 5.—Mechanical means for the carrying away of the coke made are indispensable for the working of vertical retorts.
 - 6.—Such conveyors do not break the coke, as it is harder than that made from horizontal or inclined retorts.
 - 7.—With vertical retorts, it is not essential to use perfectly dry coal, and therefore a saving can be made in the roofing to cover the coal-stores.
 - 8.—With vertical retorts, a considerable increase in the yield of gas can be counted upon, although it is of lower illuminating power than that obtained from ordinary or inclined retorts.

ACCESSORIES FOR PROMOTING CONSUMPTION.

THERE are no gas-supplying districts, and it may be said there are no households, in which finality has been reached in the possible applications of gas, other than for illumination. We have the gas-cooker and the gas-fire in great variety; and it may be taken that the managements of every gas undertaking, according to the plans that seem to them good, are doing their utmost to expand their uses. But in every household, in connection with the practice of several professions, and in many shops, there are small requirements for heating, to meet which gas (by the design of suitable and simple appliances) can be applied. It is a matter of interest and profit to ferret out these requirements, and for the makers of gas appliances to design the necessary means for satisfying them. Such appliances must be simple, conveniently applied, cheap, and, though cheap, not unattractive. We believe that the more slightly such appliances are made, without being unduly ornate, the more attractive they are, and certainly the greater the inducement to users to keep them clean. It is in cultivating the use of little conveniences in which gas is the fuel that there is a large amount of profitable work to be done. The small consumptions going on here and there throughout the day are not to be despised. The aggregate of small things sometimes makes up something large. The truth of the remark is seen on every side. But it does not appear from general observation that all that could be done is done to propagate such small uses. Consumers have continually brought to notice the gas cooker and the gas-fire. The users of these are in some districts numbered by their thousands; but rare indeed is it that consumers are confronted, with directness necessary to arrest attention, with what may be termed the consumption promoting accessories.



Iron Heater on Enamelled Base Plate.



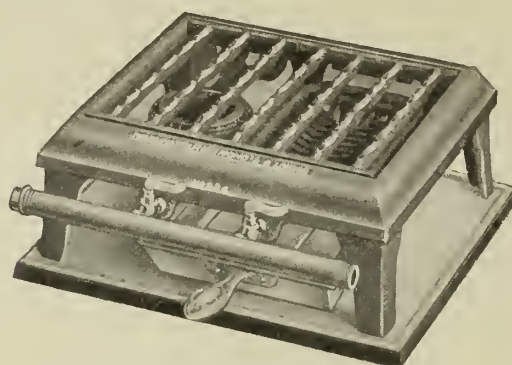
Pyramid Iron Heater.

Boiling Burner on Enamelled Base Plate.

The point is brought home, and these thoughts cross the mind, on inspecting, in the show-rooms of the Richmond Gas Stove and Meter Company, Limited, certain small, inexpensive, and attractive novelties that have been produced for the purpose of encouraging this small class of business, through which novelties convenience (with a saving of labour) may be given to the consumer, and the gas account be increased. Among them there are new ordinary household flat-iron heating stands, boiling-burners, grillers, and water-heaters, all neat and effective in design, and seductive from the point of view of efficiency. Take first the flat-iron heating stands, they are shaped after the form of a flat-iron, with four raised supports to keep the iron well above the points of combustion all round the tubular body. These stands are fixed to sheet steel metal trays, with slightly raised rims, and enamelled white. There is a clean appearance about them that is suggestive of the cleanliness and of the delicate work that has to be performed on ironing-day in many households, now

that mechanical operation in the laundries, through destruction of linen and other household fabrics, vexes the heart of the careful housewife. The stands fixed to the white tray can be had finished in a variety of tints in porcellanite enamel or in black. The white trays are in themselves a distinctive feature. There are several articles fixed to similar bases. The trays are an extension of the now familiar white enamelled cooker crown-plate, which the Richmond Company claim to have originated some years since. The use of such plates has been carried to the simple, unobtrusive boiling-ring, and the serviceable hob hot-plate; and there is no question they are an aid to cleanliness. The welcome that has been given to the innovation proves its wisdom. A bright, clean exterior, when combined with usefulness, appeals to the consumer; and the slight extra price is not begrudged. There is no doubt, too, that these things will help to brighten the gas show-room window, which is always, owing to the deadly dull black of most gas appliances, improved by introducing colour.

But to return to the articles themselves, the flat-iron heating-stands are, as has been said, cheap; and they look practically everlasting. They can, of course, be used equally well for boiling purposes. Here is another little convenience. It is a pyramid stand arranged for three flat irons; and it is made to simply stand over one of the boiling-rings on the top of the cooker. It is an economical convenience, when more than one iron is required at a time, or irons are rapidly needed in succession, to be able to heat three ordinary irons over one boiling-ring. These, too, are quite inexpensive, and must appeal for their serviceability. Then there are the boiler-rings, fixed to the white enamelled plate as a base. There are also little hot-plates, with boiler burner and griller, all the parts being removable for cleaning, and with white enamelled plate below. These goods are all made in steel, enamelled; one example seen being finished in style giving the appearance of aluminium, and the other in black. The former has a very clean-looking appearance.



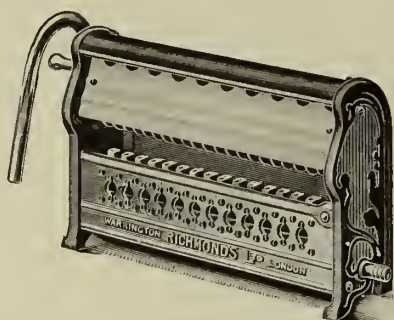
Hot-Plate on Enamelled Base Plate.

We cannot describe all that is to be seen in the way of small conveniences for domestic use, but will turn to the water-heaters for various purposes. There is no doubt that the conveniences of water heating by gas offer an excellent field for exploitation. A small heater is the "Avon." Many of the firm's water heaters are appropriately named after rivers. This one, standing on an enamelled shelf, makes a very presentable fitting. The heater is on the principle of metal gills, which conduct the heat of the gas to the water in a copper coil. It is a very compact arrangement, and can be fixed anywhere. It has particular applicability for lavatory basins, for surgeries, dispensing-rooms, chemists, dentists, hairdressers, and so forth. It is, a test shows, a remarkably quick heater; and it gives absolutely no trouble. It is made in two sizes—15 inches and 18 inches wide; and in both cases $7\frac{3}{4}$ inches high by $3\frac{1}{2}$ inches deep. The small size will supply 2 pints of water per minute at 116° ; 3 pints at 99° ; and 4 pints at 88° . The larger sizes, at the respective temperatures, $3\frac{1}{2}$, 5, and 7 pints.

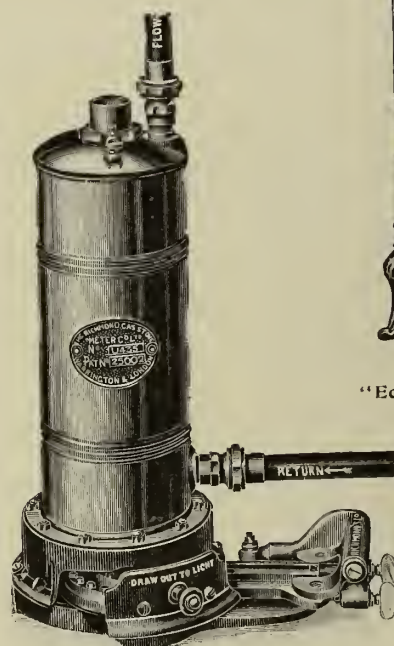
The "Humber" water-heater is another attractive and well-made article. Being on the convenient hot-water circulating system, it can be readily fixed to either supersede or supplement the coal range boiler, without incurring the cost of new piping, and is also suitable for greenhouses, conservatories, restaurants, and lavatory basins. In one size only, this heater was on the market last season. This year a larger size has been added, fitted with gas and air adjusters. The heater is constructed throughout of heavy gauge tinned copper, and is fitted with flange joints top and bottom. By the simple operation of unscrewing a few nuts, the interior can be taken out, cleaned, and replaced within a few minutes. A perfectly water-tight joint is obtained both top and bottom by screwing up the bolts and nuts again. There are two taps controlling the outer and inner rings of the burner. With the gas full on, a 25-gallon cylinder can be raised to a temperature of 100° Fahr., starting from cold. With only the smaller ring alight, consuming about 10 feet of gas per hour, any quantity of hot water required may be on tap in any part of the house at any time. For greenhouses and conservatories, it will heat from 50 to 80 feet of 3-inch cast-iron pipe, or 80 to 120 feet of 2-inch wrought-iron pipe, according to the size of the heater.

Another water-heater differing in duty is the "Economic." It is particularly for the wash-house, and takes the place of the ordinary coal copper. Being on legs, it is a convenient height for easy lighting and general use; and another advantage is that it

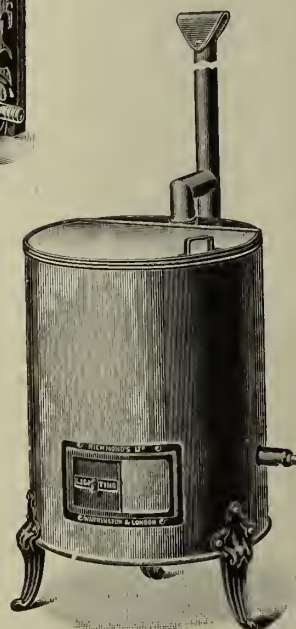
takes up half the room of the old-fashioned copper. It has a galvanized body and lid, tinned copper pan, and flue-outlets for steam and waste gases. It can also be had in a somewhat cheaper form, with a rustless cast-iron pan. The capacity is 10 gallons. For new property, a copper like this saves money for the builders; and the gas suppliers are benefited. The distribution department officials of gas-works should look out for new property, and try to secure the introduction of such conveniences. By them, saving of time and labour is secured; and they are popular where there has been experience. The "Economic" is simple in construction, and repair is quite an easy matter.



"Avon" Water-Heater.



"Humber" Water-Heater.



"Economic" Wash-House Boiler.

This article is not intended to deal with the larger productions of the firm in the way of cookers—ordinary and slot. But it may just be mentioned that the samples on view in the show-rooms exhibit the firm's usual care in the matter of detail; and it is noticed that minor improvements—minor yet of importance in themselves—have been introduced. Besides efficiency in relation to gas consumption, other advantages in the cookers are the interchangeable and removable (without screws) hot-plate burners and oven burners, and the burner carrier and gas bar. The linings are enamelled by Richmond's patent process; and this ensures an enamel absolutely non-porous, smooth as glass, easily cleaned, and of a permanent character.

"Transactions" of the American Gas Institute.—We have received the "Transactions" of the American Gas Institute for last year. It contains the report of the proceedings at the third annual meeting, held in New York from the 21st to the 23rd of October, under the presidency of Dr. A. C. Humphreys, Principal of the Stevens Institute of Technology. In addition to the President's Address and the papers, some of which have been given in the "JOURNAL," there are a number of reports by Special Committees; among the subjects dealt with being screw-threads and pipe standards, calorimetry, a unit of light, and the definition of heating value. An appendix to the report of the Trustees of the Gas Educational Fund contains the answers to several series of questions in the practical class, occupying 190 out of the 1056 pages in the book. Other features are the "Wrinkles" and the "Question-Box." Reference to the subjects dealt with in these three sections is facilitated by an index in each case. The rest of the matter consists of the accounts, &c. A portrait of Dr. Humphreys forms a frontispiece to the volume, which contains numerous illustrations and several plates. The book is published by the Institute, under editorship by the Publication Committee.

CLEANING GAS-COOKERS, SERVICE-PIPES, GAS-FITTINGS, &c., BY SAND BLAST.

A Novel Introduction.

GAS engineers are ever alive to new ideas that promise to promote economy and efficiency in the divers operations appertaining to the production and utilization of coal gas. A new idea is before us to-day; and, what is more, its practicability has been successfully demonstrated in the shops of the distribution department of the Tottenham and Edmonton Gas Company, through the enterprise of the Engineer and General Manager (Mr. A. E. Broadberry, Assoc.M.Inst.C.E.). Those who know the condition in which gas cookers, grillers, rings, &c., are frequently returned from hire, and the dirty work involved in overhauling and cleaning, must welcome anything that aspires to minimize both cost and labour in carrying out the renovating operations. In the old processes of baking the stoves, for which special ovens have to be erected, or of pickling, the subsequent scraping and wire-brush cleaning to remove the coating of oxide formed ready for re-coating before being re-fitted, is a most tedious operation, and cannot be by any means claimed to be healthy work. To accomplish this by a cheaper and healthier method are the objects Mr. Broadberry has had in installing a sand-blast plant, consisting of an air-compressor, an air-receiver, sand-blast apparatus, turntable, and an exhauster—the whole of the machinery being driven by a 9-H.P. gas-engine. We are pleased to learn that it is giving good results.

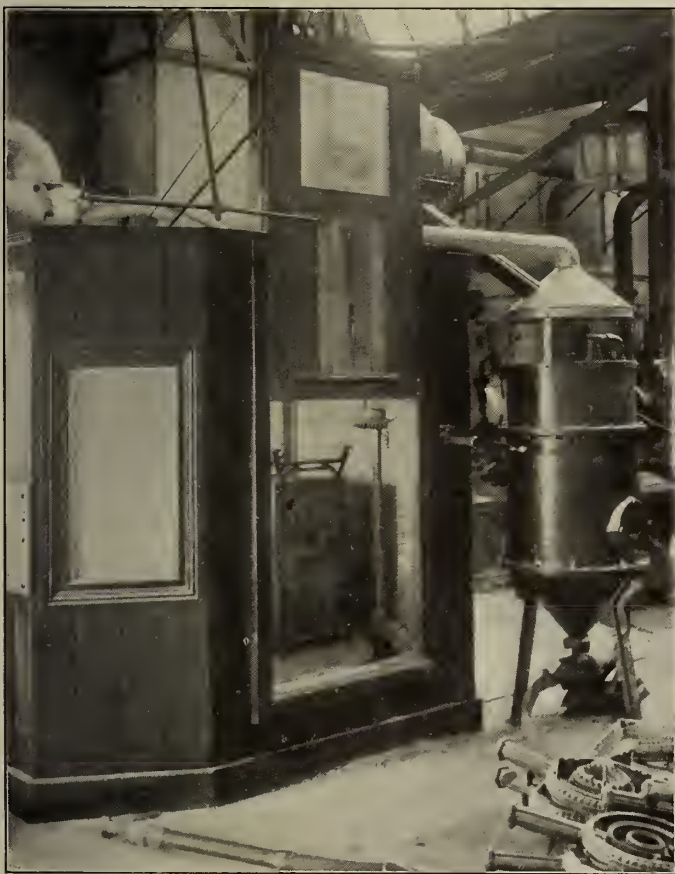


Fig. 1.—The Cleansing Chamber, with its Sliding Door Raised.

The operations are briefly described as follows: Air is compressed to 1 atmosphere (15 lbs.) into a receiver, and is then conveyed into the two-pressure apparatus, which produces the sand-blast by the intimate mixing of quartz sand and compressed air. To the bottom of this apparatus is fitted a length of special india-rubber hose, at the other end of which is fastened a nozzle, which the operator directs on to the part to be cleaned—regulating the blast as necessary. A small chamber made of matchboard and zinc, or tin-lined, encloses a turntable, whereon the cooker is placed; and, when sufficiently cleaned on one side, the operator, by the aid of a winch, turns another side to view, and continues the blast until the cleansing is perfect, and the cooker is then quite ready for varnishing. The cleaning sand or other material used, drops through the grids of the turntable into a trough below; and by a spiral conveyor is passed along, and returned by a bucket elevator for use again into the two-pressure apparatus. Any dust created which does not gravitate into a sand-settling box fitted with baffles, is either exhausted into the atmosphere outside the workshop, or into any convenient shaft. Should it be absolutely necessary to abolish the dust entirely, the air and dust can be filtered. With reference to this latter process, we must compliment the Engineer upon his innovation in dealing with the dust question by means of a "Cyclone" separator, fitted



Fig. 2.—The Sliding Door Lowered.

with a water-spray, which reduces the dust to mud, and deposits it in a tank underneath.

The illustrations reproduced here are reproductions of photographs of the plant at Tottenham. Fig. 1 shows the sliding-door of the cleaning chamber raised; and a cooker on the turntable in position for cleaning. In fig. 2, the sliding-door is lowered; and the workman is ready to start cleaning. Readers will observe that the nozzle is passed through a slit in a rubber curtain; and the man can see his work through a window in front of him. Fig. 3 is a back view of the plant, showing the two-pressure apparatus, the elevator casing, with sandslide, the "Cyclone" separator on the right, and the exhauster in the background.

It is worthy of note that it is possible to utilize the sand-blast

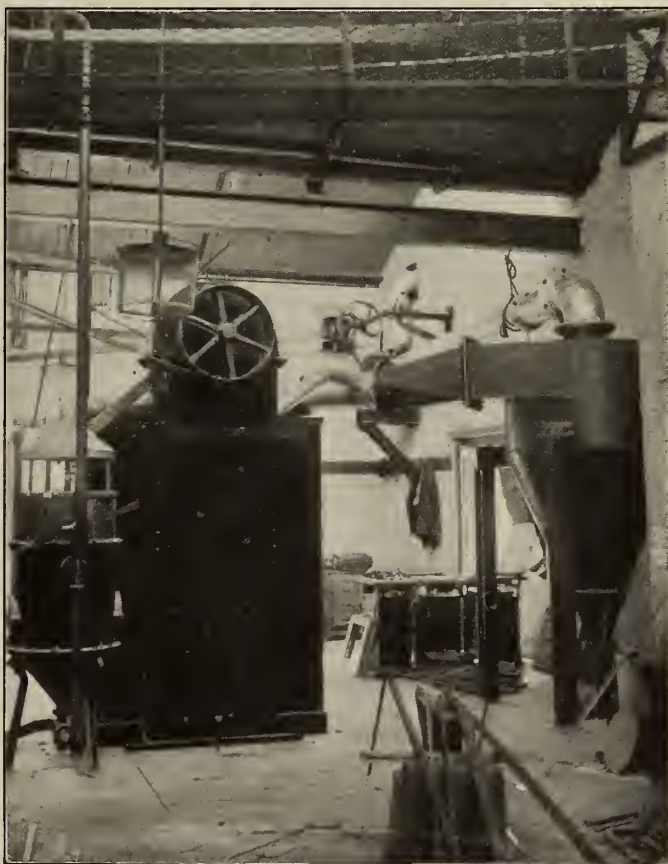


Fig. 3.—Back View of the Plant.

plant for a variety of purposes in a gas-works. For instance, by subjecting lengths of excavated service-pipe to the blast, any fault is readily exposed. Brass fittings, nuts, bolts, flanges, &c., which were formerly scrapped, can be cleaned with rapidity, without damaging the threads, and be put into use again.

The work of cleaning and renovating cookers is growing considerably; and reduction of labour involved for any given number of cookers is a matter of importance. The output of the machine, after the one man had only had a fortnight's training, was twelve complete cookers a day. Formerly the work was carried out by two men and four boys, who never reached this total; and most probably only did ten cookers. The action of the sand-blast is remarkable, as every crevice is reached; and the inner parts of the rings, which were so difficult to clean by the old method, are thoroughly treated. In fact, the stoves in many instances seem almost fit after the sand-blast treatment to be sent out without further varnishing.

The London Emery Works Company, of Park, Tottenham, who manufacture and erect these plants, have other installations, capable of dealing with six or twelve cooker bodies per hour, worked by two or four men simultaneously. The success at Tottenham has induced them to pay special attention to this new branch of their business; and there is no doubt much more will be heard of the use of the process in gas-works in future.

WATER-HEATING BY GAS AND ELECTRICITY.

A Comparison of Cost.

IN the "Correspondence" columns of the "JOURNAL" for the 20th ult. (p. 166), we published some interesting comparisons supplied by Mr. Cyril Davis, Managing-Director of the Davis Gas-Stove Company, Limited, regarding the comparative heating values of gas and electricity for cooking purposes. At the end of the letter, Mr. Davis remarked that investigations had been carried on with regard to the use of the two agents for water-heating purposes; but as his letter had already extended to some length, he refrained from including them in his communication. The subject, however, is one of such general interest, that we asked the Company to furnish the data derived from their further investigation; and they have complied with the request. The following is their communication.

As stated in our letter, we can get 23,162 B.Th.U. from one pennyworth of London gas at 2s. 3d. per 1000 cubic feet; whereas with electric current at 1d. per unit we only get 3437 B.Th.U. available. In the test given below, the relative prices of the gas used and assumed for electricity are 2s. 1d. and 1d. respectively—i.e., the local rates at Luton.

First Test.—High-Grade Geyser.

Heat absorbed per hour	34,440 B.Th.U.
" " per cubic foot of gas used	546 "
Cost per 10,000 B.Th.U. absorbed,	0.458d.

Second Test.—Gas-Heated "New Davis" Circulator.

Heat absorbed per hour	17,000 B.Th.U.
" " per cubic foot of gas used	500 "
Cost per 10,000 B.Th.U. absorbed,	0.5d.

Third Test.—Ordinary Boiling-Ring.

Heat absorbed per hour	2623 B.Th.U.
" " per cubic foot of gas used	305 "
Cost per 10,000 B.Th.U. absorbed,	0.82d.

To avoid any possibility of being criticized as to the method employed in converting the electric current into heat, we compare the above practical test with electricity at an efficiency of 100 per cent., at which figure we get the cost of 10,000 B.Th.U. as being 2.9d., and thus get the following comparisons:—

10,000 B.Th.U. absorbed by electric-stove costs	2.9d.	=	633
" " " " gas-geyser	0.458d.	=	100
" " " " gas-circulator	0.5d.	=	109
" " " " gas-ring	0.82d.	=	179

These figures are obtained with electricity giving 100 per cent. efficiency and at the unusual price of 1d. per unit and 2s. 1d. per 1000 cubic feet for gas. These should be more like an average of 2½d. and 3s., when we get:—

10,000 B.Th.U. absorbed by electric-stove costs	7.25d.	=	1320
" " " " gas-geyser	0.549d.	=	100
" " " " gas-circulator	0.6d.	=	109
" " " " gas-ring	0.964d.	=	179

From these figures it will be seen that, with current at 2½d. per unit and 100 per cent. efficiency, against the results of an actual test with gas at 3s. per 1000 cubic feet in an ordinary geyser, the relative costs are:—

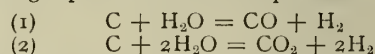
Gas	1d.	Electricity	1s. 1.2d.
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THE ADVANTAGES OF STEAMING IN VERTICAL RETORTS.

Dr. R. Geipert, one of the Assistant Engineers at the Mariendorf (Berlin) works of the Imperial Continental Gas Association, has contributed to the "Journal für Gasbeleuchtung" of April 24 an article on the advantages of admitting steam into vertical retorts. It will be remembered that Dr. Geipert was, jointly with his Chief, Mr. E. Körting, responsible for a paper on the same subject which was published in the "JOURNAL" for Nov. 10, 1908 (p. 404). In the same number of the "JOURNAL" (p. 400) some criticisms were offered on the arguments advanced by Mr. Körting and Dr. Geipert in favour of the addition of steam; and somewhat similar criticisms have since been made by Herr Terhaerst and Dr. Trautwein, of the Nuremberg Gas-Works (see "JOURNAL" for March 30, p. 903). The latter criticisms are now referred to by Dr. Geipert. From the theoretical standpoint, the question of the economy of the admission of steam into vertical retorts has also been discussed by Dr. Strache, of Vienna, with reference to results reported by Mr. Körting and Dr. Geipert (see "JOURNAL" for Jan. 12, p. 95). The following is a summary of Dr. Geipert's article.

The crucial point on which a decision must be arrived at as to the economy of admitting steam into vertical retorts is the amount of fuel consumed in the retort-furnaces. It is useful to consider also *a priori* from the theoretical standpoint the conditions in which water-gas manufacture must be conducted in retorts if it is to prove economical. It may be advantageous or not, according to the conditions of working. The aim must be to economize furnace fuel as far as possible. In the following discussion of the question, it will be assumed in the first place that the heat imparted to the setting in unit time is constant. This condition can practically readily be fulfilled, as the draught of the setting always remains the same while the secondary-air damper is not moved, and the proper proportion of producer gas to secondary air is obtained solely by regulation of the primary-air damper. If in these conditions it is desired to make water gas, the time during which the charge remains in the retort must be prolonged and steam introduced for the extra time. The greatest duty is secured when a large quantity of water gas is made in a short time. It may, however, be questionable whether sufficient extraneous heat enters the retort to correspond with the quantity of steam introduced. When this is not the case, the hot coke presents a useful reservoir of heat, to the value of which attention was directed in the former article. The heat withdrawn and supplied may be checked by calculation.

The following statement shows the heat the hot furnace gases supply for water-gas production. The equations concerned are:



According to equation (1) the heat expended on the production of 1000 cubic feet of water gas is 101,124 B.Th.U., and according to equation (2), 73,483 B.Th.U. Consequently, water gas containing 6 per cent. of carbonic acid requires for its production 96,180 B.Th.U. per 1000 cubic feet. In the former article it was calculated that at least 42.4 per cent. of the heat introduced into the setting goes towards the carbonization of the coal. This proportion, when the consumption of fuel in the furnaces amounts to 14 per cent. of the weight of coal carbonized and the fuel (coke) has a calorific value of 12,600 B.Th.U. per pound, corresponds to 1,675,377 B.Th.U. per ton of coal carbonized. The time of carbonization is ten hours; so that the heat taken for carbonization is at the rate of 167,537 B.Th.U. per hour, which should suffice to produce 1700 cubic feet of water gas per hour. Taking the heat utilized for carbonization at 42.4 per cent. and the calorific value of the coke as stated, it follows that 18 lbs. of coke consumed in the retort-furnaces corresponds to the production of 1000 cubic feet of water gas. The heat withdrawn from the hot coke resulting from a ton of coal, if the coke is cooled to (say) 200° C, amounts to 252,887 B.Th.U., assuming that the mean specific heat of carbon is 0.448 (Kunz). This amount of heat will afford 2630 cubic feet of water gas without any further expenditure on furnace fuel.

It is assumed in this argument that the 167,537 B.Th.U., which represents the average consumption of heat per hour of the retorts during the carbonization, without the admission of steam, of one ton of coal, will also reach the retorts during the extended period in which steam is admitted. This, however cannot be forthwith assumed, as every transference of heat depends on a fall of temperature; and this is not uniform from time to time in the gasification of coal. At the beginning of carbonization, the cold coal cools the inner walls of the retorts, and so brings about a great fall of temperature; whereas towards the end of the carbonization the incandescent block of coke has a temperature not far below that of the furnace gases. When steam is admitted, the block of coke is again cooled, and, consequently, there is again a fall of temperature. Thus the primary effect of the admission of steam is a cooling of the coke, and a secondary consequence is the taking up of extraneous heat. Thus, in fact, the production of water gas

will be distributed between the two sources of heat. For instance, in the conditions of heating assumed, there should be a make of water gas of 4342 cubic feet per hour per ton of coal carbonized, or about 40 per cent. of the make of coal gas.

If, however, the quantity of heat transmitted to the retort in the extra time during which steam is admitted does not correspond with the average transmitted before steam is admitted, it can obviously only be less than the latter, because the average fall of temperature from the furnace gases to the block of coke must be as high (if not higher) when steam is not admitted as when it is admitted. It is thus possible that less heat is taken up by the retorts while steam is admitted than when it is not. In that case, less heat needs to be imparted to the setting, and, taking the extreme case, no heat would have to be taken up by the retorts except that necessary to cover losses by radiation from the setting. These losses are constant per unit of time, provided the temperature of the setting remains the same. They may therefore be given an absolute value which, for the conditions of the normal ten-hour period of carbonization, can be taken at a maximum of 35·8 per cent. of the fuel consumed in the furnace. As this fuel consumption amounts to 14 per cent. of the weight of coal carbonized, and 5·13 tons of coal were carbonized (at the Schlieren works, at Zurich) in ten hours, the loss by radiation per hour is equivalent to the calorific value of 55·8 lbs. of coal. If the quantity of heat corresponding to this effect is introduced to the retort-setting, a loss through the sensible heat of the flue gases has to be taken into account, amounting to 21·8 per cent. of the heat applied. Thus, to make good the losses by radiation from the setting, 71·4 lbs. of coke are required as furnace fuel. In the hour there is produced by means of the sensible heat of the coke in the retort 13,032 cubic feet of water gas per setting. This sensible heat does not cost anything. So that only the loss by radiation has to be reckoned against the water gas; and therefore per 1000 cubic feet of water gas only 5·5 lbs. of coke are required. These considerations only admit of limiting values being deduced for the furnace fuel consumed during the extra time in which steam is admitted, which values are as follows per 1000 cubic feet of water gas made:—

18 lbs. of coke if the water gas is made exclusively by the expenditure of external heat.

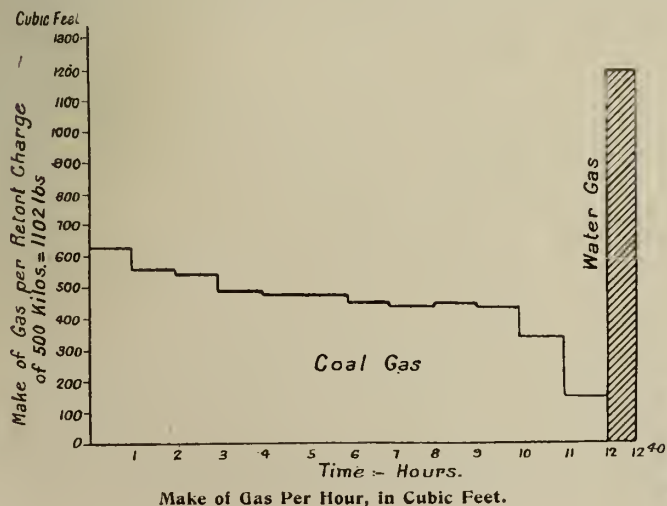
5½ lbs. of coke if the sensible heat of the hot coke in the retort suffices by itself for all the heat required.

In the conditions assumed, the figures obtainable in practice must lie between these limits, and will amount, if (for example) the above 40 per cent. of water gas is made in an hour, to 7 lbs. of coke per 1000 cubic feet of water gas. It may be remarked that the loss by radiation from the setting of 35·8 per cent. is a particularly high and therefore unfavourable figure.

So far therefore as the heat available for water-gas production is concerned, a very large make of water gas in a very short time and with small consumption of furnace fuel may be reckoned on. In water-gas production, however, it has generally to be taken into account that the conversion of the steam by incandescent carbon depends not only on the heat, but also on the rate of flow of the steam. So that a point will be reached at which the extent of decomposition of the steam by the carbon will be too small, or the quantity of steam remaining undecomposed will increase to such an extent that the excessively forced make of water gas will in consequence be carried out at a loss. One point of advantage is that the production of water gas can be started before the coal is completely carbonized; so that, without extending the time during which the charge remains in the retort, it is possible to produce water gas at a low cost. But in this case the make of water gas is naturally restricted to a comparatively small limit.

The course of gasification after the admission of steam is portrayed in the annexed figure. The curve for carbonization without the admission of steam is taken from the results obtained by Dr. Bueb at Dessau in 1906 (see "JOURNAL," Vol. XCV., p. 23), and the extension for the admission of steam is based on the make of water gas obtained at Zurich last year (see "JOURNAL"

Course of Carbonization, without and with Steaming, in Vertical Retorts.



Oct. 27, 1908, p. 256). This combination is admissible because great precision is not aimed at, but rather a portrayal of the conditions which have been described as favourable for water-gas production in the retorts, and the water gas is reckoned on the difference of 40 minutes between the times during which the charge remains in the retort. It will be seen that the make of coal gas falls off steadily, and by the twelfth hour has reached a minimum. Steam is then admitted, and the make of gas is increased so that it is greater than that of coal gas at any time. The coal gas made per hour amounts per ton of coal carbonized to, at a maximum, 1328 cubic feet; at a minimum, 323 cubic feet; and on the average, 962 cubic feet; while the water gas made in 40 minutes corresponds to a make of 2476 cubic feet per hour.

These figures indicate that water-gas production in vertical retorts is economical, as was shown by the practical trials at Mariendorf and Zurich. Taking the results of the Zurich trials, it was found that, when steam was admitted to the retorts, there was a consumption of coke in the furnaces equivalent to 15 per cent. of the weight of coal carbonized; while when steam was not admitted, the consumption was only 13·9 per cent. There was thus a difference of 1·1 per cent., to which 1579 cubic feet of water gas per ton of coal carbonized are to be ascribed. Hence the coke consumed in the retort-furnaces per 1000 cubic feet of water gas made amounts to 15·6 lbs. With this figure as a basis, the following comparison between working without and with the admission of steam is obtained, taking as the scale of working a make of 141 million cubic feet (4 million cubic metres) of water gas per year of 300 working days.

One setting produces per diem 144,020 cubic feet of mixed gas, of which 17,658 cubic feet will be water gas. Thus, in 300 working days, 5,300,000 cubic feet of water gas will be obtained per setting. In order, therefore, to produce a mixed gas containing 141 million cubic feet of water gas, 26·7 settings of vertical retorts will be required. When steam is admitted to the retorts and the charge remains in them for 12 hours 40 minutes, the quantity of mixed gas made per diem will amount to 3,845,206 cubic feet, of which 3,374,091 cubic feet will be coal gas. To produce the same quantity of coal gas in retorts when working without the admission of steam, 25 settings would be in use daily and a charge would remain in the retorts for twelve hours. To bring the quantity of gas up to 3,845,206 cubic feet, it would be necessary to add 14 per cent., or 471,115 cubic feet of water gas. Thus 1·7 settings were required for the production of water gas. If this water gas were made in an independent plant and the vertical retorts were worked without the admission of steam, the following would be the cost of production of 141 million cubic feet of water gas:

6 per cent. interest and depreciation charges on a capital outlay on plant of £4250	= £255
Cost of repairs	= 350
Wages at about 1½d. per 1000 cubic feet	= 400
Coke 40·7 lbs. per 1000 cubic feet at £1 os. 4d. per ton	= 2608
Total	£3613

If the same amount of water gas were made by admitting steam into vertical retorts, the cost would be as follows:—

6 per cent. interest and depreciation charges on a capital outlay on plant of 1·7 settings at £2000 per setting	= £200
Cost of repairs at £150 per setting	= 255
Wages for 1·7 settings	= 85
Coke consumed as retort-furnace fuel per 1000 cubic feet	= 15·6 lbs.
Coke combined as carbonic oxide in the water gas	= 14·7 "
	30·3 lbs.

= a total of about 1907 tons at £1 os. 4d. per ton = 1940

Total £2480

Consequently, there is an annual saving by the admission of steam to vertical retorts of £1133, or, per 1000 cubic feet of water gas, 1·9d.

In regard to the calculation and comments of Herr Terhaerst and Dr. Trautwein, it may be pointed out that the foregoing figures are based on practical working results. The figures for the water-gas plant correspond with the average realized on several years' working. No value is attached to the recovery of retort scurf, because it would be attended with expenditure on wages, and would carry with it the risk of injury to the walls of the retorts, whatever method of removal was adopted. In cases where the working figures differ from the above, the calculation must naturally be altered. In any case, however, it may be remarked that the practical results support the theory that there is a special advantage in making water gas in vertical retorts, because the sensible heat of the coke can thus be utilized. Also, it is possible to make water gas before carbonization is complete. The objection that water-gas production in the retorts has an unfavourable effect on the durability of the material of the retort and on the hardness of the coke and its calorific value, is rendered of little force by the fact that the absorptive capacity of the steam for heat is so small that, relatively to the heat withdrawn from the retort by the charge of damp and cold coal, it becomes negligible—being only a few parts per cent. of the latter; also it is as nothing compared with the quantity of heat which the hot coke suddenly loses on quenching. The change of calorific value of the coke depends on the proportion of ash it contains,

and is likewise not worth mentioning. The difference in the amount of coke made when steam is not admitted and when it is admitted is only about 1.45 per cent. of the weight of the coal; so that if the coke in the one case contained 12 per cent. of ash, it would in the other case contain $12\frac{1}{4}$ per cent. of ash. The difference of $\frac{1}{4}$ per cent. in the amount of ash would cause no appreciable diminution in the calorific value of the coke.

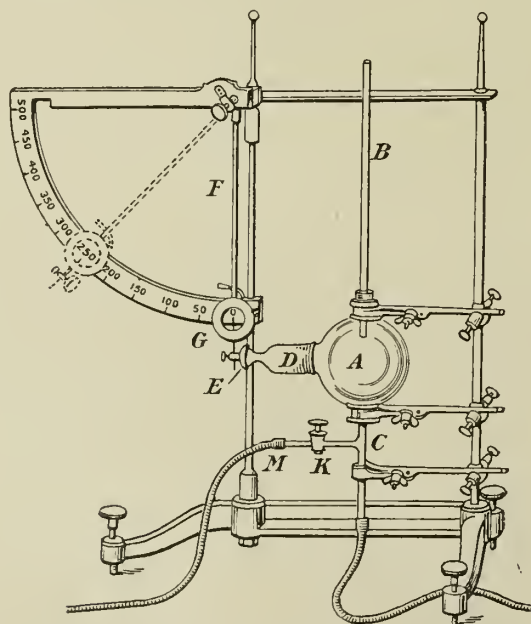
GAS-FIRED POTTERY KILNS.

At the Municipal Secondary School, Hanley, on the 24th ult., Mr. H. Ansell, of Barrhead, Glasgow, gave a lecture on "Coal and Gas Fired Continuous Kilns for Pottery." After describing various kilns, and stating that the muffle kilns use far more fuel comparatively, weight for weight, than any other kind, the lecturer showed a drawing of an ordinary type of coal-fired muffle kiln as employed in the manufacture of fire-clay, and said these kilns turned out some good work, but had their faults and were heavy with fuel. Passing on to gas-fired kilns, he described a six-chambered one of his own design, and pointed out that the initial error made in firing was in giving too much gas. After persistent reduction in quantity, however, he said they produced excellent results. Everything depended upon the man at the producer, and it must be worked to a nicety. The difficulty lay in the production of gas which was perfectly uniform in quality and quantity, so that the proportions of gas and air remained constant. He preferred to regulate the supply of gas, leaving the air constant, rather than attempt to modify the relative amount of both. They found that the colour of the pieces was better than in those from the coal-fired kilns, the purity of the white body and glaze more brilliant, and the fusion of it more perfect; so that, generally speaking, the results were superb. In this kiln there was a saving of 15 per cent. over the coal-fired continuous kiln, and of 65 per cent. over the ordinary intermittent kiln.

A short discussion followed the lecture; and a vote of thanks was accorded to Mr. Ansell.

A RAPID METHOD OF INFERRING THE CALORIFIC AND ILLUMINATING POWER OF COAL GAS.

Part IV. of the "Journal für Praktische Chemie" of this year contains an article by Herr Nicolai Teclu, on a method which he has devised for the rapid estimation of the calorific power and, incidentally, of the illuminating power of coal gas. The method is indirect, depending on the fact that the calorific power and the tension or explosive force exerted by a mixture of gas and air on explosion are both dependent primarily on the temperature of combustion of the gas. Consequently, the explosive force of such a mixture may be applied to the deduction of the calorific power of the gas in the mixture.



The investigations were carried out in the Chemical Laboratory of the Commercial Academy at Vienna; and the apparatus used is a modification of one devised by Herr Teclu in 1907 for a series of experiments on the explosive limits of mixtures of air with hydrogen, methane, coal gas, and acetylene. The modified apparatus now used, which is made by the Vienna firm of Rohrbach, is shown in the annexed figure. It consists of the glass globe A, of 1 litre capacity, with three tubulures each 2 c.m. (0.8 inch) wide. The tube B, 35 c.m. ($13\frac{3}{4}$ inches) in length and 1.2 c.m. ($\frac{1}{2}$ inch) bore, is fixed by means of a cork tightly in the upper tubulure; while the upper end of the tube C, which is 12 c.m.

($4\frac{3}{4}$ inches) long and 1 c.m. (0.4 inch.) bore, enters the lower tubulure. This tube has a side arm M, with glass tap K. The lateral tubulure D of the globe is narrowed at its mouth to 0.8 c.m. ($\frac{1}{3}$ inch). The cap E, forming the bob of the pendulum F, fits loosely over the mouth of the tubulure D. On the pendulum rod above the cap E is an aluminium ring G, with a pointer traversing (when the pendulum swings out) the millimetre scale shown on the quadrant. The scale extends from 0 at the base of the quadrant to 500 m.m. at the top. There is a stop to prevent the pendulum swinging back in the opposite direction. The lower end of the bottom tube C is connected to the gas supply; and the test is made in the following manner.

A deadbeat seconds clock is started at the moment the gas is turned on to C; the tap K being closed. After a few seconds, the gas escaping through B is lighted and burns at the top of the tube. A small proportion of the gas also escapes through D. The gas supply is turned off in exactly 30 seconds. The flame at once begins to diminish in size, while air enters the globe through the annular space between the tube C and the lower tubulure of the globe A and, to a smaller extent, through the tubulure D. The flame gradually loses its yellow colour, becomes blue, and splits up. One portion of the flame remains at the mouth of the tube B, while the other portion descends with increasing velocity into the globe, where it causes an explosion. The resultant gases are thereby suddenly expelled through all the three openings of the globe. The portion of the gases which escapes through D gives an impulse to the pendulum corresponding in force to the tension or explosive force of the escaping gases. Though the pendulum is thus propelled by only a part of the total explosive force, this part is a constant proportion of the total for all tests made with a particular apparatus, provided no alteration is made in the parts of the apparatus between the tests. If necessary, the explosion may be regulated in the first instance by varying the length of the tube B. Otherwise, it is automatically regulated by the explosive limits of the coal gas; and, consequently, the impulse given to the pendulum is a measure of the calorific value of the gas.

The gas used in the trials was drawn from the supply from the Municipal Gas-Works of Vienna. Over 200 tests were made on the gas; and the results quoted in the paper show that the impulse given to the pendulum as observed on the scale varied from 248.5 to 271.5 m.m. Comparative tests were made on a mixture of equal volumes of hydrogen and marsh gas; and the corresponding readings on the scale varied from 245 to 250.5 c.c. It was found that corrections for variations of temperature, moisture, and barometric height could be dispensed with, as they only caused differences of a trifle over 1 per cent. Ten samples of coal gas were found to have a calorific value higher than that of the mixture of hydrogen and methane by the following percentages:—

8.24 0.77 2.79 1.78 8.24 2.58 8.04 9.65 0.97 0.36

Since the intensity of the light afforded by mantles depends on the temperature of combustion of the gas, the illuminating power must, Herr Teclu says, be directly proportional to the calorific power. Hence the apparatus affords a means of estimating the illuminating power of the gas when consumed under mantles, and even of the ordinary illuminating power, because the incandescence of the carbon separated in a luminous flame depends on the calorific power of the gas. When the gas was enriched by carbureting, it was observed that the flame took longer to pass down into the globe; but when it was reduced in quality by dilution with hydrogen, the flame descended more rapidly than before. Actually the time taken by the flame to burn down in the explosion apparatus described depends on the difference between the specific gravity of the gas and of air. The lighter the gas the more rapidly will it escape from the globe, and the more rapidly will air be drawn in, and consequently the flame will pass down more quickly. Observation of the number of seconds which elapse from the time the gas is cut off to the time of the explosion therefore affords a measure of the illuminating power of the gas.

This observation may be made along with the observation of the calorific power by means of this apparatus. The time which elapsed between the cutting off of the gas and the explosion was 27 seconds for a mixture of equal volumes of hydrogen and methane, and from 34 to 35 seconds for a number of samples of coal gas. In Herr Teclu's opinion, the ratio of the impulse given to the pendulum (as observed on the millimetre scale) to the time which elapses between the turning off of the gas and the explosion is a fair measure of the quality of the gas used in the test by reference to the corresponding ratio for a gas of standard quality. He considers that the method is as exact as most methods of technical chemical analysis; and the test occupies only a very few minutes.

After each test the globe is cleared of its gaseous contents by applying suction to the lateral tube M while the tap K is open.

In the paragraph in the last number of the "JOURNAL," notifying the election of Mr. Frank H. Jones as a member of the Institution of Civil Engineers, he was described as of Messrs. H. E. Jones and Son. This was due to a misconception. We learn from Mr. H. E. Jones that the partnership between himself and his son was, owing to the many separate engagements of the latter, put an end to four years ago, since which time they have worked quite independently, although their offices at Palace Chambers are the same.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle.

The Sixty-Fourth Half-Yearly Meeting of the North of England Gas Managers' Association was held in the Lecture Theatre of the North of England Institute of Mining Engineers, in Newcastle, on Saturday—Mr. W. FORD, of Stockton, the President, in the chair. There was a good attendance of members.

The PRESIDENT expressed his pleasure at seeing so many of his old friends, and likewise some new ones, present. Their bill of fare, so far as gas questions were concerned, was a very meagre one; but they had a gentleman with them who, he hoped, would make up for any defect on this point, and who, he also hoped, would do service to the members of the Association. He had had the honour during the year of having been invited to a considerable number of provincial meetings. Unfortunately, the state of his health did not allow him to accept any of them, with the exception of the last one—that of the Eastern Counties Association. He could assure them that at this meeting he never saw a more brotherly or friendly feeling existing. He claimed for their own Association that they gave every stranger a hearty welcome; but he could assure them that he received an exceedingly cordial one from the members of the Eastern Counties Association. He hoped that his successor would be able to pay more of these friendly visits to kindred associations than he had been able to do. He thought it his duty to explain why he had been at so few of the meetings. In calling upon the Honorary Secretary to read the letters which had been received from gentlemen who were unable to be with them, he mentioned that his old and especial friend Mr. Cox, of Sunderland, regretted to say that though it was his intention to be present, he was not able to do so. He regretted exceedingly Mr. Cox's absence, but hoped, as he was sure they all did, that he might be long spared to come among them.

The HON. SECRETARY (Mr. H. Lees, of Hexham) read a number of letters of regret he had received from representatives of other Associations and from members of their own Association. He also submitted the annual statement of accounts, which was unanimously adopted.

NEW MEMBERS AND ASSOCIATES.

The following were admitted to the Association:—

Members.—Mr. Charles Ford, of Amble, and Mr. William Siddle, of the Holderness Gas-Works.

Associates.—Mr. Charles F. Blincoe, of Middlesbrough; Mr. Percy T. Armstrong, of the Leeds University; Mr. J. Shield, of Hexham; Mr. W. A. Howie, of South Shields; Mr. Frank P. Lees, of Hexham; Mr. W. A. Duff, of Newcastle; and Mr. Michael A. Scott, of Middleton St. George.

LECTURE BY PROFESSOR BONE.

Dr. W. A. BONE, F.R.S., Professor of Fuel and Metallurgy in the Leeds University, then delivered a lecture, on "The Influence of Surface upon Gaseous Combustion," which will be found on p. 300.

At the conclusion of the lecture,

Mr. W. DOIG GIBB (Newcastle) said he supposed that most of them came there with the knowledge that Professor Bone had the superintendence of the general experiments that were being carried out for the Institution at the present time in Leeds University. They also knew him as a scientific lecturer; and therefore they were prepared to hear something out of the common run of the papers they had from practical men. He was sure none of them had been disappointed. It was, he thought, flattering to the intelligence of the North of England managers that the lecturer had been more suggestive than conclusive. They in the North of England provided a very high class of literary fare; and he was certain that Professor Bone's contribution to it would very worthily maintain their high standard. Therefore it was with great pleasure he moved that their best thanks be tendered to him for coming to them and giving them the lecture.

Mr. A. B. WALKER (Walker and Wallsend), in seconding, said that he, as had doubtless many of the other members, had the opportunity of hearing Professor Bone at the Institution meeting. He was sure they enjoyed that lecture, both as regarded the literary matter, and also the experiments; and that day Professor Bone had certainly kept up to the standard he then laid down. In both of the lectures, if they studied them, they would find matter which would enable them to explain a great many matters which they previously did not understand. He should like to say, on his own behalf, that the congratulations of the members were due to the President and the Committee for getting Professor Bone there that day.

The PRESIDENT conveyed to Professor Bone the sentiments of the Association; adding that he was sure they had all enjoyed the treat.

Professor BONE acknowledged the kind vote accorded to him for what, he was afraid, must have been rather a difficult subject to follow. He was very glad to appear before audiences who would listen with such attention as they had listened to him on subjects of this kind. He was not skilled in the arts of popular lecturing; and he did not practise them. Probably his temperament was not

in that direction; so that, when he came to address audiences, he had to bring before them subjects which were not of a popular description. Therefore he often made very great demand upon the attention of his audiences. It had given him very great pleasure to make his first appearance before the Association; and he should look forward to meeting them again in a similar manner. But his pleasure, on this occasion, was very greatly enhanced by the fact that his old friend, Mr. Ford, was their President. Mr. Ford had known him, he might say literally, the whole of his life; and he was very glad indeed to lecture at a meeting presided over by him.

DATES OF MEETINGS.

The HON. SECRETARY, in the name of the Committee, moved a resolution to alter the date of the spring meeting from the last Saturday in April to the first Saturday in May, and to continue the autumn meeting on the first Saturday in October, with powers to the Committee to alter these dates under special circumstances. He said the Committee had asked the members to express their opinions upon the proposed change, and only one had done so.

Mr. G. KEYTE (Workington) seconded the motion.

The HON. SECRETARY having explained that the proposed change to the first Saturday in May was intended to meet the convenience of members in the matter of train arrangements, the resolution was unanimously agreed to.

THE LIVESEY MEMORIAL FUND.

Mr. T. H. DUXBURY (South Shields) proposed that the Association contribute twenty-five guineas to the Livesey Memorial Fund. Having, he said, observed the attention given to this matter by the Technical Press, it was quite unnecessary for him to attempt to eulogize the work done by the late Sir George Livesey, or to emphasize the necessity for a donation being given by the Association. As a matter of fact, the minimum required to complete the fund was £10,000, and he understood that, up to date, the figure realized was a little over £9000. Consequently, while the bulk of the money was already obtained, there was still a further sum required; and the Committee of the Association felt the members would like to do something in the matter.

Mr. J. LEWIS (Newcastle) expressed his pleasure in seconding the motion.

The PRESIDENT said the only difference of opinion upon the Committee was that some of the members would have liked to make the amount more. Therefore he had no hesitation in putting the motion to the meeting.

The motion was agreed to unanimously.

ELECTION OF OFFICERS.

It was reported that the ballot for office-bearers had resulted in the following being elected:—

President.—Mr. T. H. Duxbury, of South Shields.

Vice-President.—Mr. J. Lewis, of Newcastle.

Hon. Secretary and Treasurer.—Mr. H. Lees, of Hexham.

Members of Committee.—Messrs. C. H. Armstrong, of Walker and Wallsend; and Mr. W. Doig Gibb, of Newcastle.

Auditor (in place of Mr. Armstrong).—Mr. W. Garbutt, of Newcastle.

VOTES OF THANKS.

Mr. T. BOWER (West Hartlepool) moved a vote of thanks to the Committee and Scrutineers for their services, and also to the President and Council of the North of England Institute of Mining and Mechanical Engineers, for granting the use of their premises to the Association.

Mr. T. HARDIE (Redheugh) seconded the motion.

The PRESIDENT expressed his indebtedness to the Committee, and particularly to the Hon. Secretary, for the sympathetic assistance they had given to him in the work of the Association; and the motion was carried.

PLACE OF NEXT MEETING.

Mr. T. H. DUXBURY at this stage interposed to say that he wished to convey to the members his sincere thanks for doing him the honour of electing him their President. So far as their next meeting was concerned, he personally should take it as a compliment if they could hold it in South Shields; and if they should determine to do this, he was equally certain his Directors would be very pleased to see the Association once more down at the seaside.

It was agreed to accept the invitation.

Mr. W. HARDIE (North Shields), the Mayor of Tynemouth, proposed a vote of thanks to the President for his services during the year; saying he was exceedingly pleased to have the opportunity of doing so. The vote was in a double sense due to their friend Mr. Ford, because this was the second occasion on which he had filled the onerous position of President of the Association. He had filled it with, he thought, credit to himself, and, he was sure, with great satisfaction to the members. Mr. Ford gave them a very fine Presidential Address; and he would only like to say he considered the portion of it which referred to the past history of the Association—its formation and progress—would be a very

useful part of the "Transactions." There was no one more fit to do this work than Mr. Ford, because he was one of the founders of the Association, and he had been constantly in touch with it during all the years of its existence. He had been a worker for its good, both in the reading of papers and in other ways which had tended to the advantage of the Association.

Mr. J. WHYTE (Seaham Harbour) said he had much pleasure indeed in seconding the proposition.

The motion having been cordially agreed to,

The PRESIDENT referred to the flattering remarks which had been made about him by the proposer, and said Mr. Hardie's late father was his esteemed friend. Mr. Hardie and he doubtless had to do with the inauguration of this now successful Association. He thanked the members, not only for their vote on the present occasion, but for their election of him as President for a second time. He could assure them that it had given him immense pleasure and gratification to have held the office.

The meeting then terminated.

THE DINNER.

The members and friends, to the number of more than a hundred, dined in the Turk's Head Hotel—Mr. Ford in the chair. The toast of "The Association" was proposed by Professor Bone in an appropriate speech, and was acknowledged by the Chairman. That of "Kindred Associations" was submitted by Mr. T. H. Duxbury, and was responded to by Mr. Robert Watson, of Doncaster. The proceedings closed at an early hour.

COAL-GAS FUEL FOR MOTOR VEHICLES.

An apparatus for enabling compressed coal gas to be consumed in the cylinders of an engine designed to run on petrol is the subject of a patent recently granted to Messrs. Pearce and Climpson, of Hastings; and the construction of the device is shown in a diagram which appears in the current number of the "Commercial Motor." Its operation is as follows: Compressed coal gas, which is admitted from a steel cylinder through a jet, impinges on a conical baffle-plate, which splits up the single stream of gas into a number of finer streams that pass through a series of holes near the edge of the plate. The gas must then traverse a thick layer of steel parings (held in place between two plates of perforated sheet metal), and be further broken up by means of a sheet of wire gauze before it enters the expansion chamber. The objects of these baffles and gauze partitions are to secure the gradual lowering of the pressure of the gas as it leaves the cylinder, and ensure a steady flow of gas, at a low pressure, from the expansion chamber to the engine cylinders. As the gas issues from the former through a nozzle, the requisite quantities of air for combustion are admitted through ports, the sizes of which may be regulated by means of a sleeve.

A representative of the above-named publication went to Hastings to witness some tests with a four-cylinder petrol engine to which the device was fitted. It was an old 24-30 H.P. Duerkopp engine, and it had seen much service on an old London Road Car motor-bus. According to the account furnished to our contemporary, the gas was compressed to 120 atmospheres (1800 lbs. per square inch) in a steel cylinder $5\frac{1}{2}$ inches in diameter and 50 inches long, and containing 60 cubic feet. A reducing-valve was fitted to the cylinder, and the pressure of the gas was reduced to 20 lbs. per square inch before reaching the nozzle.

The average of a number of tests shows that 70 cubic feet of gas will, in the engine mentioned, give out the same amount of work as is obtained from a gallon of petrol. At the present prices for coal gas compressed to 120 atmospheres, the engine costs much more to run on gas than on petrol; but it has been ascertained that, provided the demand were sufficient to keep a compressing plant fully employed, the gas could be compressed into cylinders to the required pressure at a rate not exceeding 5s. 6d. per 1000 cubic feet, including the price of the gas before compression. At this rate, compressed gas fuel is equal to petrol at 4'68d. per gallon. The size of a cylinder capable of holding 600 cubic feet of gas compressed to 120 atmospheres, is 15 inches in diameter and 7 feet long—a convenient size to be stowed away under one of the inside seats of a motor omnibus.

It is acknowledged that there is no novelty in the idea of employing compressed coal gas as fuel for self-propelled vehicles. There have been, in this country and on the Continent, many attempts to run tramcars with internal combustion engines consuming coal gas; and it has been found that the system can be worked very economically. Our contemporary does not see any serious obstacle in the way of its successful operation with motor omnibuses or motor vans in the engines of which coal gas is being consumed.

At a recent meeting of the members of the Institution of Municipal Engineers resident in the northern division of the home counties district, which includes Bedford, Buckinghamshire, Essex, Hertfordshire, and Middlesex, Mr. Henry C. Adams, Assoc.M.Inst.C.E. (Messrs. Henry Adams and Son), was elected Chairman of the District Committee and a Member of Council of the Institution, and Mr. Bernard Partridge, of Walthamstow, Hon. Secretary. An Executive Sub-Committee was appointed.

THE INFLUENCE OF SURFACE UPON GASEOUS COMBUSTION.

[A Lecture by Professor W. A. Bone to the North of England Gas Managers' Association, May 1.]

Professor W. A. BONE, D.Sc., F.R.S., of Leeds University, in the course of a lecture to the North of England Gas Managers' Association at Newcastle last Saturday, said:

May I offer a word of explanation of my choosing this subject? The reasons which have led me to select it are two-fold. In the first place, the subject of surface combustion is one which is at the present moment creating a great deal of interest among chemists, particularly on the Continent, and I believe is likely to prove of extreme interest and value in technology. It is a subject which, so far as modern investigation goes, is somewhat in its infancy; and I propose to speak, not so much about what has been accomplished, but rather to follow the direction in which inquiry has been put forward, and the kind of results that may be expected to accrue. At the same time, the subject is at present in what I may, perhaps, term a theoretic stage; but I think there are certain advantages in taking a question of this kind, and expounding it to men engaged in the more practical side of gas manufacture and combustion of gases. There are frequently very valuable side-lights thrown upon every-day practice by the results and direction of current scientific inquiry; and I have deliberately selected this subject, in order to bring before you those points which, I hope, some of you may find valuable as side-lights upon practice. Many people look in a lecture rather for accomplished results directly bearing upon practice, and which they can immediately apply. I think there is a great deal to be said for a subject which will cause people to think, and which may explain some of the hidden difficulties which they encounter. In the second place, the subject has the advantage, to me personally, of being one on which I have been working for some years. We, unfortunately, often have to talk upon matters of which we know very little, or only by reading or hearsay; and it is an advantage to be able to speak about a subject from the inside, so to say.

You may, perhaps, better understand what I mean by surface combustion if I review the early history of it. For this, we must go back about a hundred years, to the classical researches of Sir Humphry Davy, because it was in the course of those researches that the phenomena of surface combustion was first discovered. After experiment upon the ignition-points of explosive mixtures, Davy found, what is now a matter of common knowledge, that the elements of a combustible mixture will combine, with a fair velocity, at temperatures considerably below the ignition-point, without any apparent flame. Having thus demonstrated the occurrence of flameless combustion as a general phenomenon within a fairly wide range of temperature below the actual ignition-points of mixtures, he was led to ask the question whether, seeing that the temperatures of flames far exceeded those at which solids became incandescent, a metallic wire could be raised, and maintained, at incandescence, by the slow combustion of gases, without actual flame, but producing heat enough to keep the wire ignited. No sooner was this question asked, than he submitted it to the test of experiment. He plunged a hot spiral of platinum wire into a jar containing a mixture of coal gas and air, rendered non-explosive by an excess of combustible gas. The wire at once became red hot, and remained so until nearly the whole of the oxygen in the mixture had disappeared; the gases, of course, combining on the surface of the wire, and the heat of the combustion being sufficient to maintain a state of incandescence. On removing the wire, the glow ceased. On placing it in another jar, with a smaller mixture, the glow re-appeared, and did so practically as many times as he wished. Subsequent experiments proved that hydrogen was far more susceptible of surface combustion, in contact with platinum, than either ethylene or carbon monoxide; and that whereas platinum and palladium had the power of inducing surface combustion in an eminent degree, such metals as gold, silver, iron, or zinc—being either inert or only feebly active—were only feebly acted on in this sense. Such is the mutual activity of hydrogen and platinum that Davy was able to demonstrate, in lectures at the Royal Institution, the ignition of a jet of hydrogen when it was made to impinge upon a warm spiral of platinum; and in the following year—1818—Erman succeeded in exploding a charge of electrolytic gas, simply by bringing it into contact with a spiral made of platinum, heated to a temperature of 50° C.

Seven or eight years afterwards, the subject was elaborately investigated by Delling, in collaboration with Thénard, and independently by Döbereiner. The results of these experiments showed that the power of inducing surface combustion is possessed in varying degrees by all solids, according to their specific character—their state of diffusion upon a point of surface of a given mass, and according to the temperature. Platinum, in a state of thin division, will cause a combination of hydrogen and oxygen to take place at ordinary temperatures; finely-divided silver at 150° C.; and gold-leaf, at 260° C.; while non-metallic substances—such as charcoal, pumice stone, porcelain, rock crystal, and broken glass—become active at a temperature of 350° C. In the case of glass, it is found that angular pieces are, approximately, twice as effective as spherical masses of equal surface; and that the roughness of the surface considerably aids activity.

As to the cause of these various phenomena, Döbereiner showed

that freshly prepared platinum-black absorbed oxygen from the air; and that when it was charged with oxygen and plunged into a jar of hydrogen formation of steam ensued. He found that the operation of alternately charging the metal with oxygen, and then burning away the oxygen in hydrogen, might be repeated a great many times. He concluded that the function of the platinum was to act as a carrier of oxygen to the hydrogen; the catalytic combination being essentially a series of rapidly alternating oxidation and reduction. This view—which was very commonly held, and is still by a very large number of chemists, but which, I think, has been found to be not in accordance with fact—was very strongly opposed by De la Riva, in a controversy with Faraday in 1835. Faraday, while not denying the fact—which cannot be denied—that finely-divided platinum absorbs oxygen, and that an oxidized or oxygenated sponge is reduced by hydrogen at temperatures not much higher than the ordinary, argued that surface combustion is a phenomenon quite distinct from that of the action of a wire, or tin foil, upon a mixture of the two gases. The function of the metal, in the true catalytic combustion (which, perhaps, I may be able to explain later), he thought was to simply condense both the metal and the combustible gas at the surface, thus producing a condition at the surface layer comparable to that of high pressures; so that the effect of introducing a strip of platinum into a combustible mixture might be considered analogous to that of forcing the layer of gas immediately in contact, as if we had a mixture and applied pressure to it, and the cause of combination at the surface was simply a case of combustible gases being present in high concentration at the surface.

Another version of the condensation theory, and one which seems more in accord with the facts as they are now coming to be known, was brought forward by the Italian physicist Fusinière, in the year 1825; and it is rather an interesting view. His idea was that it is the combustible gas only, and not the oxygen, which is condensed at the surface; and that the combustible gas is, by some action at the surface, which he did not profess to understand, rendered more than ordinarily active, and then is simply burned by the oxygen. This view, as it might be applied to the case of the combination of hydrogen and oxygen in contact with platinum, derives considerable support from the researches of Thomas Graham on the occlusion of hydrogen by metals, and particularly by those of the platinum group. No doubt most of you are aware that the metal palladium possesses the power of occluding hydrogen to quite an extraordinary degree, at ordinary temperatures. It will occlude 950 times its own volume; and even at the temperature of boiling water, it will occlude 650 times its own volume. Platinum, while it is much less active, is still an active occluder of hydrogen; and many other metals possess this power, at moderately high temperatures. All metals which occlude hydrogen are also capable of allowing hydrogen to pass through them red hot. The view is, therefore, that the surface combustion in the case of hydrogen is due primarily to the occlusion of the hydrogen by the metal, and that the occluded hydrogen is in a form more active than ordinary hydrogen.

In common with this view of Fusinière, William Henry found that, when a platinum ball is immersed in an equal volume of electrolytic gas and ethylene, the hydrogen and the oxygen alone combine. There is no combination of the hydrocarbon gas at all, unless the mixture contains a much larger proportion of oxygen. This result, which has an important bearing upon the methods of analyzing and separating gases, was afterwards confirmed by Graham. It is, therefore, clear that during the period between the years 1816 and 1836, which immediately followed the discovery of surface combustion by Davy, the subject engaged the attention of some of the most eminent experimentalists of the day. It was established, beyond question, that all solids have this power of inducing, or accelerating, combustion, under suitable conditions. It was recognized that, in the case of metals, those which are the most active are precisely those which in the most marked degree possess the power of occluding hydrogen. But experiments had been conducted solely with mixtures of hydrogen and oxygen. Other gases had not been studied; and no general effort had been put forward. After the year 1836, the interest in the subject waned, and was not revived for a period of about sixty years.

After this brief historical introduction, and before dealing with the results of recent investigations, I may appropriately offer a few general observations as to the significance of surface action in relation to chemical changes in gases, in view of the importance of the close study of the factors governing such matters, from the point of view of their technical application. It is now generally recognized that heated surfaces have a very marked influence in accelerating, not only combustion, but chemical interchanges in gases generally. The common view, though there are facts which we might call in question—what may be called the orthodox view—is that this action of surface is mainly an accelerating, and not directive, action; or, in other words, the gaseous system (where it consists of a simple gas) is not in a state of stable equilibrium, and is therefore liable to change. The introduction of a hot surface will merely accelerate the movement towards a state of stable equilibrium, but will have no influence at all upon that final state. In the generation and in the application of gaseous fuels, we have to deal, not only with combustion, including the interaction of the products of complete combustion, where the supply of oxygen is deficient, but also with the decomposing of the gases, and dissociation phenomena; and the action of hot surfaces accelerates all alike. It is clear, therefore, that in all

industrial heating operations, which are more or less necessarily conducted in furnaces enclosed or bounded by solid walls, and also more or less packed with solid materials, the question of the influence of hot solids at once assumes an importance which, though it is often overlooked, can hardly be over-estimated, in dealing with the applications of gas for heating purposes. I had the pleasure of showing, at the meeting of the Institution of Gas Engineers in London last June, how surface accelerates the decomposition of methane, when at high temperature. I pointed out then the function of the charge in retorts, of the hot tar, and the heat of the walls of the retort, in promoting the decomposition of methane into carbon and hydrogen; and I was able to show experiments bringing out this fact. That is only one instance—many could be cited—and one which, of course, applies equally to the gas industry, of the importance of taking into account the heat of surfaces in considering gaseous interchanges.

We have to regard hot surfaces, then, as accelerators of combustion, and as radiators. When we speak of flame we are dealing with a case of explosive combustion. We are apt, on account of the very short duration of flame, to speak of the interaction of ordinary flame chemical changes as being instantaneous; and no doubt when measured by the ordinary gross units of time which we adopt in ordinary communications, the change does seem instantaneous. But it only appears instantaneous because we use far too large a unit of time. We have to consider, in regard to combustion, not the units which are ordinarily adopted, but units comparable to the time which elapses between two currents of molecules in a gaseous mixture. That is what we may call the molecular unit of time. It is an exceedingly small unit; but if we were able to appreciate these short intervals, we should find, in a flame, that the chemical changes are comparatively slow—at any rate, in ordinary flames—and that there is plenty of room for great acceleration of that change, even though it will appear to us as insufficient.

I want to convey to you the idea that, even in a flame, we must regard certain chemical changes as slow, when compared with what may be produced under suitable conditions. If you appreciate this fact, you will see that, even with regard to combustion, we might have, in actual flame, plenty of room for an accelerating action, if a substance can be found to accelerate the combustion. That is precisely what the influence of a hot surface is. Therefore, if we have a mixture in process of combining, brought in contact with a nearly red-hot solid, combustion takes place with greater rapidity in the neighbourhood of the solid than it does in the atmosphere which is outside the surface, and the heat is developed at that surface more rapidly, and so you get greater intensity. Therefore the surface becomes, by its function of giving out radiant energy, a further important item in the operation of heating.

It is not my purpose to discourse at all upon the importance of radiation as a means of heating, except to say that probably the importance of radiation in furnaces, heating by gas-fires, and so forth, has not received the attention which it really deserves. Some twenty years or more ago the late Mr. Frederick Siemens, in his efforts to bring furnace construction into more scientific lines, emphasized the opinion that the proper heating in a furnace is entirely due to radiation, in contra-distinction to actual flame-contact. I think we are coming down to the other view, that the objective aimed at must be to get the greatest efficiency out of heating by gas, and is, in my opinion, to introduce as much surface combustion as possible—that is to say, to throw the combination of gases as far as practicable, or get the combination to take place as far as possible at the contact with the hot surface, and to heat them up by surface combustion to a high temperature, so as to get the maximum amount of radiation. And when I remind you that the action of radiant energy from a hot surface is proportional to the fourth-power of its temperature, you see the very great importance of localizing, as far as may be, the combustion upon the surface, so as to get the highest possible temperature there.

During the past ten years, a good deal of investigation has been made, not simply in regard to surface combustion, but also with reference to the action of surfaces in inducing dissociation phenomena, and their action in rapidly accelerating chemical equilibrium in gaseous mixtures. The view which has been put forward—which is due to the German chemist Nernst—is that you may consider that the action at the surface, whether it be by combustion or dissociation at the hot surface, occupies a time which is infinitely short, as compared with the velocity at which the gases will diffuse on to the surfaces, or the products of combustion, or dissociation, will diffuse away from the surface. Consequently, the controlling factor of the process is the rate of combination of the gas on to the surface. This theory is partly right and partly wrong. I quite agree that we may regard the combustion at the surface as occupying an exceptionally small amount of time, and that, therefore, we cannot measure it; and that the actual controlling factor is something else. My experiments show that this controlling factor is not diffusion, but, as we shall see, something quite different.

I thought it might possibly interest you if I explained, by means of slides, the manner in which knowledge of surface combustion may be applied—how investigation may be governed, and the factors controlling it be determined. The way in which the thing must be carried out is to determine the rate of combination of different combustible gases with oxygen, when the reacting mixtures are brought in contact with various solid surfaces, at

selected constant temperatures. For this purpose, it is necessary to select a fairly low temperature, for two reasons—first of all, so that the velocity may be conveniently increased; and, secondly, that the surface combustion shall not be accompanied by any change in the main body of the gas which is in actual contact with the surface at any given instant. When you take a mixture of combustible gases, it may be a considerable distance below the ignition-point, and put them in an ordinary glass vessel, you may keep them weeks or months without noticing any change in them. But when you introduce some of the solid substances we have been mentioning into the vessel, you at once find a change, which may be measured. We may take a gas mixed with pure oxygen only, before we begin to consider mixtures containing two or three gases. I will explain the experimental method by means of a slide. The slide shows you the apparatus, including a gas-furnace, which can be maintained at a constant temperature for weeks together. In this furnace is laid a long glass tube, drawn out at each end, and hermetically sealed. The tube contains the solid substances; and the gas circulates rapidly over them. The rate of change is indicated by the rate of fall of temperature in the apparatus. In some of the experiments it is necessary to take off samples of the gases at various intervals, without disturbing the contents of the apparatus. For this purpose, we have a series of bye-pass tubes. We have investigated very thoroughly mixtures of hydrogen and oxygen; and the results of these investigations have been published in the "Transactions of the Royal Society," in which the full details can be studied. But since they were published, we have investigated many other mixtures.

In the case of hydrogen and oxygen, the mixture is, in many respects, one of the simplest and most suitable for a lecture of this sort. To get any general idea of the temperatures operating in surface combustion, it is of no use merely to experiment with one surface. We have investigated a great variety of surfaces. For instance, we have taken porous porcelain, or substances very similar to it, fire-clay, which is a highly silicious substance, and is practically free from materials, such as ferric oxide, which we want to avoid. Then, as representing the basic varieties, we have taken magnesia; and as representative of metals which are either non-combustible or nearly so, we have taken gold, silver, and platinum, and iron, copper, and nickel. Then it was necessary to examine materials with easily reducible surfaces, such as ferric oxide, nickel oxide, and copper oxide. Finally, we hope to take those very unique substances of the rare earths which are used in the manufacture of incandescent mantles—viz., cerium and thorium. We have not yet reached this stage; but we trust we shall do so; and the results may have some bearing upon the use of the incandescent mantle. In the case of hydrogen and oxygen, the temperature varied, with platinum, from 160° to 460° C.; with porous porcelain and magnesia, it was 430° ; with silver, 400° ; with gold, 250° ; with nickel, 230° ; with copper, 204° ; with oxide of nickel, 160° ; and with oxide of iron 200° .

In the case of either an oxidizable metal or a reducible oxide, a temperature must be selected at which no permanent oxidation or reduction of the surface takes place. Selecting the case of hydrogen, for which, fortunately, very complete data are now available, we find, first, that the catalytic power of a given surface usually increases up to the state of maximum value, when successive charges of the combustible gas, united with the proper proportion of oxygen for complete combustion, are circulated over it; and that the rate of combination of the gases is strictly proportionate to the pressure. Two interpretations are capable of such a result. Either the rate of combination in the surface layer is infinitely greater than the ratio at which either the hydrogen or the oxygen can diffuse on to the surface from the external atmosphere, or than the steam produced in the combination can diffuse away. So that the actual rate observed depends on the number of molecules of oxygen which arise at the surface by diffusion from the surrounding gas, in a unit of time; and this, in turn, may depend on the practical pressure of the oxygen in the surrounding gases, at any given moment, which, as the gases are present in their combining rates, is always one-third of the total pressure of the mixture. The function of the surface, therefore, is to render one or other of the gases active, by loosening or dissolving the bonds which hold the atoms in the molecule together, so rendering it an easy prey to the action of the other gases. If, then, the rate of combustion in the surface layer is infinitely great, compared with the rate at which the particular gas concerned is rendered active, the actual rate observed will be proportional to the pressure of the latter.

When we come to examine mixtures containing the combustible and the oxygen not in combining proportions, but in other than combining proportions, if we began (say) with an excess of hydrogen—three of hydrogen to one of oxygen—as the oxygen disappears during the course of the experiment, the amount of the excess of hydrogen goes on accumulating, and you get a larger and larger excess of hydrogen as the experiment proceeds; and therefore you are able to value the effect of a gradually increasing excess of hydrogen. We find this very striking and significant fact, whether we start with an excess of hydrogen or whether we start with an excess of oxygen—that the governing factor in the analysis of the surface combustion is not the pressure of the oxygen, but the pressure of the hydrogen. A further thing we have proved by experiment is that, if we start with an increase of hydrogen, not only is the resulting velocity increasing, but the velocity with which we started is bigger; and this faster velocity

is continually being accelerated. This means that somehow the gradually increasing excess of hydrogen is greatly due to the disappearing excess of oxygen. Thus you see that the excess of oxygen, so far from accelerating or stimulating the surface, is actually making the surface less active. This we found to be also true in the case of carbon monoxide. It is not the oxygen which is the governing factor, but the carbon monoxide; and I believe that it will be true of all combustible gases, that the oxygen has nothing to do with determining the velocity. This at once disproves the idea of Nernst, that the velocity is determined by diffusion factors, because, if this idea were true, then it would follow that the velocity must be proportional to the gas which is in defect at the surface.

These results suggested to us the fact that hydrogen should have a stimulating effect upon the surface under combustion. We therefore proceeded to investigate how the activity of the surface varied according to the nature of the atmosphere to which it had previously been exposed. Our experiments ultimately proved that the stimulation of the velocity, and the change, was due to the activity of the occluded hydrogen itself, or to something which happens to the properties of the surface at the moment of the occlusion of the hydrogen. It is not quite clear what it is. The experiments with copper oxide were of considerable interest. Copper proved to be a very much more varying catalyst than its oxide—a circumstance which we did not expect to find—both as regards the combustion of hydrogen and the combustion of carbonic oxide. We took a piece of copper gauze, and tried the velocity, during combination, of the gases, over the gauze; and also in the case of its oxide. In both instances hydrogen was the controlling factor. The oxide proved to be active to only about one-eighth or one-tenth the extent of an unreduced metal. We discovered here a fact which is of very great interest, and which I do not yet, perhaps, quite understand, though I hope to in a short time. Experiments with a mixture of hydrogen and oxygen in their combining proportions, and with hydrogen and nitrogen, showed clearly that we have nothing to do with oxidation of the surface in a retort, as is commonly supposed, because, if it depends on the radiation from that surface, say in the case of copper oxide, then the rate at which the gases begin to combine should be proportionate to the rate at which these gases would be reduced by pressure. The extraordinary thing we found here was that, when we take oxygen and nitrogen, we get a very much faster rate of steam formation. The surface is reduced and steam formed at a greater rate than when we take hydrogen and oxygen over the surface. The oxygen actually protects the surface from reduction by the hydrogen. When oxygen is present to any great extent, the rate is proportional to the pressure of the oxygen, not of the nitrogen—which is different from all the other substances. The oxygen condenses on the surface of the gauze, and actually protects the gauze from the reducing action of the hydrogen; and what we get is not the reduction of the gauze by hydrogen at all, but a combination of hydrogen and condensed oxygen—proving that the hydrogen never got to the surface at all. That is a very extraordinary result; and it is sufficient in itself to disprove the idea that surface combustion has anything to do with the alternating rate of gases over the surface.

It has been proved by experiment that a hydrocarbon, like marsh gas, is burned at a very much quicker rate than hydrogen—twenty or thirty times the rate of hydrogen—and when you introduce a solid surface, so great is the action of that surface upon hydrogen that the action is reversed—in fact, the hydrocarbon is almost left untouched. This reminds me of a rather puzzling fact I came across some time ago, which may be of interest to you. I had occasion to make an analysis of coal gas (a gas where air was drawn through the retorts); and there was a large percentage of nitrogen in the gas—an average of 17 to 20 per cent. I was much struck with the fact that the marsh gas was normal, and that it was the hydrogen which was in defect. I was for a long time unable to explain, or to form an idea in my own mind upon, this subject. When we started on the experiments on these selected combustion surfaces, we found that when we introduced the solid substance hydrogen went before marsh gas. This is just one way in which we may explain processes. I do not suppose that anyone here ever gets so much nitrogen in gas sent out, or is likely to; but still it may occur in accidental circumstances. This is just one instance in which these experiments have thrown light upon subjects in which you are very greatly interested.

As a general result of the experiments, we have disposed of the idea that surface combustion consists of a rapidly alternating series of explosions and reductions of the surface. The combustible gas, in most, if not in all, cases, is in some way, either by direct contact with the surface or by some influence exerted by the surface on the volume of gas not actually occluded, but outside, rendered active, and is then burned with extraordinary swiftness; and in some cases, probably that of copper, it is the oxygen which is thus influenced.

I think we have now to study the electric condition of that surface, because we have found that during the experiments, at any rate, metallic surfaces become charged with electricity. What the nature of this is, I cannot say; but that is the direction of the development in which we are to work immediately. The rate at which the activated combustible gas is burned is relatively very great, compared with the rate at which it is rendered active; so that the controlling factor in the process is not the actual rate of combustion at the surface, but the rate of activation of the com-

bustible gas which is brought into contact with it, and which is in time proportional to its pressure. This contention has been supported by a great many experiments, in which it was found that metallic surfaces have a very remarkable property, and particularly nickel, in rendering hydrogen active at a comparatively low temperature.

This has been adopted in commercial practice, in the working up of coal-tar products. The reactions are carried out by passing the gases or substances you want to hydrogenate over a nickel surface, in a fine state of division, at the low temperature of about 70° C. In such an experiment, you get benzene reduced to aniline. The most remarkable result, to my mind, is that you can completely change the mixture of carbonic oxide, with three times its own volume of hydrogen, into marsh gas and methane, at 250° C. So you will see that these experiments have abundantly proved that hydrogen in contact with nickel is abnormally active. I think that the explanation of this activity of surface will ultimately be found to be connected with the electric properties of these substances at high temperatures, and be associated with what is now well known of the discharge of negative corpuscles from heated surfaces. It is found that the rate of discharge is something like 25 times greater in hydrogen than without it. This points to some very intimate connection between the presence of hydrogen at the surface, or occluded at the surface, and the electric discharge. I believe that in this direction we shall be able to find a solution of these problems.

MANCHESTER AND DISTRICT AND YORKSHIRE JUNIOR GAS ASSOCIATIONS.

Joint Meeting at Rochdale.

A much enjoyed and altogether admirable feature of the working of these two Northern Junior Associations is the joint visit made every May to some works on the alternate arrangement of the two Councils—usually in their own county. On the present occasion, Rochdale was the town chosen; and Saturday last saw the members mustering in very large numbers at the *rendezvous* in the Town Hall. Everything that could be done to heighten the significance of the visit, and add dignity and grace to the civic welcome was done; and the noble and richly-adorned hall presented an animated spectacle when the Mayor (Councillor Wilson Dunning), accompanied by his niece the Mayoress, Councillor Walker, the Chairman of the Gas Committee, several other members of that Committee, and Mr. T. Banbury Ball, the Gas Engineer, ascended the platform.

WELCOME BY THE MAYOR.

The Mayor said that they all realized that no long speech was necessary or desirable at this stage of the day's proceedings. He had been asked to come and welcome them on behalf of the Rochdale Corporation, and especially of the Gas Committee. He had the greatest pleasure in extending them a very cordial welcome, and assured them that Rochdale felt honoured at having been chosen for the combined official visit. The Corporation were happy in possessing an excellent Gas Manager who was going to superintend the arrangements for their visit to his works, and who would give them all the special information they desired. That being so, it relieved him (the Mayor) of the necessity of saying much about the works. He did not claim they would get great benefit from inspecting the works; but they could not fail to profit from meeting together thus and exchanging views. He held strongly that such technical gatherings in any industry resulted in great benefits, not only to the individuals, but to the communities they served. Their works had been going for some considerable time; and, consequently, some portions were partly out of date. They did not believe in reckless or premature reconstruction, but tried to make the most of existing arrangements to work economically and to secure good results. Alterations of the older part of the plant were in view; and extensive though they would probably be, they hoped they would be in every way a benefit to the undertaking, and consequently to the town at large. As a Corporation, they owned the gas, water, and electricity works and the tramways—all of which he esteemed to be legitimate enterprises for a municipality. But he held that the present inhabitants and those who availed themselves of these services must not grasp at all the profits; the community as a whole, and not merely in any given years either, were entitled to the advantages and profits. Too often nowadays they heard the cry that all gains should go first hand to the inhabitants and consumers. He deemed such a plan bad, because to spend capital instead of interest would soon bring them on to the rocks. Lastly, he would invite them, so far as their time permitted, to see some of the other features of their municipal work, and particularly to notice, in close proximity to the Town Hall, how they were preparing to cover in further stretches of their not too alluring river, so as to secure readier access to the district on the other side. They would see that the town had already secured one grand open space in this way, and the tramways a most convenient centre. They might also be interested in the three bridges in ferro-concrete thrown over the river between the Town Hall and the gas-works.

Mr. F. Thorp, the Vice-President of the Manchester and District Association, and Mr. H. Butterfield, the President of the

Yorkshire Association, voiced the thanks of the members for the honour paid them in their reception and welcome by the Mayor, and for the privilege of visiting the gas-works—promising that full advantage would be taken of the opportunity.

VISIT TO THE GAS-WORKS.

The company then walked down to the gas-works, where they were divided up into four parties, who were guided round by Mr. T. Banbury Ball, the Engineer, Mr. Stenhouse, the Corporation Chemist (who has charge of the tar and sulphate plant), Mr. Mellor, the Assistant-Engineer, and Mr. Handley, another member of the staff. An illustrated souvenir of the works had been distributed among the members; and as this contained a plan of the works, it made the inspection easier than would otherwise have been the case in the somewhat limited time available.

The manufacture of coal gas in Rochdale dates from 1824. In the preceding year a Company was formed, and an Act of Parliament obtained for the purpose of supplying gas to the town and neighbourhood, which stipulated that the Company should supply "a cheaper and better light than could be obtained from oil-lamps." This Act received the Royal Assent in May, 1823. The limits of supply were a mile-and-a-quarter in every direction from the centre of the old Market Place. The works were erected in 1824, on a small portion of the present site. The Chairman of the Company, Mr. John Roby, a local banker and author, ventured to make a balloon ascent on the occasion of their formal opening. The capital of the concern was £12,000. The Company had not a very long existence; for on applying for additional capital in 1844, opposition was offered by the Rochdale Improvement Commissioners, and the contest ended in the Commissioners being authorized to acquire the Company's undertaking for £26,500, which, with £1200 costs, brought the original capital of the publicly-owned works to £27,700. The works were among the earliest gas-works to pass under municipal control. Rapid expansion of the business took place, followed naturally by reductions in price. In the first complete year under municipal control, the gas made was 27,919,000 cubic feet, and the consumers numbered 904; whereas last year these figures had reached 608,436,000 cubic feet and 29,630 consumers. Many as have been the alterations, additions, and improvements carried out on the works, one serious disadvantage has not been overcome—viz., the lack of railway connection, all coal having to be carted on to the works. More than thirty years ago, parliamentary powers were obtained for the removal of the works to a new site adjoining the railway; but as large sums of money had just previously been expended on the existing works, such strong opposition was manifested to the proposed removal that the scheme was abandoned.

The average daily production of gas in mid-winter is about 2½ million cubic feet; and at the time of the present visit about 1½ million cubic feet are made per day. Rochdale was one of the first gas-works to try inclined retorts. A small house contains five settings of sixes, 15 ft. long and 21 in. by 15 in. □-shaped, which were installed in 1890. Four years later, the present imposing retort-house was erected; and in it were placed 20 similar inclined settings of sixes, 15 ft. long and 24 in. by 15 in. □ retorts, which carbonize 5½ cwt. charges in six hours. Strong testimony is afforded, by the apparent newness of the exterior of this building, to the absence of unnecessary smoke and dust about the works. As this house supplies the main part of the year's make of coal gas, it was carefully examined, and the usual drawing, charging, and furnace feeding operations watched. To avoid the common evil of leakage of air into the top of the combustion chamber around a badly-fitting charging door, with the consequent high local heating and general derangement of the heating arrangements, it was noticed that these doors were faced and fastened down just as mouthpiece-lids are.

Special attention was paid to the adjoining coal-stores. There is some 40 feet difference in the levels of the streets forming the approaches to the works at either end of the retort-house. Advantage has been taken of this fact to make a high-level entrance to the coal-stores from the Manchester Road at the south-east corner of the works. These stores lie along the full length of the retort-house on the charging side, and they have large ventilating window spaces opening on to it. The coal is never stored above the level of the sills of these windows; thus securing ventilation, and avoiding the extreme pressure and side-thrust that a greater depth than 24 feet of coal would occasion. A bucket elevator brings the coal from the breaker in the stores to the middle point of the retort-house, where it can be delivered into conveyors and stored in the usual overhead hoppers. The roof of these stores is a 40 feet wide level continuation of the entrance street (and itself roofed in for its full length) with shoots along each side, down which the coal is discharged from the carts into the stores. From the windows at the end, one looks down 40 feet into the street passing the main entrance of the works.

Crossing the fine, wide space known as the coke-yard (though on Saturday hardly any coke was visible in it), the old retort-house is reached. The modern house is cool and fairly roomy; but this is really spacious, and as it is only used in mid-winter, it is easy to understand the general desire to make fuller and better use of so much valuable ground-space. Here are housed 19 settings of seven horizontal retorts in a bed, □-shaped, with circular mouthpieces, all direct-fired and hand charged. Originally six other settings existed; but they were removed to make room for a carburetted water-gas plant. Hydraulic stoking machinery was installed in the retort-house about 30 years ago; but the house

was ill-adapted for it, and the results were disappointing; so its use was soon discontinued. Abundant room exists opposite each face of the bench, and a large store of coal is here stacked to a height of some 11 or 12 feet. Mr. Ball almost apologized for bringing his visitors to see this part of his carbonizing plant. Since the erection of the inclined-retort house opposite, in 1894, which has ever since been in constant work, this venerable pile has only been used to meet the emergencies of the maximum mid-winter make. Even then, so antiquated a type of setting, now quite obsolete in up-to-date works of any size, is hardly to be commended, even as a make-shift, seeing that it is so uneconomical in fuel consumption and labour charges. It is expected that after one more winter's working all the house will be demolished; but no decision has been arrived at regarding the type of carbonizing plant that is to take its place. In one corner of the house stand two complete regenerator settings of horizontals (of different types), erected partly as an experiment in the earlier days of gaseous firing and when the extensions were being contemplated which afterwards resulted in the erection of inclined retorts, partly also as a full-scale experimental plant.

The last section of the gas-making plant consists of the carburetted water-gas sets erected in 1905 by the Economical Gas Apparatus Construction Company. There are two sets, each capable of producing 750,000 cubic feet per twenty-four hours, and room is left for a third set when, if ever, required. Steam is supplied from two Lancashire boilers, 30 ft. by 8 ft., working at a pressure of 120 lbs. per square inch; while the air-blast is furnished from twenty fans of the usual type, only operated by two 30 H.P. steam-turbines running at 1750 revolutions per minute. Each of the boilers and turbines is of sufficient capacity for both sets of generators, while the exhausters and pumps are also in duplicate. The scrubber and condenser are common to both sets; but they are large enough to suffice for both sets working simultaneously. The carburetted water gas is mainly used for enrichment—to bring the candle power up to 18 candles; and the quantity added to the coal gas does not usually exceed 25 per cent. At the time of the visit, one generator only was in use, and in eight hours it made its daily amount of 250,000 cubic feet. The steam-turbines have been found highly satisfactory and smooth, quiet, and reliable in working. To avoid creating a nuisance from the buzzing of the fans, especially as the works are closely surrounded with houses, this plant is not run at nights or on Sundays. The water-gas plant is provided with two of Waller's three-bladed exhausters, each capable of passing 80,000 feet per hour at 60 revolutions per minute.

Immediately outside the house stands the relief holder for the water gas, a three-lift holder of over 300,000 cubic feet capacity. Needless to say, so large a holder was not erected at the time, but was an existing holder utilized for this special purpose. To minimize the heavy back-pressure it would throw, the third lift is very seldom used. An incidental advantage secured by having so large a holder here is that, though the actual making of water gas may only extend over one shift of eight hours, the gas can be regularly withdrawn and mixed with the coal gas in an unvarying proportion all the twenty-four hours. The water gas is purified by itself, measured through a rotary meter, and finally mixed with the coal gas at the inlet of the station meter.

The exhausters for the coal-gas plant are of the Gwynne make; each pair being coupled direct to a horizontal engine and capable of passing 120,000 cubic feet per hour at 60 revolutions a minute. The condensers are of the vertical pipe type; and the washing plant consists of two tower scrubbers, 38 feet high and 12 feet diameter, and a "Standard" washer-scrubber of 3 million cubic feet per day capacity. The purifiers consist of two sets of six boxes; one being 30 feet square, and the other 24 feet square. Four boxes in each set are worked with lime, and the two final catch-boxes with oxide. The smaller purifiers are usually worked in connection with the carburetted water gas; but the connections are so arranged that either kind of gas can be sent through.

One interesting relic of bygone experiments in purification was seen in the exhauster-house in the shape of the change valves and pumps of a Brin oxygen apparatus, which stands practically complete in an adjoining house. This oxygen was used for revivification of the oxide *in situ* without the disadvantage of the lowering of the candle power by admixture of the gas with the residual nitrogen. The results were not altogether satisfactory, especially from a financial standpoint, so the plant has had a long rest from labour. Though a derelict plant, it does not represent a dead capital charge, having been paid for out of revenue.

A Maxim carburettor is on the works for occasional use when enrichment is necessary and the price of oil or some other circumstance renders water-gas making inadvisable or impossible. Benzol is used as the enriching oil, and comes from the works' own tar plant.

The holder capacity represents 3,612,000 cubic feet, and is equal to twenty-four hours maximum consumption. In addition to this is the carburetted water-gas relief holder.

The liquor is worked up into sulphate of ammonia; and this process, as well as tar distillation, has been carried on in these works for nearly thirty years. A steam-jet discharger is used to expel the salt from the saturator, and a Claus kiln, with its limestone scrubber and open oxide box, deal with the waste gases.

The tar is distilled in three 12-ton stills, direct-fired (with coal). The tar oils are collected in two fractions only; all the oils, after the light oils, being collected in one fraction and sold as creosote oil. Formerly when anthracene was marketable, other divisions

of the distillate were adopted, and the anthracene cake extracted. The light oils are washed to remove and recover the carbolic acid, and then refractionated into three grades—viz., benzol, solvent naphtha, and heavy naphtha.

Mr. Stenhouse, who has charge of this branch, had arranged an instructive set of exhibits of all the liquor and tar products, the whole plainly labelled, and supplemented with scale models. Not only so, but equivalent quantities were exhibited together—e.g., a gallon of gas liquor and the sulphate of ammonia it would yield, &c. The working of the Claus kiln and all the other parts of his department were explained *con amore*; and only the exigencies of a pre-arranged time-table prevented a longer stay here.

A return was made to the Town Hall, where a choice tea, provided by the Gas Committee, received ample justice. At the high table Councillor Walker, the Chairman of the Committee, presided, and supporting him were members of his Committee, and the Presidents and Secretaries of the two Associations.

Mr. JAMES TAYLOR, the President of the Manchester and District Junior Association, spoke of his past associations with Rochdale and Mr. Ball. Then a comprehensive vote of thanks to the Chairman and members of the Gas Committee, and to Mr. Ball and his Assistants who had acted as guides was spoken to by Mr. MOSLEY and Mr. HOLLINGWORTH on behalf of Lancashire visitors, and by Mr. CRANFIELD for the Yorkshire contingent. It was pointed out that the attendance had suffered a good deal because of the visit clashing with the Gas Supply Examination.

After the resolution had been cordially passed, Councillor WALKER responded, and thanked the visitors on behalf of the Corporation and the Gas Committee. He was glad to hear their kind references to Mr. Ball and his staff, and appreciated these remarks. The members of the Corporation had a warm place in their esteem for Mr. Ball. He could assure them that they appreciated and valued him very highly. The members of the Council did not pretend to understand the technicalities of gas-works practice, nor did they imagine that it was for them to initiate improvements or developments therein—they simply tried to bring their common sense to bear on its business side and its policy. As they had seen, the works were old in part. They did not claim that they were model or show works; but they claimed they were doing the best with what they had got, and that they were making gas as cheaply as ever they could.

Councillors SHARP and OGDEN next delivered interesting speeches, which were followed with keen interest.

Mr. T. BANBURY BALL then rose to respond on behalf of himself and staff, and was received with musical honours. He protested that, after speeches from the Chairman and two other members of the Gas Committee, any words of his were unnecessary. He was pleased to acknowledge that in all his 27 years at Rochdale his experiences with his Committee had always been pleasant. Of all who were on the Gas Committee when he first knew it, no single one now remained on it. After 27 years experience of the Committee, he had yet to hear the first disparaging word about any advice he had to offer. He did not claim that his advice had always been accepted. He could not expect it; but when it had not been accepted, it had received earnest thoughtful consideration. In technical matters his Committee were content to be guided by the advice he had felt impelled to give, and to accept his view of what was best; but on matters of policy and finance, it was their prerogative to hear his opinion and advice, and then, as responsible custodians of the Corporation's assets, to take the step they considered best. The Chairman had emphasized the utilitarian and non-showy characteristics of the works; and this exactly hit off the situation. If the obsolete period of one of their retort-houses had been somewhat prolonged, it was only because municipal exigencies had prevented their earlier action. Still, he was sanguine that the preliminary steps to its reconstruction and modernizing would not be long delayed. They might see many places with more mechanical appliances; but he was one who thought that such should be rigidly restricted to cases admitting of their economical use. He saw no sense in doing by mechanical appliances what could be done by hand at half the price; and he had seen cases of mechanical application run mad. He had been very pleased to have the visitors at the Rochdale works, and his staff had equal pleasure in having done what they could for them. He was convinced that some points of interest could be found in even commonplace works, especially when visited in company with others who were ready to discuss what they had seen; and he was bound to say in justice to the many gas colleagues whose works he had visited, that he never knew a door to be shut through which he had expressed a desire to go.

Mr. William Edgar Allen, the donor of the new library at the Sheffield University, which was opened by His Royal Highness the Prince of Wales on Monday last week, is the Chairman of the well-known engineering firm of Messrs. Edgar Allen and Co., Limited, the Imperial Steel Works, Sheffield. Mr. Allen, who has provided the cost, amounting to £10,000, of the building which is to house the library, had previously shown his enthusiasm for the extension of higher education by other gifts to the same University. Donations by Mr. Allen of £5000 each to the Sheffield Royal Hospital and the Sheffield Royal Infirmary, as well as of £1100 to a guild having charge of the interests of the poor in Sheffield, were also announced on the same day.

USE OF TAR FOR ROADS.

There was a large attendance of representatives from all parts of the United Kingdom at the British Road Conference, convened by the County Councils Association, which was held in London from Thursday to Saturday of last week, under the presidency of Lord Belper. His Lordship opened the proceedings on Thursday morning with an address at the Institution of Civil Engineers; and subsequently sectional meetings were held simultaneously in that building, and at the Surveyors' Institution and the Institution of Mechanical Engineers, in the immediate vicinity. Altogether forty papers were submitted for consideration; and quite one-fourth of them contained references to the use of tar in connection with road making. We extract the portions dealing specially with this subject, which is one in which most of our readers are interested.

Mr. F. G. Carpenter, a Surveyor from the West Riding of Yorkshire, in a paper on "Road Maintenance," remarked that the principal cause of the increased expenditure which had taken place of late years on roads was the great alteration in the class of traffic, alike in regard to speed, weight, and method of propulsion, passing over them. He said the effect of the altered conditions of traffic had been to emphasize the defects of the ordinary class of macadamized roadways, and create a demand for a road which, in addition to being of sufficient strength, should be impervious to moisture, and therefore practically mudless and dustless. The present much-condemned method of binding together the aggregate of an ordinary macadam road by the use of road scrapings was productive of the greater part of the mud and dust found so objectionable; but for the rural roads the cost of providing a better-class binder was prohibitive. Tar had so far proved to be the best material for binding; and its use had led to the production of many patented forms of tar macadam. To substitute tar macadam on all roads would entail enormous expenditure; and it could, therefore, only be expected that the various highway authorities would undertake the treatment of the lengths of main roads that passed through the towns or villages. Experimental lengths of tarred granite, tarred limestone, and "Tarmac" had been laid down on some of the heavily trafficked roads in the West Riding; and so far the latter material was giving the best results. But whether its ultimate life would warrant an extension of its use, could not yet be determined. Its initial cost was high; but it had certainly much in its favour. The first cost per super. yard of the materials on the experimental lengths laid complete was as follows: "Tarmac," 4s. 5d.; tarred granite, 2s. 2d. to 4s. 6d.; tarred limestone, 1s. 8d. to 3s. 6d. The thickness of the coating of each of the materials was 4 inches consolidated, laid in two layers, the bottom being 3 inches thick of 2½-inch material, and the top layer of 1 to 1½ inch material. In comparison, the cost of ordinary granite macadam in this county varied from 1s. 3d. to 1s. 9d. per super. yard. During the past two years several lengths of main road in the urban or built-up districts had been tar-sprayed or tar-washed; and, with few exceptions, this treatment had given great satisfaction. Most of the work was done by machine, and cost ½d. per super. yard, which, added to the cost of sweeping and sanding, brought the total to about 1½d. This treatment undoubtedly prolonged the life of the metal by about 20 per cent.—thereby repaying the cost of the dressing, in addition to the saving in discomfort to the inhabitants in the immediate locality.

Mr. G. A. Phillips, the County Surveyor of Glamorgan, made the following remarks at the close of his paper on the "Construction and Maintenance of Roads," when dealing with the methods tried in coping with the dust nuisance: Tar-spraying has been carried out with much success. The first section done on a main road in Glamorganshire was carried out by hand with ordinary gas tar thoroughly boiled, at a cost of slightly under 1d. per super. yard for two-coat work, including sanding. Part of the length of road so treated was a hard stone surface, and part a limestone surface. While in both cases the abatement of dust was attained, the trial was more generally successful on the granite surface; this being probably due to the better wearing quality of the stone. Subsequently another section was tar-sprayed by machine; and, though this was carried out at less cost—viz., about ¾d. per yard for two-coat work—its effect was not quite so lasting as that done by hand. In both cases, however, the trials were successful; and there is no doubt that the preserving effect which it had on the roads treated has more than justified the expense, as the treatment added at least twelve months' life to the roadway. Tarring of footpath surfaces has also been found very effective; resulting in a great saving in the cost of maintenance, while affording much cleaner and much more pleasant surfaces to walk on. With the present experience, the author is of opinion that tar spraying or painting the surface of a road well constructed with hard stone on a strong foundation promises the best and most economical results, both in the matter of dust abatement and suitability for modern traffic. Waterproofing the roads in this manner enables the camber to be reduced to a minimum. Care should, however, be taken to properly construct the road with hard surface material on a sound foundation, and to tar the surface before it has been worn into holes or depressions, as it must not be expected that tarring of the surface will convert a bad road into a good one.

Mr. H. E. Stilgoe, the City Engineer and Surveyor of Birmingham, in a paper on the same matter, said: The subject of tarred macadam is now receiving considerable attention. Its utility

greatly depends on the ingredients, their treatment and mixing. When it is said that this material will not stand heavy traffic, what is meant by it? It is not expected to wear like stone or wood paving. If the comparison is with ordinary macadam, then the process of bituminous binding will not stand heavy traffic either. When tarred macadam is used, the author is in favour of a bottom course of 4 inches of tarred 2-inch stone and a top layer of 1½ inches of fine, rather than finishing the surface with the larger stone. He believes that this system is better for repairing purposes. A tandem roller is best for this work. Taking into consideration the items of utility and cost and the facilities for construction and repair, the author is of opinion that, of macadamized roads, one constructed with good stone (water-bound) on a proper foundation, and the surface properly coated with hot coal tar, is much the best. The system of tar-spraying roads by machinery has greatly facilitated and reduced in cost what the author considers one of the greatest boons conferred upon the users of macadamized roads. It lessens wear and tear, prevents damage by suction of pneumatic tyres, reduces dust to a minimum, reduces mud, and generally increases the life of a road. Watering is unnecessary for maintenance on tarred surfaces; and when it is resorted to on ordinary macadam the spray should be fine. In repairing or patching ordinary macadamized roads, the surface of the defective place should be picked up, the old material removed, and fresh stone laid on and rolled in. A little fine tarred stone is useful as a binder in dry weather.

Colonel R. E. Crompton, in the course of a paper dealing with the reduction of the cost of maintaining roads by the improved construction of the roads themselves and of the vehicles passing over them, said he had taken great pains to note the effect of steel-studded tyres on roads which had been tar-bound to a sufficient depth. He had in mind certain portions of the Great North Road north of Hatfield, which two years ago showed grooves due to the action of the studded tyres, but which since they had been repaired and tar-sprayed to a sufficient depth to ensure the tar penetrating ¾-inch from the surface, at the same places showed no signs of grooving.

The creation and avoidance of dust were dealt with in papers by Mr. A. Dryland, the County Surveyor of Surrey, and Lord Montagu of Beaulieu, a member of the Council of the Roads Improvement Association. Mr. Dryland expressed the opinion with regard to tar macadam that, when the relative expenditure has been taken into consideration, it has not shown any considerable advantage over granite macadam roads, if the latter are surface tarred. It has this advantage, however, that yearly surface applications are not absolutely necessary, though the author considers that such treatment is desirable for maintenance purposes. Tar macadam has the disadvantage of not being easily repaired. It is true it can be patched, but not with such facility as ordinary macadam. In Mr. Dryland's view, it forms a satisfactory road for small towns and villages; but its first cost is prohibitive for general use on country roads under the present financial conditions, and it is not good enough for heavy traffic in large towns or on important roads adjacent to large centres of population. Lord Montagu closed his paper with the following remarks: "It may be safely said the best method by which the effect of dust-creating agents can be counteracted is to make the road waterproof; and the cheapest way to make it waterproof is to tar it. If, therefore, it is possible to lay tarred material at the start, that plan is the best of all; but if not, a coating of tar is the next best thing."

Mr. T. H. Yabbicom, the City Engineer of Bristol, also dealt with the chief causes of dust and how to avoid them. The work of the author in this special direction has already been brought under our readers' notice by the interesting report, given in the "JOURNAL" for the 23rd of February (p. 557), on his successful application of tar for the prevention of dust on the roads of the city. His paper was to a large extent a reproduction of the particulars contained in the report.

The Dessau Vertical Retort Patents.

Mr. Charles Hunt, representative in England of the Dessau Vertical Retort Company of Berlin, has recently received from them a letter informing him that the Reichsgericht, the highest Court of Justice at Leipzig, has given a decision favourable to the Company in the action between them and Herr Aug. Klönne, of Dortmund. The patents for the Dessau vertical retort are pronounced to be good; and the "value of the object" has been fixed by the Court at 1,000,000 marks (£50,000). It will be difficult to re-open this question, because, according to German law and the amount of the fixed "value," the cost of a new trial would be at least 100,000 marks (£5,000). The Klönne Company have to pay all the costs in the action just decided, as well as those incurred in the preceding one, amounting to about 100,000 marks. The result of the trial is, it is claimed, a complete success for the Dessau Company, as all the claims put forward by the other side were rejected by the Court.

At the annual meeting of the Barking Urban District Council, Mr. W. B. Reidie, the Engineer and Secretary of the Barking Gas Company, was elected Chairman. The member who proposed him remarked that "he knew of no one more capable to fight the battles of the Council."

REGISTER OF PATENTS.

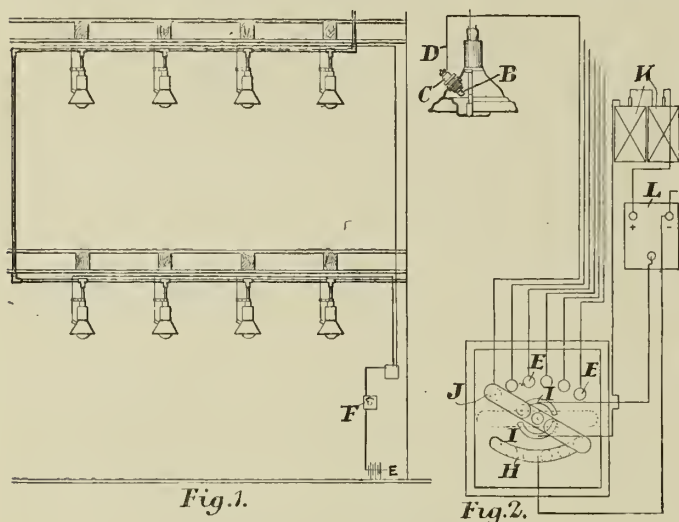
Gas-Lighting Appliances.

BROWN, T., of Manchester.

No. 6790; March 27, 1908.

This invention relates to the lighting of incandescent gas-lamps especially in mills, public buildings, and other places where they are inaccessible for lighting. It refers to an arrangement wherein the lamps are lighted electrically by wiring and sparking terminals arranged in the lamp; the wiring extending to a switch within reach of the person desiring to light the lamps simultaneously or successively.

The terminals (of nickel steel) are carried by a fire-resisting holder arranged near to the mantle or burner of the lamp. One of the terminals is connected by a wire to the gas-supply pipe which forms an "earth" return connection, and the other is connected by a wire to a battery and induction coil, and to the switch—the battery or switch being connected to a water-pipe or other "earth" connection. The switch is in the form of a plate with a number of contacts, each in circuit with one of the lamps; and a lever in circuit with the battery, on being swivelled over any one of the contacts, completes the circuit of the lighting terminals in a lamp, the current flowing through which serves to cause sparks to be emitted between the terminals and thereby light the lamp. When the lamp is lighted, the switch handle is moved on to another contact, when another lamp is lighted, and so on with each lamp.



Brown's Gas-Lighting Apparatus.

Fig. 1 illustrates an arrangement of mill lighting with the ignition devices applied thereto. Fig. 2 illustrates the switch, battery, and induction coil separately (to a larger scale). Fig. 3 illustrates a vertical section of one of the lamps, and shows the position of the sparking terminals.

In each of the lamps to be lighted is a set of sparking terminals B carried by a plug C which screws into the lamp casing—one terminal being carried by an inner insulated portion of the plug, and the other by the outer part of the plug. Connecting with the inner sparking terminal of each lamp is a wire D leading to one of the contacts E of the switch F. The other terminal, through the lamp casing and piping, connects to "earth." Forming part of the switch is a segmental contact H and two further segmental contacts I. Pivotaly mounted to work over the several contacts is a switch-lever J, the axis or spindle of which extends through the switch cover; and outside the cover is a handle. In one with (or screwed to) such handle, or its spindle, is a small pointer; and upon the cover is a curved indicator plate, marked to indicate the position of the several contacts. In circuit with the contacts H and I are the batteries K and induction coil L. When in its normal position, the switch-lever J lies clear of the contacts E—being held in this position by a spring coiled around the switch spindle.

In proceeding to light the lamps, the switch-lever J is first moved on to the endmost contact E; and then on to each succeeding contact—the handle being held momentarily over each contact to ensure of the gas being ignited. When all the lamps are lighted, the switch handle is released; and, if no spring is used, it may remain where set. But if the spring is used it returns automatically to its original position.

Recovering Ammonia from Producer Gas.

LYMN, A. H., of Bromley, Kent.

No. 8014; April 10, 1908.

The plant for recovering ammonia from a gas-producer generally consists, the patentee says, of a mechanical washer and several towers; and the present invention provides "a simpler and less costly plant than that hitherto used, by the adoption of a washer of special construction." The washer forms a unit of plant which may be repeated as often as is necessary; and these successive units fulfil all the functions of the mechanical washer and towers hitherto used. Thus the same form of washer serves for washing the gas, for absorbing the ammonia, for saturating with steam the air supplied to the producer, and, if necessary, for cooling the gas.

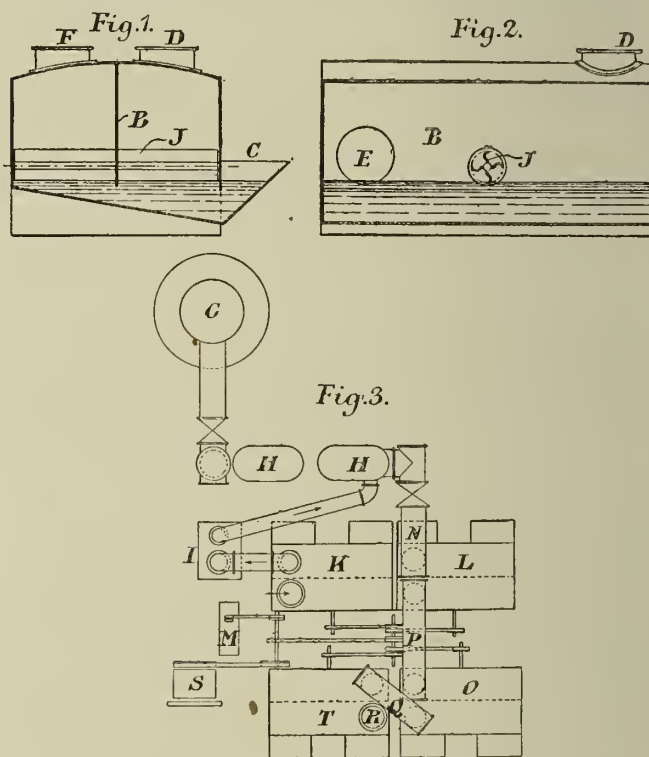
The washer is an improvement on that described in patent No. 22,644 of 1900. It consists of a rectangular chamber having a longitudinal vertical partition which does not extend to the bottom of the chamber. The bottom is preferably inclined towards a water-lute, for removal of

dirt; and the level of the water in the chamber is above the lower edge of the partition. At one end of the chamber (at the upper part) is an inlet for gas, opening into one of the compartments formed by the partition; and at the same end (also at the upper part) is an outlet for gas opening from the other compartment. In the partition at the end far from the inlet and outlet are openings for the passage of gas at or near the water level.

The chamber contains one or more blade-wheels or other like devices revolved to spray the water in, or entering, each compartment. The gas under treatment enters the inlet, passes along the corresponding chamber, through the partition, and along the other chamber to the outlet—having been brought in contact with the water thrown up by the dashers.

In a plant comprising this washer, any suitable type of producer may be used with or without a superheater. The gas from the superheater passes into the first of the washers, which acts as a gas-washer only. The water from this washer is circulated by a pump through it and a contiguously placed washer, which serves for saturating with steam the air supplied to the producer. Thus there is practically no loss of heat between the two washers, "such as is generally the case when using either two towers or a washer and a tower." If the air supply to such a plant were produced by means of a blower in the ordinary manner, the varying density of the fuel in the producer would, the patentee points out, render the mechanical spray of the air-saturator ineffective from time to time. He therefore provides a suitable blower between the air-saturator and the superheater, so that the air is sucked through the saturator, whereby the pressure therein remains practically that of the surrounding atmosphere and the water level remains constant.

The ammonia is absorbed in another washer, into which the gas passes from the first one; very dilute acid or other substance being used to fix the ammonia. A further washer may be employed as a gas cooling vessel, according to the use to which the gas is to be put.



Lyman's Ammonia Recovery Plant.

Fig. 1 is a transverse vertical section, and fig. 2 a longitudinal vertical section, through the washer according to the invention. Fig. 3 is a diagrammatic plan of the whole plant.

In figs. 1 and 2, the chamber is divided longitudinally into two compartments by the partition B, the lower edge of which is below the water level. The bottom of the chamber slopes towards the lute C. The gas enters at D, passes through the opening E, and leaves at F. A series of blades J, mounted on a revolving shaft, act as dashers to make the necessary spray in the chambers.

In fig. 3, G is the producer; and H are the superheaters through which the products pass in a direction opposite to that of the air. The latter is forwarded by a blower I, having been drawn through the washer K, which is constructed as shown in fig. 1, and contains water which has been heated in the similar washer L, through which and the washer K the water is circulated by a pump M. The washer L washes the gas entering it from the producer through the pipe N. The ammonia absorber is a vessel O (of the same type) connected with the outlet of the washer L by the pipe P. From the outlet of the ammonia absorber, a pipe Q conducts the gas into a fourth vessel T, which acts as a cooler, and the outlet R of which is connected with the gasholder. The engine S drives the dashers in the several washers, and works the pump M.

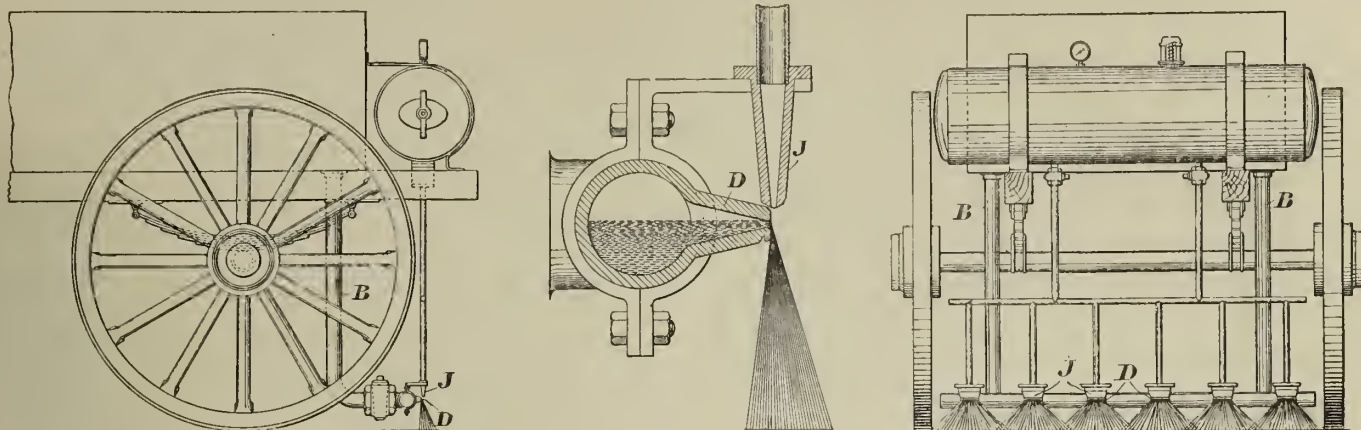
Spraying Tar upon Roads.

BLAKELEY, W., of Thornhill Lees, near Dewsbury.

No. 7367; April 3, 1908.

This invention of apparatus for distributing tar in a finely-divided state upon roads or the like, consists in modifications of the apparatus described in patent No. 4564 of 1907.

The conversion of the tar into spray and its distribution on the road surface are effected by causing the tar to issue from nozzles having their



Blakeley's Tar Road-Sprayer.

outlets contiguous to those of other nozzles from which compressed air is ejected. The tar-nozzles are preferably arranged in a horizontal position, and the compressed-air nozzles vertically above them. The outlets of the nozzles are contiguous, so that downwardly-directed streams of compressed air impinge upon the jets of tar, thereby converting them into fine spray and distributing them with "more or less violence" on to the road being treated.

The illustration shows in side elevation a portion of the vehicle for spraying tar, also an elevation of the back of the cart.

The tar is conveyed to the cross pipe C provided with horizontally disposed nozzles D. F indicates the compressed air storage vessel from which pipes communicate with the vertically disposed nozzles J. The air-pump may be worked intermittently or constantly by gearing (not shown) from the wheels of the vehicle.

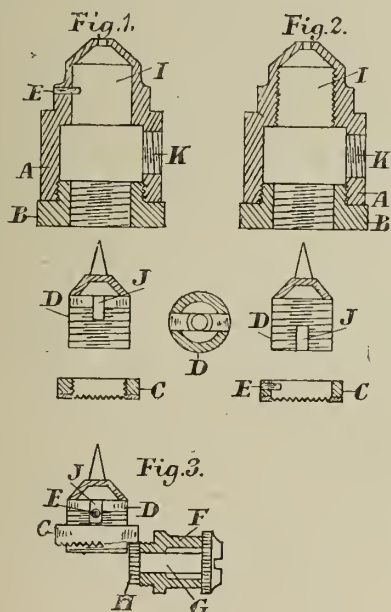
The mouths of the nozzles D are preferably in the form of slots, and grooves or lips are provided on the undersides to prevent tar trickling down their inferior slopes. The air-nozzles are by preference formed with oblong or slotted outlets similar to those of the tar-nozzles illustrated.

Adjustable Gas-Nipple.

ROTHERHAM, K., of Stoke, Coventry.

No. 9828; May 6, 1908.

This nipple, for gas-burners, can be adjusted accurately to give the proper supply of gas according to the pressure from the mains. It is the type of regulator in which the relative positions of a needle and the outlet hole of the nipple are adjusted by means of spur-wheel gearing.



Rotherham's Adjustable Gas-Nipple.

The nipple consists of the following parts: A body A; a connecting piece B; a needle plug D; a threaded wheel nut C, or a plain holed wheel C, with a driving-pin as shown at E.

In fig. 1, the chamber I is plain, bored to allow the adjusting needle D to fit easily. A guide-pin E fits into the chamber I; and the body of the needle at the needle end has a gap J, in which works the pin E. This is to prevent the needle rotating; but it allows it to move freely up and down. The wheel being screwed on the plug is fitted into the body A with the pin E in the slot J. The body is bored and threaded at K; and into the hole fits the spindle bearing F (fig. 3). On the inner end of the spindle G is fixed a toothed wheel H; and the teeth of this wheel engage in the teeth of the wheel C. When the wheel H is revolved by the spindle, the wheel C revolves on the needle plug; and as this cannot revolve with it, it is carried up and down in the body A, according to the way the spindle is revolved. Thus the needle point is made to regulate the flow of gas through the outlet hole in the body A.

In fig. 2, the chamber I is threaded, and the body of the needle plug

is threaded its whole length to screw into the chamber. A carrier slot J is cut in the end of the plug at the end away from the needle. The wheel C is bored with a plain hole to fit on the needle plug body; and a driving-pin E is fitted in. The wheel C is connected to the wheel H, the same as in fig. 1. When the wheel H is revolved, it revolves the wheel C; and the driving-pin E revolves the plug D, which, being threaded in the chamber I, causes the needle point to close or open the outlet hole in the body A as desired. This form of needle plugs allows of a large hole through their centre for the flow of the gas, so as not to check the pressure before reaching the outlet of the nipple. The outlet from the plug is made by cutting two gaps in the body of the plug at the needle end, leaving the needle point on a bridge on the body of the plug.

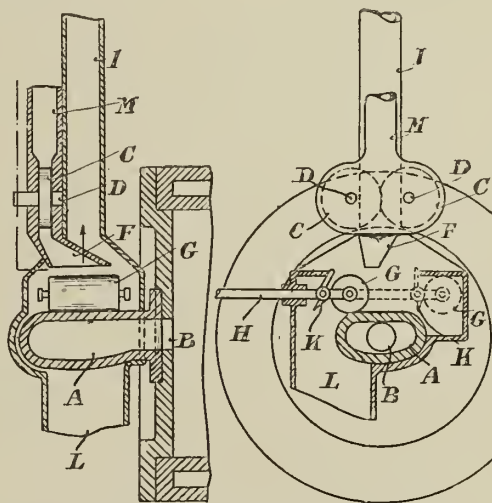
Generating Coal Gas for Operating Engines.

THIEMICH, B., of Dresden-Naussnitz, Germany.

No. 9891; May 6, 1908.

The process here referred to consists in causing pulverized coal to fall intermittently in measured quantities on to a heated surface, pressing it against the surface, and removing the residue, after the separation of the gas, before a fresh charge of coal is supplied.

The principle of the process lies in the fact that the heating of the pulverized coal and the separation of the gas take place on a heated surface in the absence of air, so that no combustion can take place; the coal being pressed against the heating surface to accelerate the process, and the feed being so regulated that before the supply of fresh coal (or at the time of the supply) the coke is removed from the heating surface, so that the area of the latter may be as small as possible. Owing to this method of regulating the supply, and to the rapidity with which the gas is generated, the gas can, it is said, be generated at the rate at which it is sucked into the engine by the piston, so that the engine can be stopped at any time without having a residual amount of gas unused—an advantage from the point of view of economy, and also lessening the danger of explosion.



Thiemich's Gas Generator for Driving Engines.

The apparatus shown is joined to the cover of the gas-engine cylinder. A is the chamber on the wall-surface of which the heating of the coal and the generation of the gas take place. The interior of the chamber communicates, by a port B, with the interior of the power-cylinder. The chamber A is heated by the products of combustion; while the engine may be started by means of benzene or other fuel.

When the chamber is sufficiently hot, the shafts D of two feed-rollers C are coupled to the engine, so that the rollers are rotated. Coal from the channel M is then intermittently fed in measured quantities by the rollers to the nozzle F, and falls on to the red-hot wall of the chamber. A roller G is then rolled over this wall from left to right by means of a rod H. The right-hand end position of the roller is indicated by a dotted circle. The roller spreads out the coal in a thin layer, and presses it against the hot wall, so that gas is immediately generated and passes upwards through a pipe I, and is then led to the cylinder. The pipe may also lead to a suitable collector and scrubber or other cleanser. During the return movement of the roller, a scraper K,

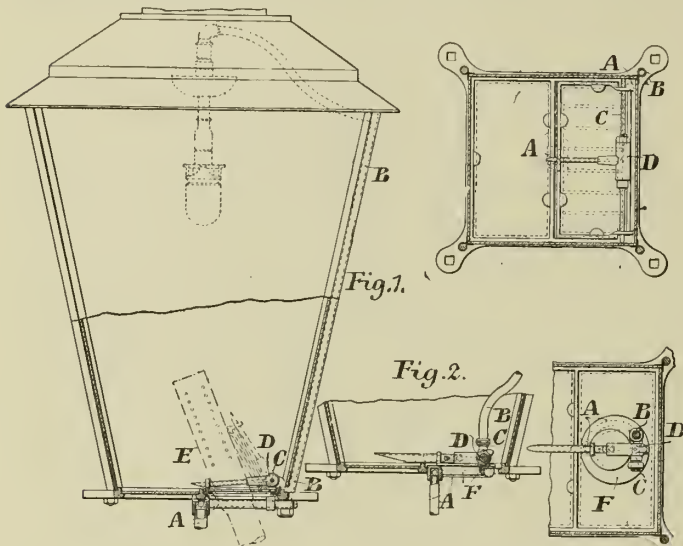
fixed to the rod H, scrapes the coke from the heating surface and causes it to fall into a receptacle L. The action described is then repeated.

After describing a modification of this arrangement, the patentee says he is aware that in the manufacture of coal gas it is known to allow a charge of coal to fall on to a heated horizontal or inclined portion of a retort, where it is allowed to lie for about two hours until the coal is partly distilled, when it is then pushed into a vertical part of the retort to complete the process; and he is also aware that in gas-works a method of producing gas is known consisting in allowing coal to fall from a hopper through a hand-operated valve on to a movable charger, which is pushed, by means of a rod, so that it travels over the bottom surface of the retort and deposits a thin layer of coal thereon, which, after the gas has been evolved therefrom, is pushed forward and discharged by means of a movable plate attached to the charger. He lays no claim to these processes; but he does claim: A "process for generating coal gas for actuating internal combustion engines consisting in automatically feeding pulverized coal at regular intervals and in measured quantities on to a heated surface, automatically pressing it against this surface, and removing the residue, after the separation of the gas, before a fresh charge of coal is supplied.

Lighting Incandescent Street-Lamps.

CUTTELL, T. L., and the ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED, of Otley.
No. 17,321; Aug. 18, 1908.

This invention refers to a lighting arrangement, wherein the pilot-jet is mounted upon, and carried by, the hinged door of the lamp, so as to be raised into the lighting position on the door being opened, and of being lowered into the inoperative position on the door being closed; the hinge of the door consisting of an auxiliary gas-supply pipe provided with an auxiliary cock fixed to the pilot-jet, and adapted to admit gas thereto on the door being opened and of cutting off the gas supply on the door being closed.



Anti-Vibration Company's Incandescent Street-Lantern.

Fig. 1 is a part sectional elevation and a sectional plan of an ordinary street gas-lamp, fitted with the arrangement; and fig. 2 is a modified construction.

A (fig. 1) is the main gas-supply pipe, which is conducted from the centre of the base of the lamp to one corner, where it is joined by a tube B forming one of the corner stays of the lamp and leading to the burner. To the pipe is attached an auxiliary gas-supply pipe C which is passed across and within the base of the lamp, and on which the lamp door is hinged. The auxiliary pipe is fitted with a swivelling auxiliary cock D provided with a pilot-jet mounted upon, and carried by, the hinged door, so that the action of opening the door has the effect of raising the pilot-jet into the lighting position and of simultaneously turning on the gas supply to it, while the action of closing the door has the effect of turning off the auxiliary gas supply and of simultaneously lowering the pilot-jet into the inoperative position. Stops are provided on the hinged door for limiting its opening movement, so as to ensure the lighting position of the pilot-jet; the latter being ignited by the torch E at the moment the hinged door is opened by the torch, as shown in dotted lines.

In fig. 2, F is a circular frame carried in the base of the lamp by a filling-in plate and being formed with the main gas-supply pipe A, which is conducted partially around the frame to an upstanding tube B situated within the lamp and leading up to the burner; and to the pipe is attached an auxiliary gas-supply pipe C, which is passed across the frame within the base of the lamp, and on which auxiliary pipe the lamp door is hinged.

Manufacturing Incandescent Mantles.

SEVERIN, L., of Hagen, Westphalia.
No. 23,122; Oct. 30, 1908.

The patentee describes a process for manufacturing incandescent mantles for inverted incandescent burners, characterized by the cut-off pieces of tubular material for forming the mantles being trimmed at the one end with a band, the free edge of which is drawn together in such a way, by means of a drawing thread drawn through it (or in the case of woven bands by means of the outermost warp threads), that a close dome-shaped end is formed, after which the mantle is finished in the usual manner.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Calorific Power of Tottenham Gas.

SIR,—With reference to the article by Mr. Arthur Edgcome Brown, on the comparative calorific value of Tottenham gas, and your comment thereon, the figures you desire shall be forthcoming in time for publication in next week's issue of the "JOURNAL." I would have forwarded them sooner, but I have been away a week, and only saw your article on my return.

The calorific value at the works has always been taken on the Junkers instrument, and is to this day. But, in our agreement with the Council, we undertook to provide them with Professor Boys' instrument; and they commenced to take the calorific values at the works.

After some time, by arrangement with the Council, it was decided to transfer the testing of the calorific value to the testing-station, and to take the test on the Junkers instrument, so as to correspond with the Company's own tests.

GODFREY WARBURTON, Chief Chemist.

The Laboratory, Tottenham
Gas-Works, May 1, 1909.

Comparative Cost of Gas and Electricity.

SIR,—You are, of course, aware that correspondence has lately been going on in the "Daily Mail" on the subject of "Electricity v. Gas;" and I send you the following letter, which appeared in that paper last Thursday:—

ELECTRICITY v. GAS.

To the Editor of the "Daily Mail."

Sir,—I am somewhat interested in the above controversy alluded to by "Flatholder." The figures he gives to disprove "Householder's" letter are purely theoretical, and do not obtain in practice. We have had some considerable experience in West Ham with regard to the comparative cost of gas and electricity, and I beg to append a list giving actual figures taken from cases in this borough. No doubt some biased gas enthusiast will say that if these figures be correct the light obtained cannot be so good as would be the case if gas were the illuminant; but I shall be pleased to refer such a one to the householders themselves, who, in every case, will state emphatically to him, as they have to me, that the light is better than that they were obtaining from gas.

Gas.			Electricity.		
(1) June, 1907, to March, 1908	£2 7 6		June, 1907, to March, 1909	£1 0 3	
(2) June, 1907, to March, 1908	£4 5 0		June, 1908, to March, 1909	£1 14 6	
(3) June, 1907, to March, 1908	£11 14 6		June, 1908, to March, 1909	£2 15 6	
(4) Dec., 1907, to March, 1908	£4 3 6		Dec., 1908, to March, 1909	£1 8 0	
(*) June, 1907, to March, 1908	£8 14 0		June, 1908, to March, 1909	£4 17 0	
(6) June, 1907, to March, 1908	£4 17 0		June, 1908, to March, 1909	£1 4 0	

With reference to No. 3, the gas-meter in this case must have been wrong, since the saving effected by electricity is so great that it cannot be an absolutely fair comparison. The cost of electricity in this district is 3d. per unit, and the cost of gas 2s. 8d. per 1000.

In the above cases, metallic filament lamps were used; the pressure of the electric supply being 100 volts. Incandescent mantles were used in the gas supply. It can be stated with confidence that the above figures can be reproduced in any district where the rates of supply for gas and electricity are at all comparable with those stated. If the pressure, however, be 200 volts, a transformer will be necessary, the maximum cost of installation of which for a ten-roomed private house does not exceed £2.

I shall be pleased to give to any *bonâ-fide* inquirer the names and addresses of the consumers referred to in this letter by numbers only and to add to them almost *ad lib.*, since the cases given are taken quite hap-hazard, and are but a few of scores of instances which I could quote.

H. H. HOLMES, Sales Manager,

Yours faithfully,

West Ham Corporation Electric Supply.

84, Romford Road, E.

On the appearance of this letter, I wrote to Mr. Holmes, saying that I should be obliged if he would favour me with the names of the gas consumers from whom he obtained the figures he had quoted; and I enclosed with my letter a list for their names and addresses. Last Saturday morning I received the following reply from Mr. Holmes.

Dear Mr. Clark,—In reply to yours of the 29th ult., you will notice that I have made it a condition that the inquirer must be *bonâ fide*. I take it that you require the names and addresses for business purposes; and therefore you hardly come within the category of *bonâ fide*.

(Signed) H. H. HOLMES.

I ask you, Sir, and your readers, if you consider that Mr. Holmes is "playing the game."

HERBERT N. CLARK,

Assistant-Engineer, West Ham Gas Company.

Stratford, E., May 3, 1909.

Rating of a Tenant's Machines and Tools.

SIR,—Adverting to the paragraph under the above heading in your issue of the 13th of April, we should like to call attention to the misleading nature of the statements made in regard to what is therein described as "a striking instance of the failure of an attempt to rate an occupier's machines and machine tools." It is said that "in order that this point might not be obscured by any technical consideration, the appellants' Solicitor withdrew all technical matters; but nevertheless the respondents declined to proceed further with the case." Being much interested in the case of *Kirby v. Hunslet Union*, settled in the House of Lords on Dec. 18, 1905, we made some inquiries into the case, and have received the following reply from the Town Clerk of Southwark, with liberty to publish it.

Town Hall, Walworth Road, April 22, 1909.

Dear Sirs,

Edmund Evans, Limited, and Southwark Assessment Committee.

The Clerk to the Guardians has forwarded me, as Clerk to the Assessment Committee, your letter of the 19th inst.

The Committee are quite in sympathy with the principle laid down in

Kirby v. Hunslet Union, and have uniformly carried it out in assessing the properties in the borough. In the above case, however, additional machinery had been placed in the premises during the quinquennial period; and the appellants raised a somewhat different question to that settled in the decided case. It was agreed that each party, though not required by the rules, should set out their case, so as to limit the issue to the particular point raised. On receipt by the Assessment Committee of the appellants' case, they found a technical objection had been inserted, which on being brought before the Court would have been fatal to the chances of the Committee.

As the amount in dispute was small, and the quinquennial valuation will take place next year, the Committee thought it advisable to consent to the order asked for by the appellants rather than allow the purely technical objection to come before the Court.

(Signed) J. A. Johnson, Town Clerk,
Clerk to the Assessment Committee.

Comment upon the statement that the appellants withdrew all technical objections is superfluous.
Sunderland, April 26, 1909.

THOS. F. HEDLEY AND SONS.

Reformation of the Street-Lamp.

SIR,—I notice in your issue for April 20, among the "Editorial Notes," an interesting article on the above subject. In view of this, it may interest you to know that we have just produced five rough sheets dealing with a portion of the subject to which you refer—viz., the adaptation of existing lamp-columns for use with suspended inverted gas-lamps; and, what is perhaps more to the point, the prices of these are very reasonable, being subject to a discount of 50 per cent. We have made for some two or three years several rather elaborate ornamental harps; in fact, the pillar and harp shown in the enclosed booklet have been erected by the Engineer of the Cleethorpes Gas Company on the sea-front of that popular little seaside resort.

F. J. GOULD, London Manager,
Messrs. James Milne and Son, Limited.

59, Farringdon Road, E.C., April 24, 1909.

[The rough sheets referred to by our correspondent contain some excellent examples of head-work in the adaptation of lamp-columns to modern street lighting. The harp shown in the booklet mentioned, which contains specimens of inexpensive and artistic gas-fittings, is particularly good.—ED. J.G.L.]

The Liverpool Gas Poisoning Case.

As was stated in the "JOURNAL" last week, two Finnish emigrants on their way to America were found on April 21 dead in a Liverpool boarding-house; while two others (who subsequently died) were unconscious. The room was full of gas; the tap being turned on, though there was no light. The inquest was held last Friday, when the manager of the house said that, notices printed in seven languages, including Finnish, warning persons not to interfere with the gas-lights or gas-fittings, were posted close to the door of the room in which the men were found. Before his death, one of the victims stated that when he went to bed about 10.30 p.m. on the 20th, the other three men, who seemed to have had some drink, were sitting up playing cards. He fell asleep, and knew nothing more. A representative of the Gas Company testified to having examined the fittings and found them in good condition. Mr. Edward Allen, the Company's Engineer, said the gas supplied to the house was a mixture of coal gas and carburetted water gas, in which the latter was present to the extent of about 10 to 12 per cent. The proportion of carbon monoxide in this mixture was about 8 per cent., which was less than was found in ordinary coal gas in some parts of the country. The maximum varied in different parts of Liverpool; the proportion of carburetted water gas being highest in Garston, which was the district where the fewest accidents had occurred. Dr. Johnson said that, in the case of the two men who were found dead, their death was due to carbon monoxide poisoning, though whether it was caused by ordinary coal gas or to shorter exposure to a more dangerous mixture, he could not say. Dr. Lindsay stated that the men who were taken to the hospital presented the symptoms of ordinary coal gas poisoning. The Coroner, addressing the jury, observed that the proportion of carburetted water gas in the mixture was not excessive. He considered, however, that a register should be kept of the various qualities of gas-mixture supplied, so that they could be ascertained if needed. A recommendation to this effect had been made by the Departmental Committee who inquired into the whole subject. In returning a verdict that the men succumbed to carbon monoxide poisoning, the jury concurred with these remarks.

The Carron Company, of Falkirk, have sent a copy of their new season's gas booklet, which has been got up for distribution among gas companies. It contains illustrated particulars of the Company's cookers, grillers, hot-plates, boiling-burners, gas appliances, and boilers, neatly printed, and enclosed in a coloured wrapper, on the front page of which space is left for the insertion of the name of any company requiring copies for their show-room.

The following paragraph, taken from the "Ilkeston Advertiser" of the 24th ult., shows what municipal electricity supply is costing the ratepayers: "Tram receipts for the past week have been £118 13s. 1½d., against £123 9s. 4d. last year. The running of the trams and dealing in electricity for illumination and power are now costing the town somewhere about a 7d. rate, and that without allowing anything for depreciation, or making provision for emergencies such as would arise from a serious accident entailing the payment of heavy sums as compensation. It is hoped that no such *contretemps* will happen; for if it does the cost will have to be met out of the current rate. It is a risky policy; but the only alternative is to take out of the ratepayers' pockets a sufficient sum for contingencies that may never arise, and that is an alternative which is unpalatable as things are at present."

LEGAL INTELLIGENCE.

TRAMWAY LINES AND GAS-MAINS.

In the King's Bench Division of the High Court of Justice last Wednesday, Mr. Justice Phillimore had before him a special case stated by the Arbitrator (Mr. Allen C. Edwards) appointed under the Tramways Act, 1870, to settle a dispute which had arisen between the Bristol Gas Company and the Bristol Tramways Company, Limited, in regard to the construction of section 32. The section provides that the construction of a tramway shall not interfere with the rights of local and road authorities, or gas, water, or electric light companies, to deal with the roads for the purpose of repairing, laying down, or removing mains, pipes, &c., giving notice of their intention to do so, when the contemplated work will interfere with the traffic, or affect the tramway; and sub-section 5 provides that any extra expense in doing such work caused by the existence of the tramway shall be borne by the tramway company. In the present case, the Gas Company alleged that, by reason of the tramlines having been laid over the gas-mains, the Company had incurred additional expense in obtaining access to, and altering, their service-pipes; such additional expense for the period between Feb. 16, 1905, and Dec. 28, 1906, amounting to £115 8s. The Tramway Company having refused to pay this demand, the Gas Company applied to the Board of Trade, under section 33, to appoint an arbitrator. Mr. Edwards was thereupon selected; and he undertook the reference without prejudice to the contention of the Tramway Company that no such "difference" had arisen, as was contemplated by section 33. [This point was not now insisted upon.] Detailed particulars of the claim were furnished; and for the purpose of his award the Arbitrator had divided them into three classes: (1) Laying down a new service-pipe and connecting it, for the first time since the construction of the tramway, with a main laid before the construction, amounting altogether to £63 19s. 8d. (2) Repairing, altering, or removing a service-pipe laid since the construction of the tramway; the main having been laid before such construction, £14 1s. 8d. (3) Repairing, altering, or removing a service-pipe or main laid before the tramway was constructed, £37 16s. 8d. The Arbitrator held, with regard to the first class, that the Gas Company were not entitled to the extra expense of laying the new service, but to one-third of the amount claimed; being the agreed proportion of the total applicable to connecting with the old main, as distinguished from laying the new pipe. He therefore awarded them £21 6s. 6d. With regard to the second class, he held that the Gas Company were not entitled to the amount claimed. As to the third class, the Gas Company were entitled to the £37 16s. 8d.; and he directed the Tramway Company to pay the costs of the arbitration.

Sir Alfred Cripps, K.C., who appeared with Mr. Bethune and Mr. Weatherley for the Gas Company, submitted that they were entitled to the whole amount claimed; Mr. Simon, K.C., contended, on behalf of the Tramway Company, that nothing ought to have been awarded. Counsel on each side argued that the extra expenditure under the first class ought not to be divided, or any distinction drawn between laying and connecting. Mr. Simon further argued that the only work for which expenditure could be claimed was that which caused an interruption of the traffic, and that the Arbitrator was wrong in holding that the trifling delay shown to have taken place was such an "interruption" as was contemplated by the section, which he submitted was necessary for founding a claim for additional expense.

His Lordship, in giving judgment, said, as he thought, the Arbitrator was right all round; and he went on to minutely examine the words of the various sub-sections, which justified his decision.

The award was therefore confirmed, and the appeal dismissed, but without costs.

WATER COMPANY'S RIGHT TO SINK A WELL.

Supreme Court of Judicature—Court of Appeal.

(Before Lords Justices FLETCHER MOULTON and FARWELL.)

A few days ago, their Lordships had before them an appeal by the Attorney-General (on the relation of the Marquis of Salisbury) from a decision of Mr. Justice Hamilton, refusing to strike out two paragraphs of the statement of defence in a pending action by appellant against the Barnet District Gas and Water Company.

Mr. DANCKWERTS, K.C., and Mr. EUSTACE HILLS (instructed by Messrs. Nicholson, Patterson, and Freeland) appeared for the appellant; Sir ROBERT FINLAY, K.C., Mr. BALFOUR BROWNE, K.C., and Mr. J. D. CRAWFORD (instructed by Messrs. Bannister and Reynolds) represented the respondents.

Mr. DANCKWERTS said the action was one to restrain the defendants from doing something which the plaintiff alleged to be *ultra vires*; and it was exactly like the *Frimley case*.^{*} A well was being sunk by the defendants at Shenley; and whether this was right or wrong was a matter to be determined at the trial. The two paragraphs which the Attorney-General desired to have struck out were of the most extraordinary character; and it was difficult to know exactly what the pleader intended to convey by them. As he (Counsel) understood the matter, it was an allegation that, because the Marquis of Salisbury had been represented by the Hertfordshire County Council when the Company's Bill was before Parliament, and because the County Council and the Rural District Councils of Hertfordshire and Hatfield had agreed that the defendants should be entitled to use the property concerned *ultra vires*, the action would not lie. How an agreement with the local authorities that the defendants should do something *ultra vires* could be a defence, he did not understand. But the second paragraph was still more extraordinary, because it said: "The relator and

^{*} See "JOURNAL," Vol. CI., pp. 636, 843.

the inhabitants of the town of Hatfield and of the village of Essendon are estopped from contending that the defendants are not entitled to sink the said well for the purpose of obtaining a new water supply for the purpose of their general undertaking." This was as much as to say that the Attorney-General was estopped because, while the Bill was in Committee, Lord Robert Cecil and Sir Ralph Littler came to some agreement in respect of it. He could not really see what this paragraph had to do with the case. They moved to have the paragraphs in question struck out, on the ground that they were embarrassing, and disclosed no defence.

Lord Justice Moulton remarked that it seemed very difficult to understand; and perhaps Sir Robert Finlay could explain it.

Sir Robert Finlay said he thought, when he mentioned the facts, the Court would say that the paragraphs ought to remain. The action was brought to restrain the defendants from sinking a well on a piece of ground which they had rightly acquired, on the ground that section 10 of their Private Act did not entitle them to do it. His contention was, in the first place, that the clause did authorize what they were doing; but he went further, and submitted that the granting of an injunction on behalf of the Attorney-General was a matter for the discretion of the Court, and that the paragraphs which his friend was so anxious to get rid of showed circumstances which would lead the Court not to entertain for a moment an application for an injunction. When the Bill was in Committee, a compromise was arrived at on the matter of clauses; and it was stated in the clearest terms, as appeared by the shorthand notes, what was to be the real effect of the clauses. Clause 10 was as follows:

The Company may by agreement purchase, take on lease, or acquire and hold, for the purpose of the water undertaking (in addition to any lands authorized to be purchased by their previous Acts), any lands within the limits of supply not exceeding in the whole 15 acres, and may, on all or any of such lands, execute, for the purposes of or in connection with the water-works, any of the works, and exercise any of the powers, mentioned in, or conferred by, section 12 of the Water-Works Clauses Act, 1847; and the Company may also purchase by agreement any easement, right, or privilege (not being an easement, right, or privilege of water in which persons other than the granters have an interest) in, under, or over such additional lands which they may think requisite.

Lord Justice Moulton: Supposing you are right, can you still justify bringing in as a defence something which does not create an estoppel against the Attorney-General?

Sir Robert Finlay said for these purposes he must assume that, owing to some flaw in the drawing of the clause, they were wrong; but if it were so drawn, then he should submit it was a case in which most certainly an injunction would not be granted on the relation of one of the parties to the agreement. He thought it would be found that, where proceedings were taken at the instance of a relator, the Attorney-General was not entitled to an injunction as of right. But the Court would consider all the circumstances; and if it appeared that the Attorney-General's name was being used by a relator who had entered into an agreement in the very teeth of which the proceedings were being taken, no injunction would be granted.

After some further discussion, in the course of which Sir Robert Finlay read extracts from the proceedings before the Committee, which showed the view that Lord Robert Cecil, who appeared for the relator and the County Councils, took of clause 10,

Lord Justice Moulton said anything which took place before the Committee did not make a contract to which the public were a party, nor did it make an estoppel. Nothing they did that day would prevent the defendants being perfectly free to bring the matter before the Court, either as to the mode of relief, or the apportionment of the costs. But he thought that the paragraphs in question should go out of the pleadings, and all the costs in the proceedings be costs in the cause.

Sir Robert Finlay said he should like to have it made perfectly clear that no objection should be taken at the trial to the defendants raising these matters, on the ground that they did not appear in the pleadings.

Lord Justice Moulton: Certainly. In setting aside the order, and striking out the paragraphs, it is on the clear understanding that no objection must be taken to bringing them forward, on the ground that they did not appear in the pleadings.

Mr. DANCKWERTS said the Attorney-General would not object.

Heavy Sentence for Gas-Meter Robbery and Violence.

In the "JOURNAL" for the 13th ult. (p. 104), we reported the hearing at the Thames Police Court of a charge against William Musson, a young man of 20, of stealing 6s. 5d. from two prepayment gas-meters belonging to the Commercial Gas Company, assaulting Susan Sarah Rogers, a girl 13 years of age, and attempting to murder his aunt, Alice Robshaw—the last-named sustaining considerable injuries. Accused was committed for trial on the three charges, and was brought up at the Central Criminal Court on Monday last week. Evidence having been given by Mrs. Robshaw, who was still in a very weak condition, the prisoner was found guilty in each case; and the Common Serjeant (Sir Albert Bosanquet, K.C.) sentenced him to five years' penal servitude.

Tin Discs in Slot-Meters.

At the Skipton Police Court, a few days ago, Madeline Guy, a married woman, was summoned at the instance of the Skipton Urban District Council for removing part of a gas-meter, and also for taking gas. John William Ashton, a collector in the service of the Council, said that he visited the defendant's residence for the purpose of collecting money from the penny-in-the-slot gas-meter. He proceeded to the cellar, and detected a strong smell of gas. The works of the meter were exposed. Upon being asked who opened the meter, defendant replied, "I opened it; I had a penny fast." The cash-box was then taken out and carried upstairs by witness, when he found inside a number of tin discs. He asked defendant who had put them in, and she blamed the children. The meter was emptied, and witness left the house saying he would go next day and put it in order. He did so, and then he found in the cash-

box another false coin. On asking defendant why she put it in, she admitted doing it because she had not a penny. Defendant expressed sorrow, and pleaded ignorance of knowing she was doing anything wrong. The Chairman (Sir Matthew A. Wilson, Bart.) remarked that the breaking of the meter was the worst offence. The Clerk to the Council (Mr. R. Wilson) said they simply wanted to give a warning to other people. They did not wish to injure the defendant. The Chairman said the Bench were not inclined to be severe. No doubt the penalty—the maximum was £5—which was inflicted upon the defendant would be a deterrent to other people. She would be fined 5s. and costs in each case.

Alleged "Improper" Use of Gas.

At the Old Street Police Court a few days ago, before Mr. Cluer, Robert Gilham, of Bookham Street, Kingsland, was summoned by the Gaslight and Coke Company for "unlawfully and improperly" using a quantity of gas, of the value of £1 2s. 8d., their property. Mr. Humphreys, Solicitor, appeared for the Company, and said the proceedings were taken under the Gas-Works Clauses Act, 1847. Defendant was the occupier of two rooms in a house in the above-named street, and in one was fixed a prepayment gas-meter. On the 24th of November last, one of the Company's collectors called at the rooms, but failed to get admission. He called again on the 13th of February, and found that the money-box in the meter had been broken open, so that a penny could be dropped in and taken out again as occasion required. In this way, said Mr. Humphreys, the defendant had been able to obtain a large quantity of gas; and he contended that this was an "improper" use of it under the Act. His Worship remarked that the defendant might have used it, but not "improperly," for lighting, cooking, and even warming himself. Mr. Humphreys said the quantity consumed was 5984 cubic feet, which was more than the defendant would have used in the ordinary way. In his defence, Gilham said he had been in possession of the rooms for about two months only when the collector called in February; and he then explained that he found the box broken. All he had done was to take the money out, so that the children should not steal it. He admitted, however, that when the collector asked for the amount due he was unable to give it to him. Mr. Cluer said he failed to see that there had been any "improper" use of gas. The meter was out of order, and the defendant should have written to the Company. Supposing he had put in the proper number of pennies one after another and they had been stolen, the Company would have claimed the money from him. The summons must be dismissed. Addressing the defendant, he said he must pay the money the Company claimed.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards resumed their sales of gas and water stocks and shares. The sale consisted entirely of new issues by order of Directors. The first lots offered were 400 "B" £10 shares and some 4 per cent. perpetual debenture stock of the Grays and Tilbury Gas Company. The shares rank for a standard dividend of 7 per cent., subject to the sliding-scale, equally with the existing "B" capital, the dividends on which have for the last five years been paid at the rate of £5 12s. per cent. per annum. They were all sold at from £10 7s. 6d. to £10 12s. 6d. per share, *cum div.* as from the 14th inst. The debenture stock was sold at par. The next lots consisted of £4000 of 4½ per cent. perpetual debenture stock and 200 new ordinary £10 shares (7 per cent.) in the Ascot District Gas and Electricity Company. The £100 lots of debenture stock fetched from par to £101 10s.; and the shares were sold at from £10 to £10 5s. each. The other new issue was 500 new ordinary £10 shares (5 per cent. maximum dividend) in the Southend Water Company, carrying a dividend of 4½ per cent.; and they fetched from £10 to £10 7s. 6d. apiece. At the Sun Hotel, Chatham, a few days ago, Messrs. Kidwell and Son sold 500 ordinary £5 shares in the Brompton, Chatham, Rochester, &c., Water Company at from £9 2s. 6d. to £9 4s. 6d. each. At the Bull Hotel, Horncastle, Messrs. Parish and Stafford Walter sold two £10 shares in the Horncastle Water Company for £8 2s. 6d. each. Messrs. Buckland and Sons sold last Thursday two original £20 shares in the Windsor Gas Company for £43 10s. apiece, and nine new shares of similar nominal value, but only £8 paid, at £11 17s. 6d. each.

Street Explosions in Oldham.—Referring, at a meeting of the Oldham Electricity Committee, to a recent street explosion, Mr. Hardman expressed the opinion that something ought to be done to try and prevent such occurrences. Mr. Dixon said he thought they had done away with the possibility of explosions; but lately they seemed to have had them almost fortnightly. He wanted to know if the cables were examined. An assistant from the electricity station stated that the cables were examined nightly. Mr. Dixon said that these explosions were dangerous to life and limb, as well as to property; and the public were almost afraid to walk on the footpath. After further discussion, a resolution was passed to the effect that the Committee be informed of the number, dates, and causes of explosions during the past twelve months.

Gas Profits at Chorley.—The Chorley Town Council have adopted the balance-sheet of the gas-works, showing a total profit of close on £2000. It was decided to appropriate £1343 of the surplus to the relief of the rates, and to place the balance, together with £623 paid out of revenue, to the liquidation of a sum of £6469 which the Corporation have undertaken to the Local Government Board to pay off in five years. It was further resolved that a yearly contribution of £1219 be charged in future on the gas account until the amount is cleared off. Mr. Sandham moved that the matter be referred back, as a protest against the proposal to devote gas profits to the relief of the rates; contending that it was a wrong use to make of the money. Alderman Lawrence took exception to the word "wrong," but Mr. Sandham said he should have liked to use a stronger phrase. There was no seconder to the amendment.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Conway Gas Bill, Littlehampton Gas Bill.

Bill read the third time and passed: Wells Gas Bill.

Bill withdrawn: Lisburn Gas Bill.

The Alliance and Dublin Consumers' Gas Bill and the Stourbridge and District Water Board Bill have been referred to a Select Committee, consisting of Lord Ludlow (Chairman), the Earl of Hardwicke, the Earl of Liverpool, Viscount de Vesci, and Lord Saye and Sele; to meet to-day.

The York Corporation and the York Water-Works Company have petitioned against the Northallerton Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords' Bills read the first time and referred to the Examiners: Bungay Water Bill, Donington Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Wells Gas Bill.

Lords' Bill read a second time and committed: South Lincolnshire Water Bill.

Bills reported, with amendments: Aldershot Gas and Water Bill, Heckmondwike and Liversedge Gas Bill [Lords], York Town and Blackwater Gas (Electric Lighting, &c.) Bill.

A Bill to confirm Provisional Orders made by the Board of Trade relating to Prestatyn Gas and Fermoy Gas has been presented, read the first time, and referred to the Examiners.

On Tuesday, the consideration of the Gaslight and Coke Company Bill as amended was further deferred till to-day.

Mr. B. S. Straus (Mile End) has given notice that he will to-day ask the Secretary of State for the Home Department whether his attention has been called to the remark made by the Southwark Coroner at a recent inquest on a child whose clothes had been set on fire by a gas-grill, that such a case was not contemplated by the framers of the Children Act; and whether he will consider the propriety of amending the Law in order to secure that all fires are properly guarded. [The inquest referred to is reported in another column.]

SALFORD GAS BILL.

House of Lords Committee—Wednesday, April 28.

(Before Lord DONOUGHMORE, Chairman, Lord MONK BRETTON, Viscount HILL, Earl MORLEY, and Lord HINDLIP.)

This was a Bill promoted by the Salford Corporation, to authorize, among other things, the extension of their gas-works, and a reduction in the illuminating power of the gas supplied.

Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. ROE RYCROFT appeared for the promoters. The petitioners against the Bill included the Manchester Corporation, represented by Mr. HONORATUS LLOYD, K.C., Mr. R. S. CLEASE, and Mr. G. RHODES; the Lancashire County Council, by Mr. FORBES LANKESTER, K.C.; the Eccles Corporation, by Mr. RAM, K.C., and Mr. E. TYLDESLEY JONES; the Salford Board of Guardians, by Mr. MACMORRAN, K.C., and Mr. H. DAVEY; the Swinton and Pendlebury Urban District Council, by Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C.; the Barton Rural District Council, by Mr. R. S. CLEASE; and the Worsley Urban District Council, by Mr. C. C. HUTCHINSON.

Mr. BALFOUR BROWNE, in opening the case for the promoters, said the Corporation were seeking powers to acquire certain lands, owned by Lord Ellesmere and adjoining the present works, for the extension of their premises, and to reduce the statutory minimum illuminating power of the gas supplied from 17 candles to 14 candles. They also sought authority to raise additional capital to the extent of £250,000. Opposition to these proposals was offered by various local bodies whose districts were supplied with gas by the Salford Corporation. Under their Act of 1862, the promoters were bound to supply gas to these districts of an illuminating power of 18 candles; but by an agreement arrived at in 1897, this had been reduced to 17 candles. Since the invention of incandescent mantles, the same luminosity was now given from low-power gas as was obtainable from high-power gas. He did not think that these outside districts had any real objection to the powers asked for being granted. What they were trying to do was to obtain a share of the profits of the Salford gas undertaking. They demanded practically either that they should have a share of the profits or that the profits should be devoted to reducing the price of the gas. The opposition, he believed, rested on an entire misapprehension of the position a corporation occupied. It had been decided that, in regard to the supply of an outside area, a corporation were in exactly the same position as a company. They could not tax an outside community if there was a loss—the loss would fall entirely on their own ratepayers. In 1897, these same districts petitioned against an Order for which Salford was asking Parliament. Their demands then were the same as they were now. As a result of their opposition, an agreement was arrived at under which Salford undertook that if any of these districts within two years promoted a Bill to supply gas to their own ratepayers, and take over the Salford Corporation's responsibility in regard to them, it would not be opposed. In pursuance of this agreement, the Swinton and Pendlebury Local Board lodged a Bill; but the House of Commons would not give them power to supply any

area except their own. Salford then contended that the obligation on their part was to sell the whole or none; and the Bill was rejected. In 1895, when Salford were seeking to obtain an Order sanctioning the borrowing of more money, the same objections were raised by these outside districts. At that time a General Election was pending, and the matter was not gone fully into. The House of Commons, however, decided that there must be a limitation of profits, and, in consequence, the Bill was withdrawn. In 1897, the Corporation promoted another Bill; and the same opposition being forthcoming, an agreement was arrived at under which these out-districts were to be supplied with gas at the same price as was charged to Salford. They were to erect testing-stations at their own expense and to share the cost of equipment with Salford, and were to have gas of 17-candle power. In consequence of this agreement, the demand for a share of the profits was withdrawn, and it was a downright breach of the agreement then entered into to revive this demand. In regard to the claim made by Barton for a share of the profits, he pointed out that it cost Salford more to supply Barton than was received in return.

At this point the Committee adjourned.

Thursday, April 29.

On the resumption of the proceedings this morning,

Mr. BALFOUR BROWNE, continuing his opening address, asked their Lordships, as a matter of good faith, to keep the outside districts to the bargain they made in 1897. Salford was quite prepared to abide by the conditions of the agreement, except in one particular. They proposed a departure which would be quite as much to the interest of the outside districts as it was to Salford. They proposed to reduce the power of the gas supplied from 17 candles to 14 candles. Any economy which would result from this change would benefit the outside districts quite as much as it would the borough itself. The outside areas, though they were entitled to some protection, were only entitled by law to be treated as though they were dealing with a company. Salford charged a lower price for gas than almost any town. The charge was lower than in Manchester, Bolton, or Warrington; while these towns charged a great deal more to outside districts which they supplied than to their own ratepayers. It was because Salford was supplying at a very low rate that such large quantities of gas were used. If the Corporation had been making 10 or 15 per cent. profit, the outside districts might have had reason to ask for a limitation or a share in the profits. But from 1899 to 1907, the profit made by the Corporation had been very small. During these years, the average profit paid in dividend by the three great London Gas Companies had been 7.9 per cent.; while in Salford—including, of course, the sinking fund—the profit had been 6.73 per cent. There were 75 per cent. of the consumers in Salford itself. The Corporation had taken the risk of this undertaking which happened to have paid latterly. While it was making a loss, the outside districts made no claim to be allowed to bear a share of it. Salford took the risk, and was entitled to the profit. Dealing with the case of Worsley, who in 1897 agreed to a differential rate of 2d. and now asked to be supplied at the same price as Salford, he contended that there was no reason for going back on the bargain. In reference to the demand for testing-stations, he pointed out that Salford had already supplied them to Swinton and Pendlebury, and that the gas could be tested there. He denied that there would be any loss to the consumers by the lowering of the candle power. It was true that it would be cheaper to produce gas of lower candle power; but the outside districts would get the benefit of the economy in the reduction in the price of gas. No gas engineer would come forward and say it was wrong to reduce the candle power, in view of the fact that a reduction such as was now proposed was taking place all over the country. If this case were being tried for the first time, he should urge that the outside districts were entitled to be treated by the Corporation just as they would be by a company; but it was not being tried for the first time. It had been tried on three separate occasions; and the last time a solemn bargain was come to. He asked their Lordships to say that, in the interests of good faith, they would not allow the bargain to be broken. The circumstances were precisely the same now as they were then—the Corporation were supplying gas at a very reasonable price, and were deriving a very small profit.

The CHAIRMAN said it seemed to him the first point that arose was whether the bargain arrived at in 1897 was to be broken or not. It would be convenient if they confined their attention to that—whether the reduction from 17 to 14 candle power was a breach of the spirit of the bargain arrived at in 1897.

Mr. VESEY KNOX said he altogether objected to his learned friend's statement that there was a bargain come to in 1897 which could never be altered. What happened in 1897 was this—the Salford Corporation came for some further capital, and terms were made which were binding on both parties while that capital lasted. When the Corporation came and asked for additional powers, his clients were entitled to ask for further concessions. He could not accept the statement that the bargain of 1897 was binding for all time, and could never be altered. He did not suggest that it was any breach of faith on the part of the Corporation for them to ask to be allowed to reduce the candle power, if they could prove that circumstances had changed and that the legislation of the past should be altered.

Mr. W. W. Woodford, the Gas Engineer to the Salford Corporation, was the first witness. He produced statistics showing the consumption of gas for the past ten years, and stated that in the years 1911-12 all the available plant at the disposal of the Corporation would be in use. They were therefore seeking powers to acquire other land adjoining the present works. He considered the site the most suitable that could be obtained in the borough. He had prepared a statement of the probable cost of the proposed extension. The land, including incidental charges, he put down at £60,000, and the total cost (including the land) at £250,000, which was the amount the Corporation asked to be allowed to borrow. He considered this expenditure necessary in order that the Corporation might carry out their obligation to supply gas. He did not think the four Local Authorities petitioning against the Bill would be injuriously affected by the proposed reduction of the candle power. A great bulk of the consumers used modern burners, which gave better

results with a low candle power. Worsley objected to the differential charge of 2d. This was a sparsely-populated district, and he thought the differential rate of 2d. was justified by the circumstances. The district was extensively undermined, and consequently there was a large loss from leakage. There was no truth in the suggestion that there had been great waste in dealing with the capital. With regard to Barton, the amount of gas they took was about $\frac{1}{2}$ per cent. of the whole production. The population was less than 1 per acre, and the supply resulted in a loss rather than a profit. The consumption of gas in the district had decreased by 14 per cent.

MR. VESEY KNOX: You are paying off your capital out of the profits you make partly from Salford and partly from outside?

Witness: We say it has nothing to do with the outside consumer what we do with our profits.

You have paid back a considerable part of the capital spent on the undertaking, partly out of the profits made within the borough, and partly out of profits made outside?—It has nothing to do with the outside district.

You have stated your capital as £935,000. I put it to you that the actual capital outstanding is only £562,000. I take that from the accounts of the Corporation of Salford?—Yes.

On the capital sum now outstanding your profits would be a great deal larger, would they not?—Yes, substantially larger.

I see the table is only completed to the end of March, 1907? Is one reason for this that if you had taken it to March last the gross profits, instead of being £69,000, would have been £85,000?—That was not the reason for stopping at 1907. The figures were taken from "Field's Analysis," in order that we might compare them with the London Gas Companies.

Last year you made a gross profit of £85,902. This amounts to 13d. per 1000 cubic feet of gas sold. So that the profit on the gas you sold at 2s. 3d. was 1s. 2d. per 1000 feet?—The gross profit taken out of the undertaking would, on the amount of gas sold, represent about 9½d.

The sum you take by way of relief to rates is equal to about 8½d. in the pound on the rates of the borough?—I am not concerned with the borough rates.

Is the sum you are taking in relief of rates 4½d. on every 1000 feet of gas?—Yes.

The total quantity of gas sold outside the borough is 418 million feet a year—that is, 56 per cent. of the total sale?—That is so.

And out of this you take 4½d. per 1000 feet for the relief of the rates of Salford?—No; the profit that goes to the district fund is 3½d.

In 1897, the price was 2s. 2d. in Salford, and 2s. 4d. in Eccles and Swinton. Now after all these years the price is 2s. 3d. all round?—That applies to ordinary consumers.

So that you are actually receiving an average price more than you received in 1897. In the Bill you are seeking to reduce the candle power from 17 to 14 candles, and substitute a new burner; so that a lower quality of gas will produce a higher result. The net effect is that you gain something like 5-candle power?—Nothing of the sort. It all depends upon the quality of the gas.

Would it not require 30 per cent. more gas to get the same light that you are getting now with an ordinary flat-flame burner?—The flat-flame burner is a thing of the past.

Can you show me anything in the Bill which compels you to give the consumer the benefit of the saving in the cost of production and not give it all to the ratepayers of Salford?—We intend to give the whole saving effected by the lower power to the consumers in and outside the borough.

Is there anything in the Bill to compel you to do so?—There is nothing in the Bill. Our contention is that as 75 per cent. of the gas is consumed in the borough, and the gas undertaking is controlled by elected representatives of that 75 per cent., there is every safeguard that the people will not sit down under a high price of gas in order that we may make more money than we are entitled to.

But the ratepayer in Salford gets the advantage when the outside consumer has to pay a high price. Let us compare your charges with those of large companies in other towns?—We compare favourably with companies in our immediate vicinity.

Take Newcastle-on-Tyne, they charge 20½d. as against your 27d.—They are actually on top of the coalfields.

Take Plymouth, there the price is 20 7/9d. Take the average of all the large provincial towns for 1907, as given in "Field's Analysis," and you will find it is 22 7/9d. as against your 27d.?—It is no use comparing prices unless you know the quality of the article supplied and all the surrounding circumstances. You must go into the character of the district, the length of mains, the population, and everything.

But I am taking the average of the whole?—You must take special circumstances into consideration. We have a very sparsely populated district, and we say it is a reasonable and cheap price, and we are serving the district very well indeed.

MR. HUTCHINSON: You justified the differential charge of 2d. in Worsley by the large amount of leakage?

Witness: I did not say that. I said it was a sparsely-populated district compared with Salford, and that the expenditure was consequently greater per 1000 cubic feet.

The whole of your district is undermined?—The undermining in Barton and Salford is comparatively small.

You wish to lower the illuminating power of the gas; and for the purpose of testing you are proposing to use a new burner which gives better results?—We are proposing to use the No. 2 "Metropolitan" burner.

MR. TYLDESLEY JONES: Are you prepared to insert in the Bill a clause to the effect that, if and when the candle power is reduced, you will supply and fix free of charge a sufficient number of burners suitable for the consumption of the gas in substitution for the burners in use at the date when you make the change?

Witness: It is not for me to say; but I have no doubt my Corporation would be quite willing to supply them if people asked for them.

MR. FITZGERALD: Within a reasonable time?

MR. TYLDESLEY JONES: Two years?

Witness: Yes.

What is the charge for public lighting in Salford?—It is according to the quantity used. We do not make any difference whether it is for

public lighting, heating, power, or private lighting. The actual price is about 1s. 11d.

In re-examination by Mr. FITZGERALD, witness said Salford compared favourably with the surrounding towns. At Liverpool, the price was 2s. 6d. per 1000 cubic feet for 20-candle gas.

Professor Vivian B. Lewes, examined by Mr. FITZGERALD, said he was aware of the proposals in the Bill as to the quality and testing of the gas supplied by the Salford Corporation. As to the quality, he said that, inasmuch as London had been more thoroughly legislated for on the question of gas than any other town, it was desirable to bring all the large provincial towns in line with London. As regarded the testing, it was proposed to adopt the burner sanctioned by Parliament as the one most suitable for the development of the illuminating powers of gas—viz., the No. 2 "Metropolitan." Previous to 1905, gas was always tested by the No. 1 "London" argand burner, originally constructed for the burning of 16-candle gas. The No. 2 "Metropolitan" argand burner had been adopted by the London Gas Companies, and was prescribed in Gas Acts as the burner for the purpose of testing.

Friday, April 30.

On the resumption of the proceedings to-day.

Professor Lewes was re-called and cross-examined.

MR. HUTCHINSON: I understood you to say yesterday that the large provincial towns ought to be brought down to the London standard?

Witness: I do not know that I said "brought down."

Cannel is not used in London gas. It is regarded as too expensive a luxury, is it not?—I do not think that is altogether the objection. Enrichment by cannel is less objectionable than any other form of enrichment; but what is wanted is gas made directly from the coal most available in the neighbourhood.

In fact, you would regard the use of cannel as an improvident and unprofitable way of working?—That depends entirely on the price. If you have to pay a high price for cannel, then it is expensive; but it may be the same price as ordinary coal.

In reply to further questions, witness admitted that if they abolished the use of an expensive and unnecessary commodity for the production of gas, they would be able to produce it cheaper and supply the consumer at a lower price. He agreed that a larger volume of gas of low standard would be produced from a ton of coal than if they were producing gas of high illuminating power. He knew that the price fixed by Parliament in connection with its concessions to the gas companies was based upon the quantity of gas which could be produced from a ton of coal. If Parliament had given a company permission to charge 5s. as a maximum price for 17-candle gas, he should say that it would be quite justified in reducing the illuminating power if it reduced the maximum price.

MR. HUTCHINSON: Gas consumed by the burner at present used in Salford for testing would give a different result if it had been burnt in a No. 2 "Metropolitan"?

Witness: Yes; but it entirely depends upon the quality of the gas. The striking difference between the burners is the means whereby the quantity of air that oxidizes the gas is regulated and adjusted. In the Salford burner, there are no means of regulating the air. The burner was constructed in order to consume gas of 18 or 19 candle power; and you have just sufficient air for that quality. In the No. 2 "Metropolitan," you have an inlet for the air which you can regulate exactly to suit the quality of the gas. This burner would give very nearly the same results, at all events within a quarter-of-a-candle, if, instead of taking 16-candle gas, you had 14-candle gas or even less. This is now the standard test-burner. The Salford burner, like the old "London" argand, was made for one quality of gas.

I put it to you that if I have a gas of 17-candle power, and then it is reduced to 14-candle power, I should have to use a larger quantity to get the same quantity of light?—In an inferior burner you would.

The same thing holds good of calorific power, a cubic foot of gas of 17-candle power will give a greater quantity of heat than a foot of gas of 14-candle power under identical conditions?—I do not think so.

Take the case of a gas-engine. Is it not a fact that the richer the gas the higher the percentage efficiency?—No, I do not think so.

MR. FITZGERALD: For gas-engine purposes, 14-candle gas is practically as good as 17-candle?

Witness: If the Salford Corporation were to reduce their standard from 17 to 14 slowly and gradually, there is hardly a consumer who would know that there had been any change, whether the gas was used for lighting, power, or calorific purposes. You get very little advantage from a high-power gas unless you can regulate the air supply. Very often with a lower quality of gas and an incandescent mantle you get better results than with an 18-candle gas.

Replying to further questions, witness admitted that if the illuminating power of gas was reduced from 18 to 14 candles, the cost to manufacture would be lower. He thought the consumer should have the benefit of the reduction. In his opinion, the incandescent burner was now practically universal.

MR. S. Y. SHOUBRIDGE, the Engineer to the South Suburban Gas Company, and for many years Gas Engineer to the Salford Corporation, said it was quite necessary that the works should be extended.

The present site was full up, and there was no room for development. The proposed additional site was a good one. In reducing the illuminating power and in adopting the proposed method of testing, the Corporation were bringing themselves into line with the other large undertakings of the country. The standard of illuminating power in Salford was too high. The introduction of the incandescent mantle had revolutionized the question of the luminosity of gas. Tests had been made at Salford with 19-candle and 14-candle gas with the incandescent burner, and the results were practically identical. He had tested with even a lower quality of gas, and had got better results than from gas of higher power. It was mere waste to manufacture high-power gas. The South Suburban Gas Company were now supplying 14½-candle power gas.

MR. HUTCHINSON: Was I mistaken if I thought you said that 18-candle gas burnt with an incandescent mantle would give no better

result than, or practically the same result as, 14-candle gas burnt with the same mantle and the same burner?

Witness: Quite so, and even lower than that.

From a company point of view, the sliding-scale admits the consumer into partnership?—To the extent that the consumer and producer both obtain the benefit of reduced charges owing to improved methods of manufacture.

In further cross-examination, witness said he knew nothing about the price of ordinary Lancashire coal suitable for the manufacture of 14-candle gas. The canal used at Salford was not of very high class. He believed the proportion of canal used was about 40 per cent. Coke, where canal was used, was not nearly so good as where nothing but ordinary coal was employed. If the canal was replaced by ordinary coal, more valuable coke was obtained; and whatever saving was effected by this change the Corporation were quite willing that the consumer should have the benefit of it. They would be forced to make a reduction from the fact that their consumers, as ratepayers, were the owners.

Mr. HUTCHINSON: Is it not a fact that you would get just as much 14-candle gas from 17 cwt. of coal as you would get of a higher power gas from a ton of coal? First of all, you make a big saving by discontinuing the use of canal, then you get a more valuable coke, and you get as much gas from 17 cwt. of coal as you now get from a ton?

Witness: Yes; but whatever the saving may be, whether large or small, it will to a great extent go to the consumer.

It was put upon me yesterday by Mr. Woodward that two reasons why a high price should be charged for gas at Worsley were, first, the leakage, and, secondly, the length of the mains. Do you attach any importance to the length of mains?—Yes, I do.

Is it not a fact that wherever in Worsley the Corporation of Salford have been asked to supply gas they have required a guarantee from the District Council on account of these mains?—Not in my time, certainly.

But I have a letter here dated Dec. 11, 1898, addressed to you, and your reply, in which you say that the lamps asked for will be supplied on condition that the Council agree to pay an annual sum equal to 7 per cent. of the cost of the mains, which was £46 15s., until the consumption reaches a certain quantity?—That was an exceptional instance. I do not know another.

Mr. Charles Carpenter, M.Inst.C.E., the Chairman of the South Metropolitan Gas Company, examined by Mr. FITZGERALD, said he had inspected the gas-works at Salford. They were very well arranged indeed, and in admirable order. He considered it was essential that additional land should be acquired. He thought the site an admirable one in every respect. If they could get land adjoining the existing works for the purpose of enlarging them, in the long run it was the cheapest thing to do.

Mr. FITZGERALD: You are aware of the proposals in the Bill as to the reduction in the illuminating power of the gas. In your opinion, is this desirable?

Witness: It is eminently desirable. The Company with which I am connected were the prime movers in the endeavour to get Parliament to reduce the standard of illuminating power. For many years the Company were opposed; but eventually, owing to the greatly increased use of the incandescent burner, they obtained authority. This was in 1900, when we asked for a reduction from 16 to 14 candle power.

A great many objections were urged against it at the time?—Yes; quite unfounded, as events turned out.

It was said that the amount of money consumers would have to spend in endeavouring to light their houses would be considerably increased?—Yes; but I may say the result of nine years' experience of lower illuminating power is that in no sense whatever is it hurtful to the consumers. Those consumers who get their gas by the slot meter take considerably less gas than they did nine years ago.

The objections urged against the reduction were not well founded?—Absolutely unfounded.

The apprehension that it would lead to an increased expense to the consumers of gas has been wholly unfounded?—Wholly unfounded. We have never been in a better position with regard to complaints of consumers than since 1900.

The question as to the proper burner to be used has been fully considered by Parliament; and the burner prescribed has been adopted by your Company?—Yes. The burner question arose at an inquiry in 1905, instituted by the London County Council in reference to gas-testing in London. The Council selected a special burner and specified the power of gas with which it should be used. A Committee of your Lordships' House decided that the method was wrong; and as a result of the inquiry a burner was made which did not exist before, and was called the No. 2 "Metropolitan" burner. The main feature of it is that the air is controlled by a damper, which can be raised or lowered. The advantage is that you can test a gas of low quality—11 or 12 candles—and you can test one of 18 or 20 candles, by simply regulating the amount of air admitted to the flame.

You know that additional gas-testing stations are asked for in the petition against the Bill?—In my opinion, they are quite unnecessary. I consider that the gas supplied in the borough and outside Salford is adequately tested at the testing-station already existing.

In cross-examination by Mr. VESEY KNOX, witness said that, in his opinion, the competition of the electric light did more to bring down the price of gas than all the sliding-scales in the world.

In cross-examination by Mr. HUTCHINSON, witness said if a company came to Parliament for sanction to borrow a sum of £250,000, they would get power to raise this amount plus whatever premium might attach—i.e., subject to the auction clauses.

Mr. HUTCHINSON: I want to put to you a question about this burner. Is this the sort of burner you would put in the dockers' houses on the south side of the Thames?

Witness: No.

Suppose you did so, what would it cost?—The cost of the burner is between £2 and £3.

How many burners like this would a docker want? (Laughter.)—I don't know whether you are trying to draw me off on a side-issue.

No, I am asking a very pertinent question?—Then I will answer

you. This burner is a scientific piece of apparatus, to be used in a scientific manner by scientific people. The scientific people who use this burner are people accustomed to the use of scientific appliances, of which this is one. There are scientific people who test the quality of tea. They use a balance for that purpose which would cost £20 or £30. Afterwards, when that tea came to be sold, it would be weighed on scales which probably cost only 5s. This is a piece of scientific apparatus for analyzing and discovering what is the true value of the gas. A burner for the use of the consumer of the gas on the same lines could be made for a little over 1s.

May I suggest that this burner is incomplete. Is not the light affected by the pressure?—Yes.

So that as the pressure varied the honest housewife would have to go on twiddling this thing up and down. It is incomplete without an automatic governor. May I read you an extract of a speech that you made to your shareholders, as reported in the "JOURNAL OF GAS LIGHTING" on Feb. 16 last? Did you use these words:

The basis of our working is, as you know, the supply of gas of 14-candle power. We got permission to come down to that quality some years ago on account of, among other reasons, the increasing use of gas for other purposes than direct illumination. And while the average quality of gas which we are able to supply by our present method of manufacture is about 16.4 candles, the average we should supply if we knew how to do it would be 14.4 candles. Unfortunately, we do not know how to do it. Now the money value of the 2 candles difference between 14.4 and 16.4 is a very considerable one. It has been put at as much as 1d. per candle; and if it were 1d. per candle, this would be £100,000 a year. If it were ½d., of course, it would be £50,000. But at any rate I have said enough to enable you to appreciate that it is a very large sum indeed. As manufacturers of gas, we have exhausted our efforts to introduce a 14.4-candle gas.

Is that correct in every respect?—In every respect.

Mr. TYLDESLEY JONES: When you got this reduction in 1900, you were put under terms to give free burners within a certain period?

Witness: I think we offered to do it. It was included in the Act; but I think the proposal came from us.

Can you tell me what the period was?—It was within two or three years.

Mr. FITZGERALD (re-examining): Have you taken the trouble to ascertain the amount of profit per 1000 cubic feet of gas sold by the Salford Corporation?

Witness: Yes; for the last ten years. I find the average amount of profit in Salford is 0.59d. per 1000 feet, and in London 10.68d.

In Salford they work for a lower return on the money invested in the undertaking?—Yes.

In comparing a municipality with a company you treat the sinking fund as part of the capital?—Undoubtedly; I should almost think it was unarguable.

In a gas company the sum represented by the sinking fund would go as dividends to the shareholders?—That is so.

With regard to the incandescent burner, although it has been the cause of a great reduction in the consumption of gas, it has been an advantage to the companies?—It was an advantage the value of which we cannot possibly over-estimate.

It has enabled them to compete successfully with electricity as an illuminant?—Yes, in almost every sphere in which electricity is used as an illuminant, except in the houses of the very wealthy.

It enables you to do that because you can give, by its means, a better light without increasing the price in any way?—That is so. And on this point I think I may say that there is a great advantage in using with incandescent mantles a gas of 14-candle power rather than a richer gas, because it is more easily regulated. I think you may see that for yourselves in London. In the streets north of the Thames you will see a good many mantles are rather black at the top. It is impossible to find a similar mantle in the streets of South London. The reason is that the gas in South London is of lower quality, and more easily adjustable to the proper amount of air.

Mr. H. E. Jones, M.Inst.C.E., expressed his concurrence with previous expert evidence.

In reply to Mr. VESEY KNOX, witness said he did not think the amount the Salford gas undertaking was contributing to the relief of the rates was very much out of the way.

Mr. HUTCHINSON: If Worsley had four corporations to which it could go for a gas supply in bulk, it would be on the velvet, wouldn't it?

Witness: I cannot say.

Therefore I suggest that you have overlooked one strong circumstance—viz., supply in bulk?—If you want a supply in bulk, you cannot do better than make arrangements with Salford.

For how much would you advise Salford to supply us?—I should want to consider that.

We should get off a little better than 2s. 5d.?—It may be.

Mr. FITZGERALD: You know that Worsley consumes about 3 per cent. of the total gas manufactured?

Witness: Yes.

Is it at all probable that they could manufacture gas for themselves at as low a price as they are getting it at from Salford?—No.

Alderman F. S. Phillips, the Chairman of the Salford Corporation Gas Committee, in reply to Mr. FITZGERALD, said he was prepared to give the Committee a solemn pledge that, if they were allowed to reduce the standard of the gas, whatever savings were effected on the cost of manufacture would be, as far as possible, divided between the consumers of the whole district inside and outside the borough.

Mr. L. C. Evans, the Town Clerk of Salford, was called to explain the meaning of the "Borough Annuity Fund." He said the original borough of Salford purchased the gas-works in 1831, and had expended a large sum upon them up to 1853, when two new townships came into the borough. It was then agreed, by Act of Parliament, that these two townships should contribute to the original borough £2530 per annum as their contribution towards the money that had been expended by the old borough. It therefore represented capital that had been spent by the old borough.

In cross-examination by Mr. VESEY KNOX, witness proceeded to refer to the Corporation accounts in some detail.

The Committee adjourned until yesterday.

AMMANFORD GAS BILL.

This Bill was down for consideration on Tuesday last before a House of Commons Committee, presided over by the Hon. A. Stanley. As will be seen from our "Notes from Westminster," however, the parties came to an arrangement, and opposition was withdrawn.

HECKMONDWIKE AND LIVERSEDGE GAS BILL.

The Unopposed Bills Committee of the House of Commons had the above Bill before them last Thursday. Mr. ALFRED EMMOTT (the Chairman of Ways and Means) presided.

Mr. BERRY (of Messrs. Sherwood and Co., Parliamentary Agents for the promoters), who stated the case for the Bill, pointed out that the promoters were adopting the more modern practice of a sliding-scale in place of the maximum dividend; and they were seeking to give a supply of power gas. By clause 4 they proposed to manufacture gas "from coal, peat, oil, or other materials yielding gas;" but the Committee altered this to "from coal or oil." The Company had given a supply of gas at 2s. 6d. per 1000 cubic feet, and at 2s. 4½d. for public lamps. They now proposed a standard price of 3s. 3d.

Mr. E. H. STEVENSON remarked that the Company had charged 1s. 11d.; but they were now asking for 3s. 3d., because in their particular district all the coal seams were thin, and the new Act would certainly increase the price of coal there. It was generally admitted that the price of gas coal must rise. He did not think, however, that anybody would be hurt if the price were made 3s.

The Committee agreed to do this.

The CHAIRMAN, with regard to the supply of Mond gas, pointed out that no price was fixed, and there was no sliding-scale or anything else. He asked what evidence could be produced that Mond gas was required.

Mr. BERRY replied that it was a large manufacturing district, and there was a field for such a supply, having regard to the amount of power used in the area.

Mr. MOON (Speaker's Counsel): If Mond gas can be supplied at a profit, this is a district in which it may be supplied. This is as high as you put it?

Mr. BERRY: Yes.

The Committee decided that they would wait until it became a matter of practical politics; and the Bill, with the alterations indicated, was ordered to be reported.

YORKTOWN AND BLACKWATER GAS BILL.

House of Commons Committee.—Monday, April 26.

(Before Mr. ROSE, Chairman, Major RENTON, Mr. AGNEW, and Mr. C. HARMSWORTH.)

The above Committee resumed consideration to-day of the Bill promoted by the Yorktown and Blackwater Gas Company, the opening proceedings in which were given in the "JOURNAL" last week (p. 237).

Mr. BALFOUR BROWNE, K.C., Mr. VESEY KNOX, K.C., and Mr. HENRY LYNN appeared on behalf of the promoters; Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, and Mr. JEEVES represented the Aldershot Gas and Water Company, who petitioned against the Bill. Mr. JEEVES also appeared on behalf of the Easthampstead Rural District Council.

Mr. SELLON, in further examination by Mr. VESEY KNOX, said it would be more economical for the Yorktown Company to supply electricity in Frimley than for the Aldershot Company, because that part of the district was practically the suburbs of Yorktown, whereas the Aldershot Company would have to lay extensive mains in order to give the supply.

In reply to Mr. HUTCHINSON, witness said his experience was that the best solution of such a question as this was to put an electricity undertaking in the hands of a gas company. One great advantage, from many points of view, was that both undertakings were under one administration and at one expense. The gas-works of the Yorktown Company were more advantageously situated for the supply of electricity than those of the Aldershot Company. There was no doubt that where they had an electrical undertaking in a district capable of supplying current to be transformed, there would be competition with the existing gas undertaking in the district. He was not aware that the Frimley Council were willing that the Aldershot Company should include the whole of their district for the supply of electrical energy.

Replying to Mr. JEEVES, witness said he could not point to any precedent in Parliament where such powers as they were now asking had been granted in face of opposition by the local authority. The length of the main to be compulsorily laid in the Easthampstead rural district was about three-quarters of a mile. This main would be practically of no use in the district except for the supply of the War Office property, which included the Staff College. Under the proposals of the Bill, he anticipated a revenue of £2343.

In reply to Mr. HARMSWORTH, witness said that the Aldershot Company proposed erecting a generating station in the Frimley district for the purpose of supplying with electricity the area which both Companies sought the right to serve; but he held that, even then, the Aldershot Company would not be able to give the supply so cheaply as the Yorktown Company. Comparing the prices of gas and electricity, with an average price of 4½d. for electricity and 3s. 9d. per 1000 cubic feet for gas, on behalf of electricity he said they would be able to compete.

Mr. ARTHUR VALON, recalled, said that the large majority of the gas consumers of the Yorktown Company used slot-meters, and up till Christmas last the price charged to them was lower than that charged by the Aldershot Company. The latter, however, had now reduced

their price to something less than 4s. per 1000 cubic feet; whereas the price charged by the Yorktown Company was 4s.

This closed the case for the promoters of the Yorktown Bill.

Mr. JEEVES then proceeded with the petition of the Easthampstead Rural District Council.

Mr. C. H. FERRARD, the Chairman of the Council, said that even in five or six years the district would not be ripe for the supply of electricity. Power should not be given to a company to supply. But when rights were given, they ought to be accompanied by obligations. When a company was not willing to undertake such obligations, it was a distinct indication that they ought not to have the rights granted to them. If the rights were given, a larger compulsory area should be inserted in the Bill; but so far as they could ascertain, there was no demand for electricity.

Mr. J. WILSON, the Clerk to the Council, said the Camberley Company applied for electrical powers for the area now in question; but it would have been in competition with the Gas Company. As a condition of the granting of the electrical powers, it was agreed that they should lay a compulsory main in Sandhurst and Crowthorne; and if that main had not been laid, the Council would have been in a position to apply for a revocation of the Order. They did not oppose the Order, but insisted on the laying of a longer compulsory length of main. He held that if the powers were granted the undertaking would be unprofitable, and that the gas consumers would suffer thereby. The proper time for the promoters to come for the powers now sought would be five or six years hence.

Mr. JEEVES, in addressing the Committee on behalf of the Rural District Council, said that, on the one hand, the gas consumer in the Council's area might have to pay directly because of loss in the electricity undertaking, and he might have to pay by reason of competition. He held that the possibility of competition should not be set aside unless the Gas Company could offer such terms as would show that they could thoroughly well serve the district in the matter of electricity as well as in the gas supply.

ALDERSHOT GAS AND WATER COMPANY'S BILL.

Tuesday, April 27.

When the Committee met this morning,

Mr. HUTCHINSON proceeded with the case for the above-named Bill.

Mr. R. W. EDWARDS, the General Manager and Secretary of the Company, said the main objects of the Bill were the extension of the gas limits, additional gas-works, authority to supply power gas, power to supply electrical energy over an area coterminous with the gas area, the construction of additional water-works, the consolidation of capital and the granting of additional capital, and other smaller provisions. There were two small non-statutory Gas Companies at present supplying gas with whom they had made terms of purchase by agreement; the price charged by them being 4s. 6d. and 5s. 10d. per 1000 cubic feet respectively. The works of these Companies were scheduled to the Bill as gas lands for manufacture and distribution; and it was the intention of the promoters to merely use the lands for storage purposes. In 1896, they purchased the undertaking of the North Camp Company, including their powers. In part of the area now contested, the Yorktown Company were supplying the church, the schools, and the drill-hall; but they offered no opposition. In 1901, the Directors of the Aldershot and Yorktown Companies arrived at the conclusion that it would be wise to amalgamate the two undertakings; and they applied to Parliament for confirmation of the agreement. But the agreement was not confirmed, on the opposition of the Aldershot Urban District Council, who held that the amalgamation would result to their disadvantage. In 1903, the Aldershot Company applied to the Board of Trade to raise further capital under opposition by the Yorktown Company, who were then supplying, though not authorized to do so, in the contested area. The result of the opposition was the insertion of a clause the effect of which was that in part of the contested area, though the Aldershot Company had mains there, they were required not to supply, unless they could do so without the expenditure of capital. In 1904, the Yorktown Company came to Parliament and then legalized their position with regard to Sandhurst and the supply of gas in bulk to the Military College; but as they did not propose to touch any part of the Frimley district, the Aldershot Company did not oppose the measure. The Aldershot Company's standard price was 3s. 8d. per 1000 cubic feet, subject to the sliding-scale. The price they were supplying at in Aldershot and Frimley was 2s. 6d., and in the urban districts 3s. 2d. for lighting and 2s. 9d. for other purposes. Upon these figures they were in a position to compete for the War Office contract; and if their powers were preserved to them in the district, they would be able to favourably compete. Calculating on the rate of increase of the past ten years, they arrived at an estimated increase of 240 million cubic feet. They were seeking authority to supply power gas. For pumping their own water they were using power gas, and there were mills in close proximity who would take it. At present, in Aldershot they supplied from 40 to 50 million cubic feet of gas per annum to the War Department for lighting, heating, and power. With regard to electrical supply, from the gas engineer's point of view this was an area where it would be advantageous if the powers for the supply of gas and electricity were coterminous. They were seeking to repeal the powers of the Ascot Company over certain parts of their area. Competition with gas or electricity was bad; but competition in bulk supply of gas was necessary. When the last War Office contract was made, the Aldershot Company tendered at 2s. 2d. per 1000 cubic feet, and the Yorktown Company at 2s.; the latter being successful. The Aldershot Company had no objection to competition for this contract so far as the Staff College was concerned; but they did object to competition for the War Office contract in the rest of their district. He did not agree that they were fighting to take away from the Yorktown Company the War Office contract, which was a fifth of their supply, and then to buy them up.

Replying to Mr. HUTCHINSON, witness said that, with regard to the contested area, for the purposes of the War Office contract, whether

for gas or electricity, both Companies should have concurrent and equal rights.

Mr. Charles Hunt said he had examined the books, and found that the Aldershot Company could manufacture gas into the holder at 5d. per 1000 cubic feet less than the Yorktown Company, which placed them in a better position for competing for the War Office contract. From the War Office point of view, the Aldershot Company were a very valuable source of competition. The contract was an important matter; but he did not think it was of vital importance to either Company. Supposing the Yorktown Company lost the contract, there might be a loss on their undertaking for a year or two; but this would very soon be overtaken, having regard to the rate of increase of their business.

Replying to Mr. VESEY KNOX, witness said the Yorktown Company were supplying at a lower price than they really ought to in justice to their own customers. He was against competition; and the Aldershot people were in a better position to supply the War Office than the Yorktown Company.

In answer to the CHAIRMAN, witness said he did not think the War Office should have the benefit of competition, because there was a temptation on the part of one Company to undersell the other, and sell gas at a price which might do injustice to the ordinary consumers. He would consider the Aldershot Company hardly treated if they were deprived of the district.

The CHAIRMAN: You do not object to competition so long as your competitor is taken out of the way?

Mr. Mountain, an electrical engineer, of Huddersfield, gave detailed evidence with regard to the electrical scheme.

Mr. E. B. Taylor said that, for the purposes of the water proposals in the Bill, the necessary capital was £54,000.

Mr. HONORATUS LLOYD then addressed the Committee on behalf of the Aldershot Company, and in opposition to the Yorktown and Blackwater Company's Bill. The Committee, he said, should maintain to them such rights in these areas as would enable the Aldershot Company to compete for the War Office contract and give the supply. The one desire of the Yorktown Company was to get rid of the Aldershot Company in the area where the War Office buildings were situated, so that they would not have the competition. He held, on the other hand, that, under the special circumstances of the case, both Companies should have equal powers. He also objected to the Yorktown Company altering their name so as to include Camberley, because the Aldershot Company supplied a large portion of that district.

Mr. VESEY KNOX, in addressing the Committee on behalf of the Yorktown Bill, said that competition for the War Office contract was to the disadvantage of every consumer in the district, as well as to the disadvantage of the shareholders of the small Yorktown Company. If the Aldershot Company got rid of the Yorktown Company in the contested area, and they were unable to compete for the War Office contract, they would drive the Yorktown people to sell their undertaking to them. The competition for this contract should be done away with, and the Yorktown Company should be left in the area. If this were done, they would insert a clause for the protection of the War Office.

After the Committee had consulted privately for some minutes,

The CHAIRMAN announced that for the sale of electricity the area of the two Companies would be divided. With regard to gas, the Committee unanimously confirmed the Yorktown Company's rights to supply in the contested area, and that no special privilege was to be given to the Aldershot Company to tender for the War Office contract. As to Mond gas, they asked that a clause should be inserted to satisfy the Committee—showing that it should be kept as separate as possible, so that no loss should fall on the shoulders of the gas and water consumers. As to Easthamstead, they were unanimously of opinion that the area for compulsory powers should be extended, giving them a period of (say) five years for a larger area. Subject to this, they approved the preamble of the Bills, which would be proceeded with.

Wednesday, April 28.

The Committee met again to-day for the purpose of considering the clauses of the two Bills.

Mr. VESEY KNOX brought forward a new clause, which was as follows:

So much of the Order of 1877, the Order of 1890, and the Act of 1896 as authorizes the Aldershot Company to supply gas in or for use within so much of the parish of Frimley as is included within the area not defined by the section of this Act of which the marginal note is "Extension of Gas Limits," is hereby repealed, and from and after the passing of this Act no gas shall be supplied by the Aldershot Company in or for use within so much of such parish for any purpose whatsoever; and all the powers of the Aldershot Company with reference to the supply of gas within so much of such parish shall cease and determine.

Mr. HUTCHINSON said they did not understand the decision of the Committee to affect the power to supply in bulk by the Aldershot Company.

Mr. VESEY KNOX said the decision was that the Yorktown Company were to have the right to supply in the area where the War Office property was situated. The Aldershot Company's powers to supply gas there were repealed, and they were to have no special privilege to compete for the War Office contract. They were now trying to alter the clause so as to get behind the decision of the Committee and compete for the contract.

The Committee decided that the new clause should be inserted in the Yorktown Bill.

Reduction in Price at Walton-on-Thames.—The Walton-on-Thames and Weybridge Gas Company announce a reduction in the price of gas of 1d. per 1000 cubic feet, as from the Lady-day quarter—making the charge 3s. 8d.

Failure of Gas at Wigton.—Last Sunday week, through the bursting of a pipe, the gas-main at Wigton was, it is stated, flooded with water, in consequence of which the town was without gas. On the following day, however, the water was pumped out of the main, and matters were thus put right.

MISCELLANEOUS NEWS.

EXAMINATIONS IN GAS SUPPLY.

The City and Guilds Question Paper.

In the "JOURNAL" last week (p. 244), we published the question paper in the examinations in "Gas Engineering" conducted by the City and Guilds of London Institute. We now give the questions submitted by Mr. J. H. Brearley in "Gas Supply," the examinations in which subject were held last Saturday. In the case of the questions marked with an asterisk, sketches had to be used; and the candidates were advised to make them wherever possible and pertinent, as they would enhance the value of their other answers. Not more than eight of the numbered questions, and only one of the alternative questions, were to be attempted in the four hours allowed for the paper in each grade.

ORDINARY GRADE.

* 1. Describe the following: (a) Ratchet stock, (b) Venturi tube, (c) a well-constructed gas-cock, (d) one form of thermostat, (e) Forster pipe joint. [39 marks.]

2. What are the advantages and disadvantages of gas and air adjusters as applied to (a) inverted incandescent gas-burners and (b) gas-fires? What precautions should be taken in each case when installing inverted burners or gas-fires to ensure satisfaction in use to the consumer? [39.]

3. Describe fully the cycle of operations that takes place in the cylinder of an "Otto" type gas-engine. If a gas-engine slowed down and finally stopped, how would you proceed to locate the fault? [39.]

4. A series of empty rooms are each illuminated with (say) a roo-candle power inverted burner. The walls and ceiling of each room are papered or painted with one of the following colours: (a) Yellow, (b) black, (c) brown, (d) blue, (e) white, (f) chocolate. State in each case what percentage of the rays of light falling upon the surface of the ceiling and walls will be reflected. What is the influence of dirt on reflection, and to what approximate extent would it affect the reflecting power of a yellow paper after five years' use in a residence situated in a manufacturing district? [39.]

* 5. Describe the construction of one form of (a) upright and (b) inverted incandescent burner by means of which "lighting-back" is effectually overcome. What effect has "lighting-back" on the combustion of gas and its products? [39.]

6. Describe fully (a) the cause of drawn lead joints, (b) the method of preparing, and the tests to be applied to, a cement mortar for gas-main joints, and (c) the means you would adopt of demonstrating to a consumer that the pressure of gas at his meter inlet is always adequate for his requirements. [39.]

7. (a) Why is fire-clay used for the fuel of gas-fires and for the lining of the back and sides? Which is usually the best method of connecting the flue-pipe of a gas-fire to a chimney constructed for use with a coal-fire, and what are the principles that determine such a form of connection? [36.]

or, (b) What is the cause of oven burners "smothering" out? What means would you employ for ascertaining whether there was deficient or excess ventilation—i.e., air passing through the oven? [36.]

* 8. (a) Give sketch in section of a station governor, and explain how the pressure in the district is controlled. Describe the construction of the valve you consider most suitable for use with governor connections. [36.]

or, (b) What are the considerations that determine the employment of district governors? Explain, by the aid of a sketch in sectional elevation, the use of a differential district governor. [36.]

9. (a) State the best form of movable pendant for (a) drawing-room and (b) workman's bench. Give in each case the points of construction and conditions in use that determine your preference for the type selected. [36.]

or, (b) Describe two forms of anti-vibrator suitable for street-lanterns; state which you prefer, and why. In what way may rubber tube connections become disadvantageous? [36.]

10. (a) Explain the constructional features and advantages in use of any two of the following: (a) Macfie's governor meter, (b) Thorp's discount meter, (c) Valon's stop meter. [36.]

or, (b) What means are employed in wet meters for preventing "slow" registration? Give one method of maintaining an unvarying water-line in wet meters. [36.]

HONOURS GRADE.

1. (a) Particulars of the information required in answer to this question accompany diagram No. 1 in the folded sheet printed in grey which is given you.† The answer must be written in the space provided on that sheet, which must be inserted in your answer paper. [39 marks.]

or, (b) See diagram No. 1 on the folded sheet printed in grey for particulars of this alternative question. All the particulars required must be written on the sheet containing the diagram, except the specification, which must be written on the last page of your answer paper, in which the diagram sheet must be inserted. [39.]

2. Diagram No. 2† indicates the contour of road, distances and sizes of mains laid in the road, which is situated in an outlying district. At point A [on the datum line], a 6-inch gas-main is joined to a 3-inch main, at point B [one mile distant, and 200 feet above the datum line] the size is increased to 4 inches, and at point C [half-a-mile farther, and 50 feet below datum] it is again reduced to 3 inches. With the

† This diagram was supplied in order to economize the candidate's time, and was a ground floor and first floor plan of an eight-roomed house. The candidate had to use this for the insertion of certain particulars as to pipe running, &c.

† This diagram and those referred to in the next question were given in the examination paper.

minimum draught on the mains, the gas pressure at point B is 5 inches; but at maximum draught (for four calendar months in the year) it is reduced to 6-10ths of an inch. For an approximate distance of 300 yards on either side of point B, the supply is then inadequate for the consumers' requirements. Explain fully two remedies, state which you prefer, and why. The answer must pay due regard to first cost and cost of maintenance. [39.]

3. (a) To upright burners of the "C" type an opal dome shade and a squat opal shade are fitted. Show by curves the effect on the hemispherical illumination (*i.e.*, throughout a vertical arc of 180°) in each case as compared with the illumination given by the respective burners *minus* such glassware. What is the relative effect upon the lower hemispherical intensity of (a) glass shades and (b) metal ring and rods when used for the purpose of carrying reflectors? [39.]

or, (b) Plot a light-distribution curve of (a) any inverted gas-burner with which you are familiar, and (b) any filament electric lamp. Explain how the candle power has been ascertained. How may the results at any given angle be modified in the construction of the inverted gas-burner? [39.]

*4. State the guiding principles of good schoolroom illumination. A schoolroom 20 feet wide, 30 feet long, and $12\frac{1}{2}$ feet high contains separate desks for 12 students and a teacher. The desks are $2\frac{1}{2}$ feet high. What lighting arrangements would you employ so as to maintain an approximately even illumination of 2.5 foot-candles upon each desk surface, and what would be the number, candle power, and height from the floor level of the light units employed? A simple sketch in plan must be shown to show the relative position of desks and lights in the system adopted. [39.]

5. (a) What is the nature of the damage to gas-mains caused by electrolysis and electric fusion? What are the best preventatives (a) in the case of existing gas-mains and (b) in the operation of laying new gas-mains? [39.]

or, * (b) What methods may be employed for connecting wrought-iron services to Mannesmann steel mains? Show by sectional sketch the form of joint you would adopt, and give reasons for your preference. [39.]

6. Describe a method of automatically lighting and extinguishing street-lamps in which pressure from the distributing governors does not form part of the operation. The appliance described must be adaptable to an inverted burner street-lamp, the method of fixing to which must be fully explained, together with the precautions necessary for efficient working. [36.]

7. What purposes do indicator diagrams serve in gas-engine practice? Show diagrams, and explain the effect on the respective curves of (a) a contraction in the exhaust-passages or an obstruction in the exhaust-pipe, (b) pre-ignition, and (c) late ignition. [36.]

8. Give a list of the types (not makes) of gas wash-pans or boilers with which you are conversant. To what efficiency tests would you subject them when making a selection, and upon what constructional and other points would your preference for any particular one be determined? [36.]

9. (a) What is the catalytic theory of the luminosity of incandescent mantles? What precautions must be observed in order to obtain the maximum luminosity from a given quantity of gas in a low-pressure burner? [36.]

or, (b) How is the incandescent gas-mantle made? What is its composition, and what is the effect of each component on the functions of the mantle? How would you test a mantle for efficiency and durability? [36.]

*10. What are the constructional points to be observed in a gas-fire in order to effectively remove the combustion products? Show by sketch in sectional elevation and describe what you consider the best means of conveying the products from the point of combustion to the point of discharge in the chimney of an ordinary fireplace. [36.]

Library Lighting by Gas and Electricity.

At the meeting of the Lambeth Borough Council last Thursday, the Libraries Committee reported that they had had under consideration the advisability of wiring the Carnegie Library. With regard to the libraries already wired, the Committee had been asked to fix the annual sum which should be charged against the Libraries Department for the supply of current. The following is a comparison between the cost of lighting with gas and electricity so far as can be ascertained from experience gained up to the 31st of March last: Tate (Central), average annual cost of gas, calculated on the three years ended March 31, 1907, £112; electricity, at 3d. per unit, for the year ended March 31, 1909, £159. West Norwood, gas £36, electricity £74; Durning, gas £42, electricity £90 (estimated, but £80 was the actual cost from June 3, 1908); Tate (South Lambeth), gas £52, electricity £115 (estimated, but £48 was the actual cost from Nov. 24, 1908); total, gas £242, electricity £438. It was explained that the average annual cost of gas included that supplied to the stoves; and this would still be continued in addition to the cost of electric lighting. The Committee went on to say that the figures given above did not represent the relative cost of gas and electricity, as the volume of light supplied might not be the same in each case. The price of gas at present is higher than it was during the three years ended March 31, 1907. On the other hand, the cost of maintenance (electric lamps, &c.) will be greater than the renewal of mantles and globes, though it is said that electricity will possibly reduce to some extent the cost of cleaning and redecoration. Bearing in mind that it was only at the suggestion and for the convenience of the Council that electric light was installed in the libraries, the system of gas lighting previously in operation having been perfectly satisfactory and efficient, the Committee decided that the Libraries Committee should be only debited yearly with the average cost per annum of the gas supplied to the four libraries during the three years ended March 31, 1907.

Cheaper Gas at Darwen.—At last week's meeting of the Darwen Gas Committee, it was decided to reduce the price of gas 3d. per 1000 cubic feet from July 1. Gas for street lighting was also reduced to 2s. per 1000 cubic feet—this being equal to a reduction of 5d.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company, London and North-Western Railway Company, and Great Western Railway Company.

Fifth Day.—Friday, March 26 (Continued).

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for the use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The earlier proceedings were reported on pp. 105, 167, 240.

The following were the Counsel engaged: For the Corporation: Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASPINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

A Corporation Witness Interposed.

Mr. John Foster, Engineer-in-Charge of the Windsor Street Gas-Works (whose evidence for the Corporation was interposed at this stage of the Railway Companies' case), examined by Mr. FOOTE, said he had been in superintendence of the works for six years. With regard to the number of empty coke-waggons put into the works by the London and North-Western Railway Company, the maximum in winter might be some 50 a day, and at other times about 30. In addition to this, there were (say) two trucks a day of lime and oxide, two of fire-clay, and three for miscellaneous goods. This made seven altogether for inward traffic other than coal. There was in the case of this Company no question with regard to a rebate on coal, as that was already given; but he might mention that 82 trucks a day was the maximum for coal going in. The general traffic to which he had referred was dealt with in the same way as the coal—put into the same sidings, by the same engines. The coal was backed by the Company into sidings; and the coke-waggons were as a general rule placed by the Corporation locomotive on the Company's siding. Under ordinary circumstances, the coke traffic could certainly be dealt with in this way; but there were occasions when it was very heavy, and when the Company could not take the traffic away in a reasonable time, and then the Corporation locomotive ran over the Company's lines and took the waggons to the marshalling place.

Cross-examined by Sir ALFRED CRIPPS: It had happened two or three times the last twelve months that the Corporation had taken out the coke-waggons and put them on the marshalling siding. It was then done for the convenience of the Company, and not for that of the Corporation. Each time this occurred, the Corporation locomotive was off the works for a period of about twenty minutes. The inward miscellaneous traffic was first of all brought into the Company's sidings below Avenue Road, and then backed on to the Company's siding connecting the railway system with the works. They arrived at the first sidings mixed up with other traffic.

Evidence for the Railway Companies.

THE MIDLAND RAILWAY CASE.

Mr. John Thompson, Depôt Master and Traffic Inspector of the Midland Railway Company at Birmingham, in answer to Mr. MACASSEY, said he was acquainted with the method of working the traffic of the Corporation into and out of the Saltley and Nechells Gas-Works. Coal destined for the works would come down to Washwood Heath sidings either in mixed or in full trains. In the case of a full train, if they were sure of getting it delivered straight away into Saltley or Nechells, it would pass outside Washwood Heath sidings, past Saltley Station, to the works. If it was necessary that a full train should be stopped at Washwood Heath sidings, it would remain there until it was possible to send it down to Duddeston Mill sidings or the connecting sidings to the works. In the case of Corporation trucks in mixed trains, the train-engine had to remain until the whole operation of shunting was over, so as to get the waggons on the proper sidings. A shunting engine dealt with the other traffic; and were it not necessary for the train-engine to remain and shunt the Corporation traffic, it would be liberated and sent to other duties. After explaining the method in which the traffic was got to the Corporation sidings at Saltley, he stated that in some cases the gas-works officials whistled when they wanted coal. This was when they had emptied the siding entirely. As a rule, however, the Company watched the working of the Corporation engines. No particular siding at Duddeston Mill was reserved for empty coal-waggons coming out of the gas-works. They were distributed into any convenient siding for dispatch. There was a particular siding used for sorting empty waggons for coke that were going into the Corporation reception sidings. The shunting engine at Duddeston Mill sidings made about eight journeys every 24 hours to and from the Corporation sidings; and were it not for the necessity of

passing the Corporation traffic to and from these reception sidings, this shunting engine would not be there at all. The shunting in Duddeston Mill sidings would then be done by the train-engine arriving there. They did not deal with the small miscellaneous traffic of Washwood Heath in the same way as they did with the coal. It was worked into Lawley Street; taken again into Duddeston sidings; and then the shunting engine brought it across from there, just as it would empty coke-waggons. There would be complaints if they locked it up among the coal at Washwood Heath. There were two sidings at Duddeston Mill into which coal for Nechells was put.

Mr. MACASSEY: Those two sidings, as I understand, are allocated specially to gas-works traffic?

Witness: They are very largely used for gas-works traffic.

Justice LAWRENCE: That is probably a better expression—"they are very largely used" for it. We have had evidence that sometimes there is other traffic put in there.

Examination continued: They never put coal into the connecting siding at the works unless they knew there were no empties to come out. There was an arrangement made between the Midland servants at Duddeston sidings and the Corporation employees. If coal was placed on this siding every time it happened to be vacant, no empties at all could come out of the works.

Mr. MACASSEY: It has been suggested that if this connecting siding were made longer, it would in some way or other facilitate the dispatch of the coal into Nechells and its being more quickly cleared by the Corporation. If it were longer, would that in any way enable the Corporation to take the traffic off it more quickly and more frequently?

Witness: It would depend upon their internal arrangements.

In your judgment, does the clearing of this siding depend upon their arrangements inside the works?—Yes; it is worked for their convenience entirely.

Even if the siding were longer, could they work it in any other way?—I do not think they could.

Further examined: The Company kept a special siding at Duddeston Mill for storing empty waggons for the outward traffic of the Corporation; and they generally had a reserve of 35 or 40 waggons on hand for coke. These empty waggons could not all at once be passed into the works; they went in small numbers from time to time as the Corporation people ordered them. The appropriation of the two sidings at Washwood Heath to gas-works traffic imposed very great inconvenience upon the Company. The delay caused by the shunting operations seriously affected the general working. At Duddeston they had to employ three foremen who would not be required but for the special services in connection with the Corporation work; and their wages amounted to £268 a year. These sidings, too, would not be opened on Sunday nights were it not for the gas-works traffic; and the cost of so opening them was about £23 a year. Owing to the passage of traffic in and out of the Saltley works, across the running lines, there was considerable delay to the traffic passing over the main line there. In regard to Washwood Heath, the total delay to engines of all kinds during the week ending Feb. 28 last caused by the method that had to be adopted in dealing with the Corporation traffic amounted to 86½ hours; or deducting the period which it might be suggested was occupied in work which was properly part of conveyance, he put the delay at about 75 hours. At Duddeston Mill, the shunting engine was occupied 155 or 156 hours per week. Though but for the Corporation traffic they would not use this engine, they did, in point of fact, at the present moment employ it for shunting a portion of the other traffic there. For this he would deduct 56 hours; leaving a balance of 100 hours attributable solely to the Corporation. During the time that the Duddeston shunting engine went to the gas-works and dealt with the traffic, it necessarily blocked all the six running lines through Saltley; and 14 hours was the total delay to passing trains by the operations during the week named. This was a very light week indeed; and the delay was much greater as a rule. If the special sidings at Washwood Heath were full of gas-works traffic, it became necessary to hold back the traffic on the journey to that point. As to Mr. Hampton Barber's statement that the Corporation had never received any complaint from the Company that their traffic was blocking the Company's sidings, he (witness) had called at the office on several occasions and complained. On five days during 1908, the number of waggons for the gas-works on hand at Washwood Heath was over 300.

Mr. BALFOUR BROWNE (in cross-examination): You have spoken in part of your evidence of the great inconvenience that is caused to your Company by dealing with our traffic. Do you know as a fact that the Corporation pay to the Company £80,000 a year? You would expect that you would be put to some inconvenience for that, would you not?

Witness: We should expect to work their traffic, I suppose.

I would like to ask about these hours that you have accumulated upon us. How did you calculate that the main line was blocked by our traffic—traffic from our works going over to Duddeston sidings, for 14 hours?—I had a responsible man day and night doing nothing but taking particulars of the delays and the operations in connection with the gas-works traffic.

I take it to mean that we blocked it with coke-waggons going over from our works full to Duddeston sidings, or empty waggons coming over from Duddeston sidings?—Or else the Midland engine putting coal in.

In that case it was your own traffic blocking your own traffic?—It was the gas-works traffic—traffic for the Corporation.

Do you know that when a thing is performed for a trader, he can give the Company notice that he does not require it to be performed? How would you like it if we gave you notice that we did not require you to block the main line? Could you conduct your traffic?—We could conduct it with very much less delay than we do now; and it could be taken into the gas-works.

If we gave you notice, as we are prepared to do at any time, that we do not require you to block the main line, what would you do?—We should have to block the main line, and bring the traffic to the gas-works—work it over the main line. The work we do is done because the gas-works cannot take their traffic in very quickly. We put the traffic in as they can take it.

Cross-examination continued: The sidings at Lawley Street Station

were to a certain extent used in the same way for other traffic as those at Duddeston were for the Corporation traffic. If the Corporation consigned their traffic truck by truck, the Company would have to deal with it just as they did with a trader's truck. At Nechells a full train-load was 35 trucks; but at Saltley a full train-load might be 50 trucks. They had at Saltley, by special permission, taken into the works 35 trucks at a time—that was, on the two sidings. If they could take a full train-load at Saltley direct from the colliery, none of the operations that had been mentioned were necessary at Washwood Heath. He could not say whether it was possible for the Corporation to take a full train-load at Nechells. He knew that the coke-waggons were hired by the Corporation from the Company; and it seemed reasonable that if they hired them the Company should send them in. He had, however, included the crossing of these trucks from Duddeston sidings in his calculation of the time the main line was blocked.

Mr. BALFOUR BROWNE: I see you make this extraordinary statement. You said that in the Duddeston sidings for 56 hours in the week named the shunting engine was used for your own purposes, and 100 hours for the purposes of the Corporation. What do you mean by your own purposes?

Witness: Shunting our own trains.

What are your own trains? Are not they trains with public traffic in them?—Yes.

So are the Corporation trains?—I meant not shunting yours—other than Corporation traffic.

You treat the public traffic as your own traffic, and ours as aliens traffic?—I hope not.

Mr. BALFOUR BROWNE: I really do not want to go into this question of the hours' delay. I do not think it is necessary. I will leave the witness there.

Justice LAWRENCE: It is a question of principle. (To witness:) If the trader was ready to receive all his traffic in full trains, would you be desirous of taking it to him in that way?

Witness: We should very much like to take it direct in full trains, if they could take it direct into the Saltley works.

If they could take it direct into the Saltley works, is there any object that you have as a traffic manager in dealing with it otherwise than running it straight on?—Absolutely none. There is no object in taking it into Washwood Heath, except that they do not accept it as it arrives.

Mr. John Elliott, Superintendent of the Line of the Midland Railway Company, questioned by Mr. MACASSEY, said the present method of working the traffic to and from Saltley from the Saltley and Nechells works was an inconvenient one, and expensive to the Company. It would unquestionably be more convenient and less expensive to the Company if the Corporation accepted their coal as and when it arrived. The Company had no object in holding the traffic at Washwood Heath instead of taking it down promptly to the works. They were compelled to do it under existing circumstances. It was not possible at present to take the full trains into the Nechells and Saltley works.

Mr. BALFOUR BROWNE (in cross-examination): We hear that since 1896 the Washwood sidings, though there were some there before, have been largely increased. I suppose they were designed and increased in size with a view to getting some increase of convenience out of the working?

Witness: They were never designed for storing coal there for days in connection with the convenience of an intermediate tradesman.

That is not for you to say. There I think you are acting as a partisan. I ask, were they designed for the convenience of the Midland Railway Company?—They were unquestionably designed for the convenience of working the traffic.

Mr. MACASSEY said he had a certain amount of evidence as to the cost to the Company of providing these sidings which were used more or less exclusively by the Corporation traffic, and also evidence as to the expense to the Company of engine power and other services rendered in connection with the traffic. He did not know whether the Court would care to hear it.

Justice LAWRENCE: It seems to me that we have not got to consider the quantum in respect of service at or in connection with the sidings. We only have to consider whether there are such services. In a case of this sort, we cannot go into the question of reasonable amount. I know the decisions have said that in a sense the amount would come into consideration. For example, if we came to the conclusion in favour of Mr. Balfour Browne that there was to be a rebate, there would have to be an investigation into the amount that was attributable to terminal services in respect of which he should get his rebate. You would have to split up the figures, and say how much was attributable to station terminal or terminal service which was not rendered to this freighter, and how much was left as attributable to the other things. I do not know whether the Court is the tribunal to deal with that now.

Mr. BALFOUR BROWNE: I should like to point out, after what Sir Alfred Cripps said, that there is nothing turning upon the question of reservation of sidings. Mere calculation as to what that reserve siding costs can have no bearing. They would need to do this—and I do not suppose they are prepared to do it—to go into the whole cost of the sidings at Washwood Heath and Duddeston, and the whole cost of the independent sidings, and then divide it somehow over the whole of the traffic that used it. That seems to me to be a herculean task that your Lordship should not be called upon to do.

Mr. MACASSEY: That is precisely the evidence I have here, to show what it is in pence per ton of traffic carried by the Midland Railway Company for the Corporation.

Justice LAWRENCE: It will have to be considered at some time if the rebate is to be allowed; but it seems to me that it is premature at this stage to deal with that. There is quite sufficient to be determined here. You have shown us that if there is any service properly called a service at or connected with a siding, then it is a sum of some proportion, I will not say a considerable proportion, because that might seem to be determining something, but there is a sufficient proportion to make it at all events reasonable to say that we would not go into it. If, on the other hand, Mr. Balfour Browne establishes his case, that there is some portion of what you are charging that ought to be regarded as a station

terminal for a station service, then we will make an order to that effect; and an inquiry must be held as to what is the amount of the proportion of that charge.

Mr. BALFOUR BROWNE: If the Court really made such an order, it seems to me that the Corporation and the Railway Company could probably put their heads together and come to some understanding. If your Lordship decides the question of principle, I think possibly that might be done. My learned friends have, if I may say so, properly said here "There is a carting terminal in these rates for general traffic that shall come off."

Justice LAWRENCE: With regard to which traffic?

Mr. BALFOUR BROWNE: The general traffic. I am still going to rely upon certain cases which show that, whether there is a terminal charge in it or not, we may still be entitled to a rebate or allowance.

Sir ALFRED CRIPPS: Then the apportionment of the figures into whatever it might be would be a subsequent matter. Let us take it that your Lordship will decide on the point of principle first; and if that is so, I do not know that we could assist the Court further as regards the Midland case. We have to show the nature of the services we perform in connection with the present sidings.

Mr. BALFOUR BROWNE: One matter that will have to be determined as a matter of principle is whether as a fact services are rendered to us for which they can make some charge.

Justice LAWRENCE: We have to determine that, as I gather, because they have in this case divided the rate, and said there is rd., or some such sum, in respect of those services. Therefore you are entitled to say, I think, upon that: "That is their own admission; and consequently unless you are satisfied there is some service performed, there must be something to come off."

Sir ALFRED CRIPPS: Taking the Midland case, where we have admitted, or at any rate stated, that a part of our charge is in respect of services in connection with the station terminal, and is not included in the conveyance rate, it seems to be incumbent upon us to show that we have performed a class of duty or service which entitles us to make a charge under that head.

LONDON AND NORTH-WESTERN RAILWAY CASE.

Mr. Thomas Mitchellhill, Mineral Traffic Manager of the London and North-Western Railway Company, in answer to Sir ALFRED CRIPPS, said, with reference to the inward traffic to Nechohls (other than coal, as to which no question was raised), that the way in which the traffic had to be worked in connection with the sidings involved more work upon the main line than was necessary. It was, however, essential to work as they did, having regard to the position and the traffic which went on at the Nechohls sidings. The outward traffic was taken away in a mixed condition—perhaps half-a-dozen empty coal-waggons, then perhaps some coke, and so on. The Corporation placed the train on the siding; and the Company's engine drew it out in this condition, and took it straight away into Windsor Street Station, a distance of $1\frac{1}{2}$ miles.

Sir ALFRED CRIPPS: For that $1\frac{1}{2}$ miles round to Windsor Street Station, you do not seek to make a conveyance rate; but you make a charge in respect of services in connection with the siding?

Witness: Nothing is charged for conveyance between here and Windsor Street; and I might say that in fixing the rates for this traffic, we based them on the Windsor Street distances—that is to say, the rates are alike.

Sixth Day.—Monday, March 29.

Mr. Mitchellhill was recalled on behalf of the London and North-Western Railway Company, and further examined by Mr. SIMON. He said that, in view of the way in which the outward traffic was presented to them at Nechohls, it was impossible for the goods engine to take it and carry it on the journey towards its destination without great rearrangement. As the lines just outside the works had heavy traffic on them, it was impossible to do the marshalling there. Windsor Street was the nearest place it could be taken to for the purpose. They would be quite content to take the traffic straight away if it could be done; but he thought there would be a difficulty in the Corporation putting down any more sidings. Then there was the further difficulty that these sidings were on a falling gradient towards the gas-works. There was also an awkward curve there. From the point of view of arrangement before the conveyance could start, the same general conditions obtained at Windsor Street as at Nechohls.

Mr. SIMON: As the Court know, the London and North-Western Company claim that rd. is in the rate for these services at or in connection with the sidings. I am not going into the quantum; but I want just to ask you this: Supposing that these services which you have to render at or in connection with your sidings were rendered unnecessary through the Corporation presenting you the traffic in unreasonable order, would you be very glad to give up your rd.?

Witness: Yes. I do not think we make any profit out of the rd.

Examination continued: As to the miscellaneous traffic inwards, with but one or two exceptions the rates were within the powers for conveyance and terminal, without allocating any terminal to the receiving end. There were two slight exceptions. The first was Manchester paint in casks, 2rs. 10d. per ton, carted and delivered. After taking off the cartage allowance at both ends, this rate seemed to be unjustifiable with the other terminals at the starting end, to the extent of 1s. 3 $\frac{1}{2}$ d.—that was to say, 1s. 3 $\frac{1}{2}$ d. must really be placed against Windsor Street to justify the rate after allowance for cartage. Now the attention of the Company had been called to the matter, it had been looked into. The total amount of traffic that had passed under this rate in three years was, as far as could be traced, 4 $\frac{1}{2}$ tons. Then there was Oldham, iron borings at 8s. 3d. There was here a small excess. So far as he knew, the only traffic ever passed at this rate was 4 tons in 1906. The cartage and delivery charge could be adjusted by the parties.

Justice LAWRENCE: What is there we have to deal with then?

Mr. BALFOUR BROWNE: I say that in each of these there is a terminal at the Windsor Street end. In that case, if there is a terminal, I

shall claim that, as no service is performed for us, they cannot charge us that terminal. There has never been any request to the Railway Company to disintegrate these rates.

Mr. SIMON: Except in two cases, the rates are not above our maximum, even if we include any kind of terminal at the receiving end. The moment we are asked to disintegrate, we should, of course, say: "There is no charge there at your end at all. We can justify this by conveyance, together with terminal at the other end." As long as we may be treated as being in the same position as though we had been asked to disintegrate, and as though we had replied, "Every one of these rates is justified by being built up in this way, with the result that there is no charge at the Windsor Street end," I am content.

Mr. BALFOUR BROWNE: Except in those two instances, I think I may treat you in that way—as if you had said there is no charge.

Sir JAMES WOODHOUSE: You are going to ask us to infer there is a terminal?

Mr. BALFOUR BROWNE: I am going to ask you to infer that in each of these rates there is a terminal.

Cross-examined by Mr. BALFOUR BROWNE: Oxide of iron would be carried in the same way as a truck of coal. On coal a reduction of 6d. was given, so as to make a fair rate in competition with the Midland Company. He had no information as to the rate that was charged for oxide. Lime would be dealt with in exactly the same way; and the lime rates were much below the maximum for conveyance. A full train-load of coal was 38 trucks; and he had seen this number on the siding. He had not meant to say that working the coal in threw more work on the main line than was necessary. He had intended to say that the operation of dealing with inwards traffic which caused the Company to leave waggons on the main line so as to get round them interfered with working on the main line.

Mr. BALFOUR BROWNE: Do you agree that a railway company could not carry on the business of a carrier if there was no place to shunt or to stand and deposit their trucks in; and they cannot therefore be said to perform a special service by having or using or granting the use of such a place?

Witness: Of course, I am bound to say that to conduct their business railway companies must have shunting and marshalling sidings.

As a fact, you have your shunting and marshalling sidings for this traffic for Nechohls at Windsor Street?—I repeat again that we should not require to take the waggons to Windsor Street if they were handed to us in the order in which the train could pick them up.

Mr. SIMON (in re-examination): It is rather suggested that the work which you do at such a place as Windsor Street Station siding is of the true marshalling kind which would be included in the conveyance charge. Do you distinguish between marshalling and sorting?

Witness: There is a distinction. Sorting is taking the waggons in the rough condition in which they are handed to the Company, and then dividing them out on to different sidings. Then when they have been placed in the sidings they are still to a certain extent in a rough condition for the train to take them away. The train proceeds with them; and on its way it may come across other sidings where the waggons have to be marshalled with other waggons which have come from other places.

It is one thing to divide waggons up for different trains, and another to arrange the waggons in a train in proper order. Does this rough sorting you have described as having to be done because of the inadequacy of the accommodation on the Corporation sidings at all dispense with the use of the true marshalling sidings up the line?—No.

Of course, the marshalling *en route* nobody suggests the Railway Company are going to charge for, except as part of the conveyance. If traffic is going to Windsor Street Station or coming from it, and you have to do the work that has been mentioned, is there included in your rates a charge for performing it on these sidings?—The Company are entitled to make a charge for it.

Is that the same kind of sorting work which you do for the Corporation traffic, even though it does not come from the station? Apart altogether from any question of the marshalling in marshalling sidings, do the waggons need sorting out?—Yes.

Justice LAWRENCE: I think we understand the difference. It is easier to understand than to express.

Mr. W. Alban Jepson, Assistant Goods Manager to the London and North-Western Company, in answer to Mr. SIMON, said that up to the end of last year he occupied the position now filled by Mr. Mitchellhill. With regard to the coal rates to the Windsor Street siding and the Nechohls siding of the Corporation, they were in both cases lower than the station rates. There was no such thing as a rebate. In the case of the Windsor Street works, the charge was 3d. less than at Windsor Street Station; and the Nechohls charge would be the same, were it not for the competitive rate which had been fixed to come into line with the Midland Company. In any event, "rebate" was an altogether wrong term to use. In the mind of every railway man there was a distinction between sorting such as could be done on the private trader's sidings, if he had adequate accommodation, and marshalling trucks, such as was carried out on marshalling sidings. To be absolutely free from any charge for terminal services, it ought to be possible for the train going in a particular direction to back into a siding and pick up the wagon for that particular direction. If any sorting had to be done to enable this picking up to be carried out, this would be, in his view, a subject for a charge. Getting the Corporation traffic in order, as they had to do, was quite outside conveyance. It was in respect of this sorting—coupled with clerk work, provision of sidings, &c.—that the Company claimed to make the charge at or in connection with these sidings. If the Corporation tendered the traffic sorted so that it could be hooked on to a train, the Company would be perfectly willing to forego the rd. charge. In fact, they would save money by it.

In cross-examination by Mr. M'CARDIE, witness was pressed to say whether there was a terminal charge included in coal delivered to Windsor Street Goods Station; but he declined to give a general answer to the question. He said, however, that in local coal traffic there probably would be some element of station terminal; but for the long distance coal and coke traffic such as they were dealing with in this case, the rate was very much more than covered by the conveyance

alone. He admitted that on Jan. 20, 1906, Mr. John Rawson, the Midland Company's Manager, telegraphed him: "Nechells Gas-Works. Do you not include something for terminal the same as Windsor Street, where powers given by you include 2d.?" His reply, on Jan. 25, was as follows: "Of course, you will understand that in setting down 2d. per ton as the terminal at Windsor Street, this was a very rough and ready calculation; and I should not like it to be used in any information which is proposed to be given to the Birmingham Corporation, as we might find a difficulty in supporting it. I do not think we have ever had to use the argument of a 2d. terminal at Windsor Street. In maintaining the present rates, and having regard to the large quantity of traffic dealt with there, I am inclined to think that both at this and the Nechells Gas-Works the usual practice of adding 1d. for services at private sidings would be quite sufficient. I should like to have a copy of any information you may be giving to the Corporation as regards coal rates to either Nechells or Windsor Street."

Mr. M'CARDIE: When did you come to the conclusion that there was no terminal included in these rates?

Witness: I say now that there was no terminal included in the rates to the Windsor Street Corporation gas-works sidings, because they are more than covered by conveyance.

Mr. ASPINALL objected to the case of coal being gone into, as it was not, in regard to this Company, before the Court.

Justice LAWRENCE said he did not see how it was relevant.

THE GREAT WESTERN RAILWAY CASE.

Mr. Thomas H. Rendell, Chief Goods Manager of the Great Western Railway Company, examined by Mr. RUSSELL, said the case against his Company fell under three heads—the inward coal traffic, the outward coke traffic, and the rate for bricks and retort material from Corngreave sidings which was in excess of their powers. The way in which the traffic was now worked at Swan Village was the only method in which it could be safely done. The sidings at Swan Village Goods Station, on which ordinary (not gas) coal traffic was dealt with, were opened in 1900; and then the same figures were put in force as were in operation at the gas-works. The private siding rates were the older ones; and the general station rates were made to conform with them. When the station rates were fixed, no specific sum was included for terminal. The rates were less than the maximum charge for conveyance; and no question of terminal would therefore arise. The rates from most of the collieries were only 66 per cent. of the maximum powers; and the highest charge in a table he submitted was no more than 77 per cent. The existing coke rates were put in force about 1893; and the filing of the application was the first intimation he had of any complaint in regard to them. When their attention was called to any charges which might be thought high, careful consideration was always given to the matter, and reductions were made, if thought fair. The empty trucks and the waggons of coke were put by the Corporation in the outwards sidings mixed up together. The coke traffic was very small; the average being about 4 trucks a day. The difference between the rates complained of and the amended rates for the six years prior to the application, which the Company were willing to refund, amounted to £67, or £11 a year. The outward traffic was taken to West Bromwich, where it was put on sidings and sorted and marshalled. For this use of West Bromwich Station, and the shunting and marshalling, the Company claimed to charge 1d. on coke. That was to say, the amended coke rates were made up of the maximum conveyance powers, plus 1d. Though the distance from Swan Village to West Bromwich was over a mile, the conveyance charge was calculated from a point exactly opposite the gas-works siding junction. The rate of 3s. 2d. for bricks and material from the Corngreave sidings, which had been reduced to 2s. 6d., was now based on the shortest physical distance. It did not include any charge for additional mileage. The traffic arose in connection with Messrs. Mobberley and Bayley's private siding. Owing to Cradley Heath Station being very much overcrowded, it was necessary to work this traffic down to Stourbridge and bring it back again. The former rate of 3s. 2d. was based upon the additional distance over the direct mileage.

Cross-examined by Mr. BALFOUR BROWNE: Formerly when the larger rate of 3s. 2d. was charged, 1d. was allocated to services at Messrs. Mobberley and Bayley's sidings. Since, however, attention had been called to the matter by these proceedings, it had been found that the work they had to do at these sidings was very onerous; and he had therefore, in the 2s. 6d. rate, added 2d.

Mr. BALFOUR BROWNE: This new invention of 2d. is not in your rate-book; and therefore it cannot justify your 2s. 6d.

Re-examined by Sir ALFRED CRIPPS: Though he was only claiming to make a charge of 2d. in connection with the Corngreave sidings rate, a week's observation showed that the cost per ton of goods of the Company's services at Messrs. Mobberley and Bayley's siding really came out at 3'9d.

Mr. Simon's Address for the Railway Companies.

Mr. SIMON, in addressing the Court on behalf of the Railway Companies, said that, in summing up the case, he wished to refer to the several propositions for which they contended. If a company were charging above their maximum power, there was, of course, nothing to discuss. All that remained was for the charge to be reduced. If, however, it was found that the Companies were within their maximum powers, there was really no inference to be drawn from the circumstance that the rate happened to be the same from or to a siding as it was from or to a station. The confusion that arose here was, he ventured to think, that when one was dealing with a case of undue preference, it was the essence of the matter that there should be competition. Here there was no element of this sort; but it was only in this way that an inference would really arise from the fact that there was inequality in point of total between a station rate and a siding rate. The rates which were charged by a railway company in England were not arrived at by the application of some cast-iron formula to distance. They were not part of a systematic, mathematic whole, which could be worked out *a priori* if one only knew the termini. They were, as a matter of fact, in every case such rates as a company thought it right and reasonable to charge within their maximum, having regard to the amount of the

traffic, the competition with other companies, &c. Therefore there was really no inference at all to be drawn. The next proposition for which they contended was that even supposing such an inference had a foundation or could be supposed to arise as a *prima facie* inference, it was rebutted as soon as it was shown that the Railway Company were, in fact, rendering services which were not within their conveyance charge. For this purpose, it was always to be remembered that there were two clauses in the Order which were correlative; and they could only fairly construe one by having regard to the other. One was clause 2, and the other clause 5. Clause 2 read: "The maximum rate for conveyance . . . includes provision of locomotive power and trucks by the Company and every other expense incidental to such conveyance not hereinafter provided for." In order to apply this clause fairly, one had to look to see what was "hereinafter provided for." It was only with clause 2 in mind that one could put the true interpretation upon clause 5, which spoke of the Company's right to charge for services hereunder mentioned or any of them when rendered to a trader at his request or for his convenience. Unless one read the two together, the real difference was not quite so apparent. The fundamental distinction was between the expense which was incidental to conveyance on the one hand, and a service or expense which was not incidental to the conveyance, but which was incidental to delivery and to reception, on the other. The odd thing was that this class of case was put forward by the applicants as though they were entitled to say: "I stand upon conveyance, and nothing but conveyance, the moment I show there is no station involved." This was not so at all. Traffic had to be received and delivered, whether there was a station or not; and in every single case, whether it was a station or whether it was a siding, they would always have these three elements appearing in order: First, the service of receiving; secondly, the service of conveying; and, thirdly, the service of delivery.

Justice LAWRENCE: Under which of these do you say it is? No. 5 is an authorizing section for services hereunder mentioned. Then you have to get it within one of the sub-headings in section 5, so as to be a service for which you are authorized to charge.

Mr. SIMON said the one under which they submitted they came was sub-section 1: "Services by the Company at or in connection with sidings not belonging to the Company." They had it on the face of the Order that Parliament did not contemplate that the expenses incidental to such conveyance, and the payment made for such expenses, which was the rate for conveyance, was going to include this at all. It was contemplated that these two things were correlative and contrasted. The next point was that they were not concerned there at all with the question of amount. All that they were now endeavouring to do was to show that there were services which were of the character mentioned in clause 5, sub-section 1, which the Companies rendered. Once they showed this, inasmuch as all the rate they sought to justify was comfortably within the maximum, the whole thing was over; and any inference from the equality of total entirely disappeared as soon as it was shown that there were services rendered which did come within this sub-section. It was suggested, he thought wrongly, that the Act of 1894 in some way which it was exceedingly difficult to grasp, conferred upon the applicants the right to come there to ask for a rebate or allowance, even without going to the length of establishing to the satisfaction of the Court that in the rate now charged to them there was a charge for station services or accommodation. He submitted that this was quite wrong. Section 4 of the Act was based upon the idea that there was to be a reasonable charge made; and that once it was shown that the charge in fact included something in respect of station services, this gave no right to ask for rebate. Until the time came when one could subtract something out of a total in which it was not at all, it was inconceivable that the Legislature should have intended section 4 to allow an applicant to come and claim a rebate or allowance, because he did not get any station services, though he had not succeeded in proving that there was any such charge for station services included in the charge made to them. Mr. Balfour Browne was, he presumed, going to argue that there was no difference between the sorting of trucks and the marshalling of trains—which latter was undoubtedly part of the conveyance.

Justice LAWRENCE: Mr. Balfour Browne says they are substantially identical—that, it seems to me, is the way he has been suggesting it by cross-examination.

Mr. SIMON: May I make this observation upon it? It may or may not be that somebody some day may hold that the two things alike fall upon the railway company to pay for; but nobody who appreciates what the transactions involve will say they are substantially identical in character. One is sorting trucks, so that the right trucks can be tied on to the right train; and the other is sorting out your train, which is quite a distinct operation. They are as distinct as any two operations can be.

Sir JAMES WOODHOUSE: I do not quite follow. We have had an illustration given of fifteen trucks standing in the sidings of the Saltley works. One of your witnesses, I think it was, said that trains were made up on these sidings by putting all the traffic going in a particular direction on one train, all that going in another direction on another, all that for the North-Western on another, and so forth. Is that what I understand you mean by sorting—that is to say, all the trucks for a particular district?

Mr. SIMON: No, not quite that. You will forgive me if I do not deal with that particular illustration.

Sir JAMES WOODHOUSE: It was a practical one that came before us in the course of the evidence.

Mr. SIMON: I do not deal with it for this reason, which is also a practical one—that, not appearing for the Midland Railway Company, I do not profess to have followed the evidence about the Midland Company's case. What a railway company are entitled to say, as I understand it, to a siding owner, is this: "I am quite prepared to come to your siding, hook your waggons on to my train, and then my train shall proceed. I quite admit that it may be necessary at some subsequent stage to break up my train, because there will be junctions, and other things of that sort." What a railway company are not obliged to do without being remunerated is quite a different thing. It is sorting out which of the trucks go one way, and which another. It cannot be that when a railway company run, as we know they do, goods trains

according to a definite time-table, they have got to take the waggons, some of which are going north and some south, and do the sorting of the waggons themselves.

Sir JAMES WOODHOUSE: What do you say is marshalling?

Mr. SIMON: I say it is a distinct operation—a different part of the journey. It is during the journey; and the journey is conveyance. Suppose you have a series of waggons not in their proper order in a train, and the train is going past three or four stations. You would come to some junctions where you are to get other waggons also going to that destination. I perfectly agree that breaking up the train, and possibly making it into two, at such a place as that, is an operation in the course of conveyance. No one disputes that; but this has nothing to do with the operation of seeing that the waggons are given to the railway company in such order that the train which passes is at any rate taking them the right way.

Justice LAWRENCE: Mr. Balfour Browne's favourite illustration is to take a single truck. He says: "I am entitled as a freighter to give a single truck, am I not; and you are bound to take it away, and take it when we like?"

Mr. SIMON: He is not entitled to stop all my up goods trains, and insist upon my taking a single truck destined for the down-line. That is the effect of what happens at Nechells and Windsor Street. He throws his traffic at us without regard to where it is going; and I submit we have conclusively shown that it is given to us in such a state that we have to take the thing all away without consideration of where it is ultimately going—to take it somewhere else, proceed to pick it out, and do that very operation which, if his sidings were decent, would be done before it was ever given to us at all.

Mr. BALFOUR BROWNE: Not upon our sidings. How could we sort it out?

Mr. SIMON: I submit that a railway company are entitled to have tendered to them at the siding a waggon or series of waggons, I do not care which, in a condition to become part of one of their trains. Our submission is that it cannot be, merely because the Corporation do not happen to have room to put their trucks in order for us to take, that therefore the simple fact of throwing them on to our main line disentitles us at any rate to payment at all for what we do in order to put them into a condition to go on.

Justice LAWRENCE: If you follow out Mr. Balfour Browne's illustration, it seems to me to be this: We are giving you the traffic which involves your sending an engine down to every truck and taking it off—first one, then another. If every freighter did that, no railway work would be possible.

Mr. SIMON: So far from there being a rebate because there is a siding, the Legislature in such facts would have to provide that there should be a charge where there was a siding.

Mr. GATHORNE-HARDY: I understand you to say that sorting as distinct from marshalling means this: We had an illustration of 38 trucks—15 for one place, and the others going in different directions. You say you were entitled to have those 15 waggons all together.

Mr. SIMON: Yes. They are not content with giving us one at a time—that would be, as a matter of fact, unreasonable and outrageous, considering the amount of their traffic—but they insist on my having one which has tied on to the tail of it a lot of others which are not going to the same place at all, and then another one coming at the tail of that. If they do not choose to get on their own ground sufficient space to put the thing in order, it is contrary to the whole law of railways, as I understand it, to say that we, as part of our conveyance, have to do that. It cannot be part of conveyance to say: "Here are six trucks going to five different places; the first and the sixth are going to one place, and the intermediate ones somewhere else." The least I am entitled to do is to say, if we have to stop trains, as we have, and go back over points and into a siding, as we have, our duty, and our whole duty, there is to hook on. Supposing they had sufficient accommodation for this sorting process, but they said to the Railway Company, "Instead of our sorting it, you come and sort it for yourselves," and we sent a railway engine down to their works, and sorted their waggons into order to hook on to our trains, does anybody mean to say we should not be entitled to be paid for that? Yet the operation is exactly the same operation in nature as we now do for them on our main line. It is obvious that if we were asked by them to come on to their own sidings, which were adequate for the purpose, and do the sorting, this would be a work which would be rendered at their sidings. We admit it is not rendered at their sidings here; but it is rendered in connection with these sidings, and, as long as the service is in the essential features of it the same, I submit it cannot matter that it is rendered on our line, and not theirs. These are the propositions for which we contend; and in these circumstances, I submit that the applicants really do not make out the foundation of any case, and they do not make the point good, that in that which we seek to charge them we are charging them anything at all for station services or accommodation.

The Court then adjourned.

Reduction in Price at Dukinfield.—The Dukinfield Gas Committee have decided to reduce the price of gas to ordinary consumers from 2s. 9d. to 2s. 6d. per 1000 cubic feet. The profit upon the gas-works during the past year amounted to nearly £900.

South Barracas (Buenos Ayres) Gas Company, Limited.—At the ordinary general meeting of the Company held on the 22nd ult., the Directors reported that the profits for the past year amounted to £11,050, which was brought up to £11,404 by the addition of the sum carried forward. They recommended a dividend at the rate of 5 per cent. per annum, free of tax, which would leave a balance of £3904. In moving the adoption of the report, the Chairman (Mr. J. C. im Thurn) stated that during the past year the works had been maintained in a thoroughly efficient condition, and no pains had been spared to enable them to cope with the increased business. The progress of the Company had been most marked. There had been an increase of 595 consumers during the year, and the consumption was growing steadily at a most gratifying rate. The districts served were developing in a remarkable manner, and land values continued to go up. There was also a steady increase in the number of the public lamps. The report was adopted unanimously.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Annual Report and Accounts.

At a Special Meeting of the Birmingham City Council next Tuesday, the Gas Committee will present their report, together with the accounts of the department for the year ended March 31 last.

Among the contracts for new buildings and plant entered into since their last report are two which have been made with Messrs. Gibbons Bros., Limited, in connection with the reconstruction of a retort-house and the erection of a boiler-house chimney at the Adderley Street works. These contracts, the Committee point out, were occasioned by the necessity for reconstructing No. 2 retort-house owing to its dilapidated condition. The house was erected prior to the acquisition of the undertaking, and had a productive capacity of 900,000 cubic feet of gas per diem. The new retort-house, when completed, will be capable of producing 1,750,000 cubic feet per diem, and is to be fitted with horizontal retorts heated by regenerative furnaces, to be charged and drawn at the one operation by a Fiddes-Aldridge machine. Messrs. Gibbons Bros. were selected to undertake the work, owing to the experience they had gained in erecting similar plants at both Liverpool and Wrexham.

The distribution of gas to the outlying districts of the area of supply, where considerable building operations are in progress, has engaged the attention of the Committee. The practice in the past in such cases has been to lay down larger trunk mains from the works to the areas requiring an augmented supply; but the Committee have arranged, in accordance with modern practice, to lay down a trunk main that will be worked at a pressure of about 2 lbs. to the square inch, with off-takes at various points, where the pressure, regulated by governors, will be reduced so as to maintain the supply at the normal or required pressure to the premises of consumers. In laying down this system, the route of the main will be arranged so as to supply gas at high pressure for public lighting along the chief streets in the centre of the city. It is proposed, in the first instance, to lay mains from the Windsor Street works along Lord Street, Dartmouth Street, Lister Street, Aston Street, Corporation Street, New Street, and Paradise Street, with branches along High Street, Martineau Street, Bull Street, Stephenson Place, and Worcester Street, to the Market Hall. The plant for compressing the gas will be installed at the Windsor Street works; and the estimated cost of the scheme is £15,000.

As the result of a conference convened by the Lord Mayor, the Committee have arranged with the Electric Supply Committee that a small Standing Committee of Reference, consisting of the Lord Mayor and three members of each Committee, shall be constituted to deal with any differences that may possibly arise from time to time in the conduct of the two undertakings. Subject to the exceptions specially authorized by the Council, neither Committee is to make any charge which is not in accordance with the rates already approved by the Council; and in the special cases the proposals are to be submitted to the Standing Committee before the bargain is concluded.

The Committee have been invited to quote a price for a large and regular supply of gas, to be taken under conditions that are exceptionally favourable to the gas undertaking, and that justify special terms being given. The Committee recommend that, subject to the approval of the Standing Committee already mentioned, they be authorized to make terms—the charge for gas to be such as will be applicable to all consumers whose conditions of supply are similar.

It is recalled that on May 28, 1908, a report was presented by the Committee which announced the retirement, on superannuation, of Mr. Henry Hack, the Engineer-in-Chief; and the sanction of the Council was asked to a scheme, as a trial, whereby the Engineers of the Saltley, Nechells, Windsor Street, and Swan Village works, having qualified for more responsible positions, should be appointed Engineers-in-Charge of their respective works. In presenting the report, the Chairman indicated that, should the trial prove successful, the Committee would bring a definite scheme before the Council at a later date. The duties and responsibilities of the Engineers-in-Charge were carefully reviewed and extended by the Committee; and weekly conferences of the chief officials, including the Chief Chemist, were arranged as a means of ensuring concerted action in matters relating to the manufacture and distribution of gas, and of full consideration being given to all proposals for the improvement or extension of plant. The organization thus formed twelve months ago has worked so smoothly and well that the Committee are unanimous in their opinion that its continuance is in the best interests of the undertaking. It is rendered valuable by the blending of the commercial with the manufacturing forces of the department; and the Corporation are safeguarded on the engineering side under this scheme by the retention and active co-operation of several trained and experienced Engineers.

To secure continuity of policy, the Committee believe the arrangements for the future should be framed so as to indicate reasonable prospects and fair remuneration to the chief officials of the department so long as they discharge their duties with efficiency; and to this end they recommend that the maximum salary to be paid to each of the Engineers-in-Charge of the three large works of the undertaking—Saltley, Nechells, and Windsor Street—shall be fixed at £1000 per annum. The magnitude of the works in question will be appreciated when it is stated that, collectively, they use nearly 500,000 tons of coal and 2,500,000 gallons of oil in the production of 6,500,000,000 cubic feet of gas per annum. The Swan Village works have a productive capacity of only about one-third that of any of the other works named; and the salary of the Engineer-in-Charge of these works can be dealt with by the Committee in the ordinary way. It is, however, intended by the Committee that the increases of salary to Engineers-in-Charge shall, as from this date, be as follows: Mr. John Foster (Windsor Street), from £650 to £700 per annum; Mr. W. Chaney (Nechells), from £625 to £700; Mr. F. J. Bywater (Saltley), from £425 to £600. Thereafter the Committee purpose advancing these salaries from time to time, and within the maximum named, to such an extent as the service of the respective Engineers appear to the Committee to warrant.

With regard to the office of Secretary, the report continues, "from the discussion which took place in the Council in May, 1907, it was

apparent that the title of Secretary created an altogether wrong impression of the duties performed by that officer; and the Committee therefore recommend that he be appointed from date as Secretary and Manager of the undertaking. The reason for this will be apparent to the Council when it is pointed out that the office in question is one of great and increasing responsibility. The holder of the position is the Chief Executive Officer of the department, who not merely performs ordinary secretarial duties, but advises the Committee on questions of policy, negotiates the purchase and sale of materials aggregating in value considerably over £500,000 per annum, supervises manufacturing costs and all other charges, and is responsible for the organization and efficiency of the large staff necessary for the conduct of the business. The Committee unanimously recommend that the maximum salary for this position be fixed at £2000 per annum. The present Secretary, Mr. G. Hampton Barber, commenced his duties with the department in February, 1901; and during the intervening eight years the Committee have had the fullest opportunity of proving his business knowledge, powers of organization, devotion to duty, and capacity for work. The outcome of his labours is fully shown in the development of the undertaking and the financial results that have been achieved during his term of office. His salary at present is £1400 per annum, which the Committee now propose to increase to £1600; any further advances within the above maximum to depend upon his continued efficiency and the prosperity of the undertaking."

The increases now recommended will bring the total salaries paid to the Secretary, Engineers, Engineers-in-Charge, and Works Superintendents up to £5240 a year, or £160 less than was paid in 1901; while the quantity of gas sold has increased from 5700 million cubic feet to 7000 millions. In conclusion, the Committee say they are convinced that the organization outlined "is necessary for the complete administration of this, the largest commercial department of the Corporation, and the largest gas undertaking in the Provinces."

The work of the undertaking during the past twelve months is indicated by the following figures, which are included in the report.

Statistics for the Years ended March 31, 1908 and 1909.

	1908.	1909.	Increase.	Decrease.
Gas sold during the year (cubic feet)	7,042,025,400	6,977,793,200	—	64,232,200 = 0.91 per cent.
New services laid during the year	7,518	8,117	599	—
Cooking and heating stoves sold during the year	703	643	—	60
Total number of cookers supplied to prepayment consumers at March 31	40,945	48,444	7,499	—
Total number of cooking and heating stoves on hire at March 31	5,041	7,351	2,310	—
Total number of prepayment meters fixed at March 31	55,782	62,431	6,649	—

The accounts show that the receipts from the sale of gas amounted to £698,712, as compared with £720,323 in the preceding year; while residual products realized £228,082, against £250,656. The total receipts were £935,636, as compared with £980,083. On the other side of the revenue account, under manufacture, coal (including oil, carriage, unloading, and all other expenses of depositing same on the works) cost £369,642, against £398,333 in the preceding year; purifying materials and wages, £6824, against £16,238; wages at works, £78,253, against £80,385; and repairs, maintenance, and renewal of works, plant, retorts, machines, apparatus, and tools (less old materials sold), £157,091, against £168,654. The total cost of distribution was £57,733, as compared with £62,020; and the remaining items brought the expenditure up to £745,335, against £800,126 in 1908. There was thus on the present occasion a balance of £190,301 to be carried to the profit and loss account, compared with £179,963 in the previous year. After meeting interest and other charges, there is a net balance of £71,459, which compares with £61,313 last year.

The quantity of coal carbonized in the past twelve months was 571,975 tons, and of gas oil used 2,578,910 gallons. Of gas sold and used on works, the amount was 6,977,793,200 cubic feet. The average net price of gas was 2s. 0.03d. per 1000 cubic feet. Coke and breeze realized £142,552; tar, £33,074; and ammoniacal liquor, £52,217. The estimated quantities made were: Coke, 309,030 tons; breeze, 59,536 tons; tar, 6,632,301 gallons; and ammoniacal liquor, 22,448,833 gallons. Of coke, 222,390 tons were sold, and 86,496 tons used.

The contributions of the Gas Department for public purposes during the year were—

In aid of the improvement rate	£71,459
Ditto interest on reserve fund	4,000
In aid of public lighting within the city	8,967
In aid of court lighting within the city	2,133
In aid of public and court lighting outside the city	4,331
Total	£90,890

New Joint-Stock Companies.—Under the title of Water and Gas Securities, Limited, a private Company has been formed with a capital of £1000, in £1 shares, of which 500 are preference. Water Undertakings, Limited, was registered on the 26th ult. with a capital of £1500, in £10 shares. The Leeds Meter Company, Limited, has been formed with a capital of £3000, in £5 shares, to adopt an agreement with C. Meinecke and R. Cremer for the acquisition of the business carried on at No. 37, York Place, Leeds.

PRIMITIVA GAS COMPANY, LIMITED.

The Amalgamation of the Three Buenos Ayres Companies.

The Annual General Meeting of the Company was held last Friday, at the London Offices, No. 153, Leadenhall Street, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. J. H. Bouwer) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN moved the first resolution, adopting the report and accounts, and declaring a final dividend of 4s. 6d. per share, free of income-tax, making a total distribution on the ordinary shares of 7 per cent. for the year. In doing this, he said it would be of no use for him, under the circumstances in which they were meeting, to delay, by going through the details and the items of the accounts, from discussing the point which, after the meeting of the River Plate Gas Company the other day, would no doubt be the most pressing one on the minds of the shareholders. His contemporary (Mr. Bowen) of the River Plate Company gave his shareholders some information, which he (the Chairman) noticed was followed soon after by a movement in the Stock Exchange, showing that the public and the shareholders had appreciated the new position which he described as having arisen. It would be remembered that, at the meeting a year ago, he (the Chairman) told the shareholders the Board were being driven as far as they could be by the Municipality, who had driven very hard terms with the Tramway Company a little while before, and who were seeking to impose upon the Gas Companies conditions which would be very onerous and very difficult to comply with. He also explained that the position of the Company in Buenos Ayres was not exactly that of having a definite concession like gas companies possessed on the Continent of Europe, nor anything like the powers of a gas company working in Great Britain, who had an Act of Parliament, the powers of which were revised and extended when the business required this to be done. The authorities in Buenos Ayres were well aware of this; and they had been putting pressure on the Gas Companies to make a substantial diminution in the price of gas. They made an ordenanza, which, fortunately, was afterwards withdrawn; and their demand to reduce the price of gas was limited to the modified reduction of 2 cents per cubic metre, which came into operation only during the last three months of the year, and to that extent had militated against the figures in the present balance-sheet. At last, he was bound to tell the shareholders, the authorities had come to clinches with them; and yet he could not say the agreement was in such a form that he could submit it to the shareholders that day, as it would be submitted, in the *ad referendum* form, seeing that it must receive their approval before it could be carried out. The matter was, in fact, not so far concluded that he could venture, with safety or propriety, to give the shareholders the particulars. It was, on the whole, a bargain which would relieve the Directors from the anxieties—the pressing anxieties—they had been under during the past year; and all three Companies had been treated the same, in regard to the possibility of considerable alterations in their future. The shareholders knew when one had been bearing pin-pricks a whole year—when one had been suffering dures for a year—the slightest cessation of it was something that gave one ease; and he would describe the position rather in that respect. But, on the whole, the Directors had been careful of the interests of the shareholders; and when the agreement came before them, it would be found that the Directors were presenting terms which, under certain circumstances, could be accepted as being a solution, and a fairly satisfactory solution, of the position. But he was bound to say another thing. They had heard him in that room advocate, and say how willing this Company would be to promote, the fusion of the three Companies, and which fusion would bring about certain economies. The operations of the past year had brought the three Companies together in a way in which they were not associated before. The Directors of the three Boards had been meeting constantly to discuss these points—loyally desiring not to move in any direction without the full support of each other. The other Companies, after the Directors had mixed together, had seen and recognized—the very hardship of the terms sought for by the Municipality had caused them all to see and recognize—in a manner not apparent before, the absolute necessity of the fusion of the Companies under one management. There was not the slightest doubt in any business man's mind that, if these Companies were to bear fresh burdens under the requirements made by the Municipality, they would do so much better, and at much less expense, joined together than they would separately. The terms therefore on which this new scheme would be best entered upon would necessarily involve the amalgamation of all the interests. He must say, however, that while the Directors had been negotiating, and they hoped to see a satisfactory solution as far as the three Companies on this side were concerned, the questions would be subject to an *ad referendum* discussion when shareholders were called together to agree to them. Beyond remarking that the Board hoped these long negotiations had reached a result which would not be unsatisfactory to the Companies which would be fused, that it would not be possible to carry out the demands made upon them without fusion, and that all recognized that fusion was desirable, he would leave the subject by asking the shareholders to refrain from putting questions to him which might complicate matters here and in Buenos Ayres. Having spoken on the question which he knew would be uppermost in the shareholders' minds, he would deal with the balance-sheet. The total at the credit of the profit and loss account was £120,246; the profit being something like £15,000 more than it was this time last year. The shareholders might wonder how this was arrived at. He would explain it presently. They had a balance forward from the previous year of £15 881, which was slightly less than it had been before, and which made a total of £136,128. Deducting interest paid on debentures (which was practically the same as before), and the interest and expenses in London (which were less than before)—£8703, against £9101—allowing for £40,000 for interim dividend on the preference shares and £10,000 on the ordinary shares, and placing to the general reserve account £10,000, which was some £4000 more than last year, they had the

balance of profit at the end of £44,923, against £33,881, or £11,000 to the good. Out of this the Directors recommended a final dividend of 4s. 6d. per ordinary share (free of income-tax), making 7 per cent. for the year. The net result was that £18,000 would be absorbed by this payment, and that £26,923 would remain to be carried forward, against £15,881 last year. Now this was extremely satisfactory. He might say that this larger income would not have been produced had it not been for the exertions of their Engineer (Mr. B. F. Browne) and their Local Director (Mr. Hale Pearson), who had been directing their attention very much to the question of extending the supply of gas for cooking and heating, and things of that sort. Meanwhile they had not been remiss in attending to the general condition of the concern. The make per ton had gone up considerably, and the leakage account had also been reduced to a satisfactory figure. There was a large increase in the number of cooking stoves on hire—something like 31½ per cent., which testified to the great exertions that had been put forward in this direction. There had been something like 12 miles of mains laid altogether during the year, of which 8½ miles were absolutely in new directions, which meant added business. The number of services had increased by 11 per cent., or by 5421. The chemical works had been well looked after; and they showed a very satisfactory increase of profit. There had been spent on capital account £30,900, which was a small percentage of the previous capital, compared with the business he had shown had been done. There was a satisfactory reduction in the cost of coal into store of something like 1s. 4d. per ton; but this only corresponded with the fall in the price of coal generally in this country. Reverting to the negotiations forming the subject of the first part of his address, he might say that, while they had been of general anxiety to the Board, they had been an especial anxiety to Mr. Sanford, whose absence from the meeting he ought to explain. He had worn himself out; and he had gone away for a short time to recuperate. His work on behalf of the Company had been inestimable. His great financial knowledge, and his local knowledge of Buenos Ayres, had been of vast advantage. It had also been a great advantage to have such an able and influential representative on the spot as Mr. Hale Pearson, the Chairman of the Company's Local Committee; and his efforts ought to be recognized. There was one other point that ought to be mentioned. Both of the other Companies in their reports referred to the amount spent on the repair and upkeep of their works. He had gone through their own figures carefully, and found they had spent £33,000 for this purpose, which, in proportion to their sale, was at least as good as the other Companies—in fact, it was an amount that would do more than maintain the efficiency of the works in the highest condition. Their Engineer was a man who would not have his works in anything but the best possible state.

Mr. W. W. PHIPPS seconded the motion; and it was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. PHIPPS, Mr. Sanford was re-elected to his seat at the Board. In some further appreciative remarks of Mr. Sanford's services, the Chairman said that gentleman was the best qualified of the members of the Board to carry out the negotiations, because he knew the local spirit and mind of the Buenos Ayres people much better than he (the Chairman) could possibly do.

On the motion of Mr. A. S. BARTHOPE, seconded by Mr. R. LONG, the Auditors (Messrs. G. A. Touche and Co.) were re-appointed.

The CHAIRMAN proposed a vote of thanks to the Local Committee (especially Mr. Hale Pearson) and the Engineer and technical staff for the capital results they had produced. He said he should like to mention this, that, inasmuch as the Company were likely to amalgamate with the other Companies, it was important they should put their house in good order; and the exertions of their Engineer had been shown in getting the works into first-class condition, and in putting in labour-saving appliances, which he had made to work very successfully, as well as in extending the outdoor business—perhaps in a manner that a year or two before had not been done so well. All this entitled him to the highest praise. The Board telegraphed out that he should receive a special bonus; and he (the Chairman) believed Mr. Browne was so single-hearted that he distributed the bonus among his assistants in the most unselfish spirit. This incident showed what a high-minded gentleman they had on the spot.

Mr. PHIPPS seconded the motion; and it was heartily passed.

Moved by Mr. G. SPURLING, and seconded by Mr. W. SAMSON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN'S acknowledgment terminated the proceedings.

LLANDRINDOD WELLS GAS COMPANY.

The Second Ordinary Meeting of this Company was held at the Offices, No. 17, Victoria Street, S.W., on Monday, the 26th ult.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. C. Holmes Hunt) read the notice convening the meeting and also the report of the Directors. They expressed their pleasure in announcing the practical completion of the works, and the commencement of the supply of gas on the 20th of April. About 140 applications for gas had been received, including many of the leading hotels. The Directors considered this a satisfactory start; and they said they had every confidence in the success of the Company. The capital expenditure to the 31st of December amounted to £4860, and there had since been expended a further sum of £1639; making a total of £6499.

The CHAIRMAN, in moving the adoption of the report, said the completion of the works had been delayed from various causes; but they were now making gas, and connecting consumers as fast as possible. They had opened a show-room in which were displayed lighting, heating, and cooking apparatus, and it was attracting considerable attention. The Directors felt satisfied that a good start had been made; and they looked forward to a steady increase in the demand for gas. Those shareholders who were not familiar with Llandrindod Wells could not do better than pay a visit to the place, for he was sure they would be highly pleased with its invigorating air and health-giving waters, not

less than with its charming scenery. The Urban District Council had recently decided to add to the attractions of the place by building a recreation-room; and the Company might pride itself on having stepped in to supply a long-felt want in the shape of smokeless fuel.

Mr. SMITH seconded the motion; and it was carried unanimously. A resolution authorizing the Directors to issue 150 further shares in the Company was also unanimously passed.

The retiring Director (Mr. C. E. Murray) and Auditor (Mr. G. H. Sawyer) having been re-elected, a vote of thanks was accorded to the Chairman and Directors, on the proposition of Mr. W. C. PARKINSON.

EDINBURGH AND LEITH GAS COMMISSIONERS.

Superannuation Scheme—Question as to Air in the Gas.

The Monthly Meeting of the Edinburgh and Leith Gas Commissioners was held on Monday of last week—Baillie BRYSON, of Leith, in the chair—at which, among other matters, the superannuation scheme was under consideration.

The CLERK (Mr. J. M'G. Jack) referred to a report by Mr. G. Lisle, C.A., of Edinburgh, the Actuary appointed by the Commissioners, upon the scheme of superannuation authorized by their Provisional Order. He read the report of a Sub-Committee, which stated that the Actuary certified that, in order to comply with the obligation laid on the Commissioners to put the scheme on a sound financial basis, they would require to make a special contribution at Whitsunday next of £67,830. At the request of the Sub-Committee in charge of the arrangements for giving effect to the provisions of the Order, Mr. Lisle had added a recommendation that, to save the charges that would be entailed by granting a mortgage for this amount, the Secretary for Scotland might be satisfied with an obligation by the Commissioners to contribute the sum of £2035 per annum, being 3 per cent. upon the capital amount. The Committee reminded the Commissioners that when it was resolved to institute the superannuation scheme, it was decided to do so on the lines of the Edinburgh Corporation superannuation scheme. The draft Order was framed accordingly. The Secretary for Scotland, however, insisted on the insertion of the new actuarial clause (commonly called the Caldwell clause); and the Committee had no option but to agree to it. The Committee were still of opinion that the scheme would ultimately be found to be commercially solvent without the special contribution; but it was essential that the contribution should be made, in order to comply with the requirement that the scheme should at its inception be put on a sound financial basis. It was possible that when the scheme was found to be solvent without the special contribution, the Commissioners might be held to be entitled to repayment of it. The annual contribution of £2035 represented practically ½d. per 1000 cubic feet of gas made. The Committee desired to remind the Commissioners that the power given by the Order of 1902 to grant annual voluntary allowances, aggregating ½d. per 1000 cubic feet of gas made, which was equivalent to £2000 per annum, was repealed as from Whitsunday next, although the Commissioners might continue thereafter the allowances granted to the then existing beneficiaries. All the allowances granted under the Order would accordingly cease in natural course.

Baillie INCHES, the Convener of the Finance and Law Committee, said the Sub-Committee were perfectly convinced that the scheme, as proposed by the Commissioners, was quite a solvent one, though actuarially it was not. The Commissioners could show that the contributions would more than pay all the claims against the fund; and at the end of ten years they would have a substantial amount over. Of course, if the fund were not paying at the end of ten years, they might have to increase the contributions.

The CHAIRMAN remarked that if the fund accumulated, the Commissioners would have to go to Parliament to get power for repayment of the special contribution.

Mr. J. H. L. PENNELL said it was due to the Gas Commissioners that it should be understood that the clauses adopted by them were exactly the ones which related to the Edinburgh Corporation scheme. He thought it was quite right that the Commissioners should have an opportunity of protesting or dissenting that there should be such arbitrary action on the part of the officials in the Scottish Office. It was right that the Commissioners should say that the clause over which this difficulty had arisen never was before them. The proceedings were hanging in London, and a deputation was sent up by the Commissioners; and he gathered from the members who were there that they even did not see the clause, although they were told that, in all likelihood, there was no prospect of the Bill being allowed to go through without it being inserted. He did not quite agree with Baillie Bryson, that it would be a simple matter to get back this large contribution.

After some further remarks, the report of the Sub-Committee was adopted unanimously.

There was on the agenda notice of motion by Mr. Pennell and Baillie Neill: "To remit to the Works Committee to report, with a view to its discontinuance, upon the practice of introducing compressed air into gas supplied by the Commissioners, with direction to the Committee to inquire and report as to whether the air is usually, if ever, intermingled with the gas while undergoing statutory official test by the Public Analyst."

Mr. PENNELL said that at the start the question arose as to how far the Commissioners would deem it desirable, before there was an inquiry, that the subject should be discussed. For his part, if there were likely to be prejudice to the Commissioners, or to anyone responsible to them, he had no wish to enter upon a discussion until there was an inquiry. He thought the whole object would be attained by sending the motion to the Committee; and there would be a full opportunity of discussing their report.

The CHAIRMAN asked if it had not been open to Mr. Pennell to have brought the matter before the Works Committee. He denied that anything of the kind existed.

The motion was eventually unanimously remitted to the Committee to consider.

MANCHESTER AND THE RATES.

Very reluctantly, the Gas Committee of the Manchester Corporation have acceded to the urgent appeal made to them by the Finance Committee, backed by the Lord Mayor, and increased the proposed contribution out of the profits of the department in aid of rates from £26,495 to £50,000. It has to be noted, however, that the resolution of the Gas Committee sets out plainly that this increased grant is made "in anticipation of profits." Other trading departments of the Corporation have revised their estimates, and the absolute advance in the City rate is now put down at 3.44d. in the pound, which is slightly less than the sum required for the Ship Canal. The economists endeavoured to get the Electricity Committee to increase their contribution this year but without effect, so the department will only hand over in relief of rates £12,000, which is the same amount as last year. During the last ten years the sum contributed from the Electricity Department in aid of rates has only totalled £35,516; while the Gas Department in the same period provided £554,383.

As will be seen from the following table, the city has drawn very heavily on the profits of the gas undertaking since the works were acquired by the Corporation 65 years ago. The appropriation of the profits of the department since 1844 have been as follows:—

Paid over to the Improvement Committee for improvement purposes, 1844 to 1887, inclusive.	£1,367,641
Paid over to Water-Works Committee (one moiety of profits from 1852-1861, inclusive)	166,265
Cost of street lighting from 1878 to 1891, inclusive, borne by the Gas Committee.	329,201
Paid into the City Fund, 1888 to 1908, inclusive	995,476
Total amount applied in lieu, or in aid, of city rates.	£2,858,583

At a traders' meeting held at the Memorial Hall last Wednesday, to protest against any advance in the rates, Mr. G. H. Clapham, Vice-President of the Retail Traders' Association, said, with reference to the trading departments of the Corporation, the taking of money from them now was only "robbing Peter to pay Paul." He added, "I think if these departments belonged to a limited liability company, or to a private firm, and were realized to-day, very few of us would like to give 7s. 6d. in the pound. The depreciation funds are totally inadequate; the renewals are not half what they should be; the time of repayment is enormously extended; and if we get the Tramways Committee to give us £15,000 more, which is roughly 1d. in the pound, it only means that in a few years we shall have to pay that ourselves. It is the same with the Gas and Markets Committees. If we get an increased contribution to-day, we get a decreased one to-morrow." Alderman Copeland, Chairman of the Finance Committee, has replied to Mr. Clapham. He says that the Tramways Department has good reserves for a good renewal account; and as to the Gas Department, the Chairman (Alderman Gibson) told him a week ago that it was never in such a sound condition as now.

COVENTRY CORPORATION GAS UNDERTAKING.

Suggested Pensions for Redundant Employees.

At the Meeting of the Coventry Corporation to-day, the Gas Committee will present the following report, containing suggestions for a scheme of pensions which they recommend should be established.

Your Committee beg to report that they have had under consideration the question of the steps to be taken in view of the approaching completion of the new gas-works at Foleshill, and the consequent discontinuance of gas manufacture at the old works. The new works, owing to better arrangements and equipment, will not require the employment of so large a staff of workmen; and it will accordingly be necessary to dispense with the services of a number of men employed at the old works. An endeavour has been made to lessen the hardship which this will entail by transferring as many men as possible to the new works; but there still remain a number whose services cannot be retained. Inasmuch as many of the men have been in the service of the department for a considerable number of years, and in some cases are now advanced in life, your Committee think that, though the Corporation are under no obligation in the matter, it will be equitable to make provision for these by granting them weekly pensions, of amounts proportionate to the periods for which they have served the department.

The scheme of payments which your Committee propose—subject to the consent of the Council—to adopt is the following: (1) For men who have served 25 years and upwards, 12s. per week; (2) for men who have served 20 years but less than 25 years, 10s. per week; (3) for men who have served 10 years but less than 20 years, 8s. per week. (Men under 45 years of age to be placed in the third class, notwithstanding that they have 20 years' service.)

The number of men who would come within the scope of this scheme would be as follows: At 12s. per week, seven men at ages ranging from 52 to 66; at 10s. per week, one man aged 46 (two other men, aged respectively 44 and 41, being placed in the third class); and at 8s. per week, eight men, at ages ranging from 41 to 46. The maximum cost of the scheme would be £410 10s. per annum; and the outlay would, of course, become less as time went on and the number of pensions diminished.

At the last meeting of the Holborn Borough Council, Colonel W. R. Smith gave notice of the following motion: "That this Council enters its protest against the resolution of the Metropolitan Water Board to pay a salary of £500 to their Chairman for the express purpose of exercising hospitality." Copies of the resolution are to be forwarded to the Corporation of London, the London County Council, and the Metropolitan Borough Councils, with the request that they will join in the Holborn Council's protest.

BLACKPOOL CORPORATION GAS SUPPLY.

The Past Year's Working.

Mr. John Chew, the Engineer and General Manager of the Blackpool Corporation Gas Department, has just presented to the Gas Committee his report for the past financial year. He says the output of gas was only slightly in advance of that for the preceding twelve months, though the price was reduced to 2s. 2d. per 1000 cubic feet, and 525 new consumers were added. This may be partially accounted for by the shorter autumn season experienced, together with the increasing number of incandescent lights in use. Residuals were produced in larger quantities, but lower prices were realized for them, and more difficulty was experienced in their disposal. The general result of the year's working is as follows: Income, £85,520; expenditure, £63,100; gross profit, £22,420. One half of this sum being required to meet the loan charges, there remains an available balance of £11,210 for disposal, against an estimated profit of £11,191. This sum, added to the previous profits made since the Corporation acquired the gas-works, gives a total of £268,000 which the works have yielded to the town. The capital account has been increased by £200, and now stands at £210,900. Towards the repayment of this there is on hand a sinking fund of £68,000, and a reserve of £9000.

NELSON CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Gas Engineer and Manager of the Nelson Corporation (Mr. Alfred J. Hope) has presented to the Gas Committee his report for the year ended the 31st of March. It shows that the gross profit was £15,175; and, after setting aside £11,489 for interest and sinking fund charges, there is a net surplus of £3686, which is £428 more than was estimated. During the year, 27,814 tons of coal were carbonized; being an increase of 636 tons on the quantity used in the previous year. The total cost of coal delivered upon the works was £16,995, equivalent to an average of 12s. 2½d. per ton, compared with an average of 10s. 9d. and 11s. 9d. per ton respectively for the two preceding years. The total wages for the year amounted to £9997, while for the previous year they were £10,272 (£347 being on account of the carburetted water-gas plant). The carbonizing wages came to £3113; being 2s. 3d. per ton of coal, compared with 2s. 4½d. per ton for the year 1907-8. The total quantity of gas made was 309,696,000 cubic feet. No carburetted water gas was produced, as, in consequence of the bad state of trade during the winter months, the plant was not required. The gas made per ton of coal carbonized was 11,134 cubic feet, which compares favourably with the make in previous years. In 1907-8, it was 10,915 cubic feet. This improved make has resulted in a saving of 559 tons of coal compared with that year, and 2359 tons compared with the year ended March 31, 1903. The total quantity of gas sent out was 309,532,000 cubic feet, being an increase of 8,601,000 cubic feet, or 2.86 per cent.; and 94.69 per cent. was accounted for. There are 6778 ordinary and 5719 prepayment consumers on the books—an increase of 729. The number of prepayment consumers increased from 4951 to 5719; and the consumption per consumer averaged 14,315 cubic feet—the receipts averaging 37s. 4½d. The gas-stove department was fairly busy during the year. The gross income from residual products was £12,022; the net income, £10,583, or 7s. 7½d. per ton of coal carbonized. The net cost of coal was 4s. 7½d. per ton. The quantity of saleable coke was 13,176 tons, the make of tar was 1583 tons, and the sulphate of ammonia 297 tons; being at the rates of 9.48 cwt., 11.95 gallons, and 23.92 lbs. respectively per ton of coal carbonized. The gas plant of Messrs. Ecroyd and Sons, Limited, including the lighting rights over the Lomeshaye and Whitefield Estates, was purchased during the year, and the new supply was completed on the 18th of November. The gas consumed on this new supply up to March 31 was 2,498,000 cubic feet, equivalent to an income of £283. The total cost of the supply was £2866 13s. 4d. The net capital outlay on the undertaking at the close of the financial year was £125,512; and Mr. Hope points out that since 1903 it has been gradually reduced from 11s. 11d. to 8s. 1d. per 1000 cubic feet of gas made.

PROPOSED GAS-WORKS EXTENSIONS AT BIRKENHEAD.

Opposition to the Scheme.

A Local Government Board Inquiry was held on Wednesday and Thursday of last week, by Mr. F. J. Willis, with reference to an application by the Birkenhead Corporation for a Provisional Order, under sections 297 and 303 of the Public Health Act, 1875, to partially repeal, alter, or amend the Local Acts relating to their gas undertaking. The application referred to the installation of plant and a retort-house in the existing works, and the acquisition of land at the north end of the town on which to erect a holder.

Mr. Rigby Swift and Mr. A. T. Miller represented the Corporation. Mr. M'Conkey, Mr. Courthope Wilson, and Mr. Brandreth represented owners of property and others objecting to the application. Mr. G. P. Snape was present on behalf of the Birkenhead and District Co-operative Society.

Mr. Swift, in stating the case for the Corporation, said the application dealt exclusively with the gas undertaking, and arose from the necessity for the Corporation making further provision for the supply of gas. The scheme involved the reconstruction to a large extent, or the re-erection, of the buildings on the site of the present undertaking in Thomas Street. Acting under the advice of the most eminent experts in gas matters, the Corporation had arrived at the unanimous conclusion that it was imperative they should confine the present site to the manufacture of gas and to the storage plant which was already upon

it, and should find room for further storage on some new site. The application was made in order that the Corporation might have placed in their Act of Parliament which prescribed their area for the manufacture and storage of gas, a further piece of land for storage purposes only. Under the Birkenhead Corporation Act, 1881, the Corporation could not manufacture gas or residual products except upon the present site; and by section 5 of the Gas-Works Clauses Act of 1871, they could not store gas except upon the site in Thomas Street. The consequence was the Corporation desired to acquire land and store gas on it.

The opposition at this juncture intimated that they did not oppose the Corporation seeking extra facilities for the manufacture of gas; but they contended that the storage of gas could be carried out on the existing site, or on land immediately adjoining. It was also contended that the site was unsuitable.

Since 1896, continued Mr. Swift, the manufacturing capacity of the works had remained unchanged, and since 1894 the storage capacity had been unaltered. The consumption of gas, however, had increased a great deal since 1896. In that year, the maximum day's consumption was 2,753,000 cubic feet, which had since risen to 4,006,000 cubic feet. Taking the last ten years, the gas consumption in Birkenhead had increased at the rate of 1,294,000 cubic feet per annum; and the annual quantity of gas manufactured had increased from 511,000,000 to 829,000,000 cubic feet. The present capacity of the works was to supply 24,799,000 cubic feet of gas in seven consecutive days. If in 1910 there was a repetition of the demand that was made five years previously, the present undertaking would be quite inadequate to cope with it. It was proposed to re-arrange the existing works and build a new retort-house, giving an output of 39,690,000 cubic feet; and it was estimated this would give to the Corporation, taking the consumption at the present rate of increase, a reliable supply of gas for the next twenty years. The engineers were of opinion that no further storage ought to take place upon the existing site, which they considered should be utilized for the manufacture of gas only. So far as he (Mr. Swift) was aware, there was no land in the neighbourhood which was more suitable for storage purposes than the site at the north end. The present storage capacity was equal to 3,000,000 cubic feet of gas; and the Corporation were advised that it was necessary for them to meet the increased manufacturing power by providing another holder with a capacity of 2,500,000 cubic feet. With this object, they looked for a site, and found one which was ideally fixed for the purpose of providing capacity for additional storage. The site was situated at the north end of the town, and included 12,214 square yards; and there it was proposed to erect the holder. The neighbourhood was being rapidly developed. Many of the objectors to the scheme had been under the impression that there would be noxious fumes emitted from the holder. This was erroneous. So far as the amenities of the neighbourhood were concerned, the erection of the holder would be an improvement, and not a detriment. The opposition was based upon the fact that some injury would be done to the letting value of property, but such a difficulty had not been met with. The total cost of the scheme would be £35,000.

Mr. T. O. Paterson, the Gas Engineer to the Corporation, stated that there was no room for the storage of gas at the old works, as the land was too congested. The greater portion of the space was occupied by the manufacturing plant. The pressure of gas in the north portion of

the town had been indifferent; and it was desirable, in the interests of the inhabitants, to improve the distribution and meet further requirements. It was customary to have outside stations for gas distribution. The land would cost 2s. 8d. a yard; and there were no restrictions whatever upon it. The land round the existing works had been quoted at £2 16s. 6d. a square yard. Fifty-two objections had been received. In cross-examination by Mr. Wilson, he said it would be throwing money away to take down the existing holder and erect a new one. He admitted it would be a public advantage if the Corporation secured the property in the neighbourhood of the gas-works, and did away with the slum area. The property in that quarter would cost about £14,000 to buy. A 10-inch main to the north end would cost £3000.

Mr. Charles Hunt said that in the early part of last year he was consulted by the Corporation as to their position; and he had gone very carefully into the questions of capacity, consumption, &c. He was of opinion that it would be unwise to attempt to enlarge the smaller existing holder, on the ground of sacrifice of capital expenditure, loss of storage for the time being, and difficulties as to the land. He calculated that the cost would be £34,000, as against £35,000 for the scheme now proposed, and, in addition, £5000 or £6000 for laying larger distributing mains. The site for the north end holder was an admirable one, and practically unobjectionable.

Mr. E. H. Stevenson, who said he had been familiar with the gas undertaking since 1886 or 1887, gave evidence generally supporting that of Mr. Hunt. He was first consulted by the Corporation at the time the holder tank cracked through the formation of the Mersey Railway tunnel. The subsoil under the existing holders was marly clay. It was a good subsoil if not disturbed; but it would not be wise to disturb it to erect the larger holder suggested. The present large holder had a brick and puddle tank; and it would be a dangerous thing to excavate deeply close to such a tank.

Mr. Courthope Wilson opened the case for the principal opponents to the application, and said this was not merely a sentimental objection by those for whom he appeared. It was obviously to the Corporation's advantage to minimize the detrimental effect to the property; but the builders took a strictly business point of view of the matter, as they wished to obtain a full return from the money expended in building operations. A banking firm had also established a branch bank at considerable expense to tap trade in a new and promising locality; and they were genuinely alarmed lest the erection of the gasholder should deteriorate the whole of the neighbourhood, and thereby drive away customers. The Legal and General Assurance Society objected to the proposed scheme as ratepayers, as they considered it a most unreasonable waste of ratepayers' money. They admitted the requirements of the borough necessitated an extension of the manufacturing and storage plant, and they also admitted the pressure at the north end was not so good as it might be; but they said it could be remedied in other ways. One of the alternative schemes proposed by the Corporation provided for the erection of a very large holder immediately south of the existing No. 4 holder; so that it was hardly open to their expert advisers to come there and say it was a physical impossibility to carry it out. The fact that the plan of the scheme was not forthcoming was a point to which he suggested the Inspector should attach considerable importance. With regard to the loss of storage

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 284.

Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	174-18	..	5 11 1	561,000	Stk.	Feb. 25	10	Liverpool United A. .	225-227	+ 2½	4 8 1
258,955	10		7	Do. 7 p.c.	124-123	..	5 9 10				7	Do. B. .	168-170	..	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0				6	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd..	52-6	..	5 8 4				5	Malta & Mediterranean	42-5	..	6 0 0
40,000	5		6½	Do. New. £4 paid.	42-43	..	5 15 6				5	Met of 15 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne. 0 p.c.	284-292	..	4 14 11				4½	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
51,810	10		7	mouth Gas. B 7 p.c.	163-17	..	4 2 4				20	Monte Vid. o Ltd.	124-123	..	5 9 10
53,200	10		6	and Water. Pref. 6 p.c.	152-16	..	3 15 0				4½	Newt. & Gt. sh'd Con	91-93	..	3 15 3
380,000	Stk.		12½	Brentford Consolidated	247-250	..	5 0 0				3½	Do. 3½ p.c. Deb.	192-20	..	5 0 0
300,000	"		5½	Do. New.	187-190	..	5 0 0				10	North Middlesex 10 p.c.	13-13½	..	5 3 8
50,000	"		5	Do. 5 p.c. Pref.	122-124	..	4 0 8				7	Oriental, Ltd. . .	137-139	+ ½	5 15 1
206,250	"	Dec. 11	4	Do. 4 p.c. Deb.	101-103	..	3 17 8				8	Ottoman, Ltd. . .	6-6½	..	6 8 0
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	210-213	..	5 1 0				8	Portsea Island A. .	135-137	..	5 0 7
246,320	"		10½	Do. A Ord. Stk.	152-155	..	5 0 0				13	Do. B. .	129-131	..	4 19 3
460,000	2½	Apl. 16	10	British. . .	42-43	..	4 13 0				10	Do. C. .	119-121	..	4 19 2
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	114-117	..	5 2 7				10	Do. D and E.	101-103	..	4 17 1
165,700	"		4½	Do. do. 3½ p.c.	85-87	..	5 3 6				7	Primitiva Ord. .	7-7½	+ 1	4 13 4
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	132-141	+ ½	4 18 3				5	Do. 5 p.c. Pref.	58-58½	..	4 13 0
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4				5	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	10		—	Cape Town & Dis. Ltd.	42-54	..	—				4	River Plate Ord. .	142-143½	+ ½	5 8 6
100,000	10		—	Do. 4½ p.c. Pref.	5-6	..	—				10	Do. 4 p.c. Deb.	95-97	..	4 2 6
50,000	Stk.	Nov. 3	6	Do. 6 p.c. 1st Mort.	48-50	..	6 0 0				10	San Paulo, Ltd. .	135-14	..	5 14 4
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	77-79	..	5 13 11				8	Do. 6 p.c. Pref.	112-12	..	5 0 0
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 10 1				5	Do. 5 p.c. Deb.	50-51	+ ½	4 18 0
1,491,280	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk.	106-109	..	4 15 5				10	Sheffield A. . .	236-238	..	4 4 0
560,000	"		5	Do. 3½ p.c. do.	101-103	..	4 17 1				10	Do. B. .	233-25	- 2	4 5 1
475,000	"	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3				10	Do. C. .	234-236	..	4 4 9
800,000	Stk.		6½	Continental Union, Ltd.	101-103	..	6 6 3				10	South African . .	14-14½	..	6 17 11
200,000	"		7	Do. 7 p.c. Pref.	138-141	..	4 19 3				10	South Met., 4 p.c. Ord.	123-125	..	4 5 4
493,270	Stk.		5	Derby Con. Stk. . .	121-123	..	4 1 4				5/6/8	Do. 3 p.c. Deb.	85-86	..	3 9 9
55,000	"		4	Do. Deb. Stk. . .	103-105	..	3 16 2				8	South Shields Con. Stk.	152-154	..	5 3 11
148,995	"	Mar. 31	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0				5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
486,910	10	Jan. 28	12	European, Ltd. . .	232-241	..	4 19 0				5	Do. 5 p.c. Pref.	122-124	..	4 0 8
551,600	10		12	Do. £7 1cs. paid.	172-181	..	4 18 5				5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
15,161,545	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0				5	Southampton Ord. .	109-111	..	4 10 1
2,600,000	"		3½	light 3½ p.c. max. .	88-89	..	3 18 8				6½	Tottenbam A 5 p.c.	132-134	..	5 0 9
3,799,735	"		4	and 4 p.c. Con. Pref.	105-107	..	3 14 9				5½	Do. B 3½ p.c.	109-111	..	4 14 7
4,193,975	"	Dec. 11	3	Coke 3 p.c. Con. Deb.	85-86	..	3 9 9				4	Edmonton 4 p.c. Deb.	107-103	..	3 17 8
258,740	Stk.	Mar. 12	4½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0				8	Tuscan, Ltd. . .	101-103	+ 1	4 17 1
82,500	"		6½	Do. 5 p.c.	117-120	..	5 4 2				10	Do. 5 p.c. Deb. Red.	105-107	..	4 13 6
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	172-173	- 3	6 4 0				6½	Wands-1 B 3 p.c.	131-133	..	4 17 9
123,500	Stk.	Mar. 12	6½	Ilford "A" and "C" .	134-136	..	4 15 7				3	worth 3 p.c. Deb. Stk.	72-74	..	4 1 1
65,780	"		5	Do. "B" . . .	103-105	..	4 15 3				5½	West Ham 5 p.c. Ord.	119-122	..	4 6 1
51,000	"	Dec. 30	4	Do. 4 p.c. Deb. . .	102-104	..	3 16 11				5	Do. 5 p.c. Pref.	125-127	..	3 18 9
4,904,000	Stk.	Nov. 13	8	Imperial Continental	184-186	+ ½	4 6 0				4	Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2								
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10								

Prices marked * are "Ex div."

capacity of the smaller holder, if the scheme he suggested was carried out, the Corporation would have two large holders with 5,000,000 cubic feet total capacity, which, on the Corporation's own evidence, was ample for the requirement of the borough for many years ahead. As to the capital value of the small holder, £9000, he should say it had been written off in the 31 years it had been used. There were a number of sites at the north end not immediately contiguous to residential property; for there was a quantity of derelict land there.

Mr. Isaac Carr, who was called on behalf of the opposition, stated that he had carefully examined a plan of the existing gas-works at Birkenhead, and considered there was ample space for increased manufacturing and storage purposes. He saw no difficulty, judging by the plan, in so developing the works that all requirements could be met. Were he responsible for the works, he should never think of doing what the Corporation now proposed. It would be greatly to the advantage of both the Corporation and the gas consumers to confine the manufacture and the storage to the existing site. He saw no objection to destroying No. 1 holder, having regard to its age, and erecting a larger one in its place. He would undertake to erect the suggested larger holder between February and December in one year. He had not been over the works; he judged by the plan. The cost of pumping to the proposed new holder would be a serious matter. He had found the concentration of works at one spot was much more economical than dividing them.

At the completion of the evidence for the opposition, Mr. Swift urged that there were no reasons whatever why the Local Government Board should refuse their sanction to the scheme put forward by the Corporation.

GAS-METER TESTING IN MIDDLESEX.

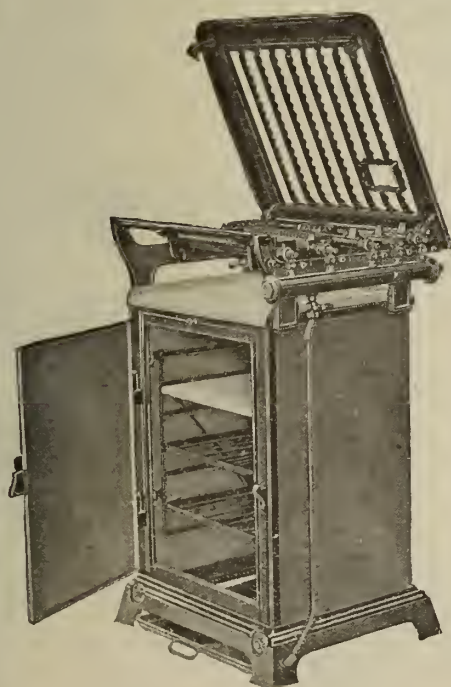
The General Purposes Committee of the Middlesex County Council report that, during the quarter ended March 31, 22,402 gas-meters were tested, in respect of which the fees payable amounted to £678 10s. During the year ended March 31, the expenditure in connection with the gas-meter testing-station was £1435 19s. 9d.; and the fees received or due amounted to £2486 14s.—leaving a balance in favour of the Council of £1050 14s. 3d. The Committee further submitted a report from Inspector Barney on the work of the station during the past year. It appears from it that during the nine years the testing work, &c., has been carried on a total of 679,051 meters have been submitted for test, and fees amounting to £20,558 12s. 6d. charged in respect of them; such fees varying from a minimum charge of 6d. upwards, according to the size of the meter. The number of meters tested and the amount of fees charged during the past year were as follows: Quarter ending June 30, 1908, meters 19,156, fees, £588 13s.; quarter ending Sept. 30, meters, 20,165, fees £602 18s. 6d.; quarter ending Dec. 31, 20,835, fees £627 10s. 6d.; quarter ending March 31, 1909, meters, 22,402, fees

£678 10s.—total, meters 82,558, fees £2497 12s. The totals for the previous year were: Meters 82,382, fees £2511 15s. 6d. Thus a larger number of meters tested show a slight decrease in fees; but this is explained by the fact that out of the total of 82,558 meters a larger proportion than usual—69,250—were tested at the minimum fee of 6d. Of the total number of meters tested during the past year, 4244 were received from gas companies and consumers, compared with 3667 received the previous year. Of the former number, 1818 were stamped and 2426 rejected. The remaining 78,314 meters were received from makers; and 76,101 were stamped and 2213 rejected.

Fatal Defective Gas-Fittings at Belfast.—At an inquest on the body of a man named Graham who lived in Belfast, the widow stated that her husband was in his usual health when he retired to rest on the 24th ult. Next morning there was a strong smell of gas from his bedroom; and she found there was an escape, while Graham was breathing very heavily. The gas-bracket in the bedroom did not work properly. Deceased had complained to the agent, and men had been sent to remedy whatever defect existed; but apparently they had not been able to do so. Deceased got tired of having the carpets lifted to allow the men to work at the pipe, and told them that there must be some other way of doing it. A constable said that after Mrs. Graham told him the gas was defective he lighted it, and it went out in less than five minutes. Dr. M'Arthur gave evidence to the effect that when Graham was brought to the hospital, life was extinct; death being due to carbon monoxide poisoning. The Jury returned a verdict in accordance with the medical evidence, finding that the deceased inhaled the gas as the result of an escape from defective fittings.

Ipswich Water Supply.—In submitting the accounts and balance-sheet of the Water Committee to the Ipswich Town Council, Mr. W. O. White, the Chairman of the Committee, pointed out that, while it was not proposed to vote anything in the reduction of the rates this year, the undertaking had given £5000 in reduction of rates in past years. Seeing that they had done this on a profit of 1d. per 1000 gallons, it could not be said that they had been guilty of charging the consumers excessively. The capital outlay on the water-works had been £277,000, and interest had to be paid on a large portion of it; but a valuable property was being created, and he thought the ratepayers had every reason to be well satisfied with the way the concern was managed. More water would be required; but he did not propose to deal with this question then, except to say that it was on the ground of expected operations that no grant was made towards the rates. Last year they used one week 93 per cent. of the available supply of water, which showed how near they were to using up their supply. The water from the gravitation sources was only half what it was a few years ago. The balance-sheet showed that the water-rental for the year was £18,284, against £18,099 in the previous year. The gross profit was £11,390, and the net profit £810, against £821 net profit in 1908. The total balance in hand on net revenue account was £2446.

Further Proof



that the "New Davis" Screwless Cooker is, first and foremost, a MAINTENANCE COOKER is found in the following incident:

The Engineer of a prominent Gas Company was sceptical as to the possibilities of the "New Davis" in this direction. In order to convince him, we sent a fitter to his works to demonstrate, in the presence of the Engineer and several members of his staff, the rapidity with which the Screwless Cooker could be taken to pieces and put together again.

RESULT:

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At their monthly meeting last Monday, the most important business at which is noticed in another column, the Edinburgh and Leith Gas Commissioners had under consideration one or two other items of some interest. The Engineer's report for the month of March showed an increase in the output of gas, compared with the corresponding month of last year, of 3,525,000 cubic feet. When, however, comparison is made of the periods from the 16th of May, it is found that in the current year there has been a decreased output to the extent of 59,310,000 cubic feet, which is equal to 3.16 per cent. The average illuminating power of the gas, corrected to standard temperatures and pressures, was stated to be 19.35 candles, compared with 20.35 candles in March of last year. This is not a large reduction for a body who have power to go down to 14 candles. It was stated before the Parliamentary Commission in July last that whatever reduction there might be would be made gradually—and the statistics submitted bear out this statement. As having some relationship to the decrease in the output of gas, it may be mentioned that the rental in the three months ending the 15th of March showed a decrease of £4541. The requirements of the Scottish Office in matters of finance are so strict as to almost make business impossible. They spell precaution pushed to an extreme. This is the position with reference to the statutory provisions; but it is much more true of the requirement of Mr. Lisle, C.A., the Actuary who reported upon the solvency of the proposed scheme of superannuation. It would almost seem that he, probably through long association with matters in the abstract, had forgotten that the proposed scheme was intended to be managed by intelligent beings, who might be trusted to find means for filling up blanks as they arose. His requirement that everything should be found geometrically perfect before the scheme should be launched is a principle hitherto unheard of in business. Suppose it were to be applied, and before anyone were allowed to engage an assistant for a year he should be required to deposit, in security, the full amount which he would earn during the year, how many assistants would be engaged? If such uncalled-for stringencies as are here attempted are to be insisted upon, how many more superannuation schemes will be proposed? The Commissioners make an alternative offer, which would be an easier method for them of complying with the wishes of the Actuary, but would not get the burden off their shoulders. It is doubtful if they will be allowed their method of an annual contribution instead of providing a lump sum. If they are not, a huge burden will be laid upon the Commissioners in addition to those—without doubt heavy enough—which were known to exist in the Provisional Order when it left the hands of the official legislators in the Scottish Office. It is no wonder that the Commissioners wished to protest against the treatment they have received. This treatment, it may be assumed, has not been adopted with the intention of

discouraging enterprise in gas matters; but its effect is, without doubt, discouraging. Unfortunately, it is treatment at the hands of officials who are permanent, and whose policy not even a General Election would change. Many years ago, the late Lord Salisbury warned the community against the rise in power of the permanent official; and his warning bids fair to be well justified. The other subject—about the alleged introduction of air into the gas—was met by the Convener of the Works Committee with a denial that the practice exists; and I would not refer to it but for the fact that it will be mentioned again when the Committee report.

A meeting of the Gas Committee of the Dumfries Town Council, which comprises all the members of the Council, was held in the end of last week to further consider the question of filling the vacant post of Gas Manager. The Clerk submitted returns he had received from sixteen different towns in Scotland, of a similar size to Dumfries, and showing that in them the rate of remuneration of gas managers varies from £200 to £500 per annum. There was considerable discussion in regard to the appointment. It was moved that the situation be advertised; also that Mr. John Smith, the Under-Manager, and Mr. S. Dickie, the Chief Clerk, be appointed Joint Managers, at a salary, in each case, of £200. The latter proposal was adopted by 12 votes to 11. It has still to be submitted to the Town Council in open session. Mr. Smith at present has a salary of £130, and Mr. Dickie one of £140. Mr. Smith has two brothers who are gas managers—one at Hawick and the other at Stirling.

As is well known, the water supplied in Aberdeen is looked upon by many as being unsatisfactory, in respect that, being taken from the River Dee, it is liable to pollution. Those who hold this view have just been able to disclose facts which confirm their opinions, and must be very disquieting to the community. Last Monday, the Water Committee, with Lord Provost Wilson, the Convener, at their head, went on a visit to Tarland, an inland village, to inspect the irrigation works which the Aberdeen County Council erected there two years ago at considerable expense. After the arrangements were completed, the District Committee of the County Council let the place to a farmer or market gardener, who undertook to attend to the distribution of the sewage over the land. The Water Committee, however, found that this undertaking was not being observed, but that, instead of the land being used for the treatment of the sewage, it was being cultivated for the growing of vegetables; and whenever the tenant thought his crops had had sufficient irrigation, he turned the whole of the sewage into the stream which flows into the Dee. On Monday, sewage was flowing into the stream at the rate of 10 or more gallons per minute. It was also found at Lumphanan that sewage effluent was reaching the Dee in an unpurified condition. The Committee concluded that the only method available for securing proper attention to sources of pollution is for the Town Council to acquire the works and look after them themselves. Meanwhile, the Town Clerk was instructed to write to the District Committee drawing attention to the reprehensible manner in which things are being conducted.



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GAS COOKERS.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, May 1.

The month's requirements being covered, and there being very little new business coming forward, the tone of the market has been weak, and parcels offered have not found a ready sale. Home demand, too, has slackened. Consequently, the closing quotations are £11 5s. per ton f.o.b. Hull, £11 7s. 6d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. There has been a fair amount of inquiry in the forward position, but makers have not shown much disposition to meet it. There has, however, been speculative selling abroad at about the equivalent of spot prices.

Nitrate of Soda.

Although prices have been fairly well maintained, demand has not been altogether satisfactory, and the month closes with very heavy stocks in Europe. The spot prices are 10s. 3d. per cwt. for 95 per cent., and 10s. 6d. for refined quality.

Tar Products. LONDON, May 3.

The markets for tar products are still quiet, with the exception of pitch, which remains firm, and several large transactions have taken place at an improved price. Creosote keeps steady; but benzols are very weak.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d., ex works. Pitch, London, 25s. 3d. to 25s. 6d.; east coast, 24s. 9d. to 25s.; west coast, 24s. 3d. to 25s. 3d. f.a.s. Mersey ports, 24s. to 24s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d.; North, 5½d. to 5¾d.; 50-90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8¾d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9¾d. to 9¾d.; heavy naphtha, casks included, London, 10¾d. to 11¼d.; North, 9¾d. to 9¾d. Creosote, in bulk, London, 2¾d. to 2¾d.; North, 2¾d. to 2¾d. Heavy oils, in bulk, 2½d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1½d. to 1s. 2d.; west coast, 1s. 1d. to 1s. 1½d. Naphthalene, £4 10s. to £8 10s.; salts, 36s. 6d. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

As there has been no covering in for the end of the month, the market for this article has weakened somewhat. The demand also from the east has been very quiet. To-day actual Beckton is quoted £11 15s.; ordinary makes on Beckton terms, £11 5s.; Hull, £11 5s.; and Liverpool, £11 7s. 6d. In Leith, £11 10s. to £11 12s. 6d. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is very active, and there is a strong demand, more especially for best steam and gas coals. In the steam coal trade, best Northumbrians are now very firm; and the opening out of the Baltic trade causes the shipments to be heavy. Prices vary from about 12s. to 12s. 6d. per ton f.o.b. Second-class steams are from 10s. to 10s. 9d.; and steam smalls are firmer at from about 5s. 6d. to 6s.—the export demand for the latter class being fuller. Production is full; and the output is well taken up. In the gas coal trade, the demand is steady, and prices are firm, particularly for best kinds. The current quotations are from about 9s. 3d. to 10s. 6d. per ton f.o.b., according to quality, for the usual classes; and up to 10s. 9d. for "Wear specials." Some further sales of gas coals have been made for export, especially to some of the Mediterranean ports, at prices not far from those above quoted. One or two local contracts are also in the market, for periods of a year; and it is expected that these will be taken at slightly below the current values, though the difficulty as to the Eight Hours' Act may influence prices for far forward delivery. Coke is firmer; and this may affect gas coke. Good gas coke is rather in lessened supply; and this steadies the market—the price being from 12s. 9d. to 13s. per ton f.o.b. in the Tyne.

Scottish Coal Trade.

The market does not improve. An attempt is being made to enhance the position of ell and splint, by the circulation of the statements that they are being "cornered." The quotations bear out that ell is commanding a better price, but that splint is declining. The prices given are: Ell 8s. 9d. to 10s. 3d., splint 9s. 9d. to 10s., and steam 9s. to 9s. 9d. The shipments for the week amounted to 306,815 tons—an increase of 3743 tons upon the previous week, and of 16,577 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,102,834 tons—an increase of 262,550 tons upon the corresponding period.

The "Glasgow Evening Citizen" has given publicity to a not very plausible story regarding a "corner" which it is said has unexpectedly come into operation in the coal market in connection with the position of certain well-known qualities of splints and ells. The coal trade has, it is said, been in a very depressed state for a good while, notwithstanding that export shipments have been heavy, and in the aggregate considerably ahead of those of last year. Prices, however, have been poor, and in many cases unremunerative; and the opinion obtaining in various quarters is that the situation has been aggravated by short selling on the part of merchants and exporters. So long as supplies of ordinary sorts were plentiful, no trouble for buyers supervened. This trouble, it is asserted, has suddenly cropped up in relation to the meeting of requirements in what are known in the trade as "named" coals. It appears, the article goes on to say, that months ago exporters and

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others sold these coals in large quantities for spring shipment, but did not cover; and now that deliveries are desired, the coal is not procurable on the conditions upon which the transactions were entered into. In the previous few days, oversold dealers had been obliged to pay to particular coalmasters as much as from 2s. to 3s. per ton above normal market prices, so as to be able to meet their requirements; and the writer stated his belief that even stiffer fines might have to be fixed before the squeeze came to an end. The market quotations certainly do not give much support to the statements in the article.

Brighthouse Gas Managership.—The Brighthouse Town Council have decided that the existing arrangement for the management of the gas-works shall be brought to a close; and a new Manager is being advertised for. For fifteen years Mr. James Parkinson has occupied the dual position of Town Clerk and Gas Engineer, with an Assistant as Works Manager; but in future he will have no professional connection with the Gas Department.

Murder by Gas at St. Helens.—An inquest was held last week at St. Helens on the bodies of a glassmaker, named Mason, and his son, who were found in bed suffocated by gas. The man's head was enveloped in a pillow-case; and an india-rubber tube, one end of which was attached to a gas-bracket, had apparently slipped from his mouth. He had also a wound in his neck. The boy had a scarf tied round his neck; and there was clear evidence that an attempt had been made to strangle him. The doctor said that probably gas had been given to the child first, and then the scarf was wound round his neck. The Jury returned verdicts of "Wilful Murder" and "Felo de se" against the father.

Fatality through a Gas-Grill.—At the Southwark Coroner's Court last Tuesday, Dr. F. J. Waldo held an inquiry with reference to the death of Ellen Victoria Philpott, aged 5½ years, whose parents live at No. 240, Southwark Bridge Road, and who died in Guy's Hospital as a result of having been severely burnt by a lighted gas-grill. The mother stated that she left the child for a short time with a younger brother in the kitchen on the previous Saturday. The gas-grill was half on, and she was about to return when she heard a loud noise followed by a scream. She hurried back to the kitchen and found the child in flames. In reply to the Coroner, witness said she had just lit the grill and told the children not to go near it. When she visited her child in the hospital, the latter said: "I went to stand on a chair to get my school-bag when my clothes caught alight." The Coroner asked witness if she had a fire-guard. Witness replied that she had, but did not put it round the gas-stove. The Coroner said it was a sad case; but, under the circumstances, the mother was not liable under the Children Act, as it was a gas-grill that caused the fire. No gas-stoves were included in the new Act; and he failed to understand why. As it was, there might be many fatal accidents caused by gas-stoves; and he felt that some day they would be included. The Jury returned a verdict of "Accidental death."

Lambeth Public Lighting.—At the meeting of Lambeth Borough Council last Thursday, the Lighting Committee reported that the average time during which the lamps in the Gaslight and Coke Company's district were alight during the period from the 1st to the 31st of March was 11 hrs. 30 min. 54 secs. per night. The fixing of the automatic apparatus to the lamps has been completed, and the date from which the reduction of 1s. 6d. per lamp per annum will take effect has been agreed as the 8th of February last. During the month of March, 1330 cases were reported to the Company of lamps having been defective or out of lighting. About one-third of the cases were of lamps not lighting up at night, and the other two-thirds of lamps remaining alight in the morning. Each defect was remedied in less than an hour after its occurrence. The Committee pointed out that no additional liability was incurred by the Council from the lamps remaining alight in the morning, as a fixed charge is paid for each lamp.

Proposed Gas Supply for Treeton and Catcliffe.—The subject of a gas supply for Treeton and Catcliffe has been discussed at a third joint meeting of the Parish Councils. At the last meeting, it was decided not to adopt a scheme proposed by Mr. Henry Ellison, of Cleckheaton, to supply gas from works he contemplated erecting at Beighton. This decision came about owing to Mr. Ellison's change of plans; he having earlier promised to erect his plant at Treeton or Catcliffe. Correspondence was now placed before the meeting with regard to the Council's inquiries concerning a proposal for the two parishes to combine and form a local Company. It was stated that a sum of £5000 would be required to start a Company, and that Mr. F. J. Jones, Managing-Director of the Rothervale Company, had promised that for every £1 raised in the district, he and his friends would put up a like sum. It was decided to call a general meeting of ratepayers to discuss the matter.

A Birmingham Manufacturer's Strange Death.—An open verdict was returned by the Coroner's Jury who were appointed to inquire into the death of William Williams, a fender ornament manufacturer of Birmingham, who died from coal gas poisoning. Clara Williams, a daughter, said deceased was a widower, and had not been well for six months. He had complained of his head and his heart; and she had known him to faint. On the evening of his death, after eight o'clock, he went to his workshop. He had been talking about his gas-engine, but had not done any work that day. A quarter-of-an-hour afterwards witness thought she heard the engine working, but on going into the yard saw it was not. She went to the workshop and found the door open, but no light in the place. She noticed a smell of gas, and going a little way into the shop struck against her father's foot. She thought the gas was on at the engine and escaping, and she went and turned it off. She had never known deceased to threaten his life; but she had known him to start the engine many times when not at work. He was very proud of his engine. Herbert Williams, brother of deceased, said he found the gas-pipe disconnected at the joint from the engine. He suggested that deceased had been doing some repairs to the engine, and had forgotten to turn off the gas-tap on the feed-pipe. The windows in the shop were all broken.

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Increased Water Supply for Llandudno.

Last Tuesday, Lord Stalbridge, the Chairman of the London and North-Western Railway Company, inaugurated at Llandudno a duplicate water main, 15 inches in diameter, which will convey water to the town from Llyn Delyn and Melynlllyn—two lakes belonging to the Llandudno Urban District Council, situated quite close to Carnedd Llewellyr, at an altitude of more than 1700 feet. The first pipe from these lakes was opened by the King, when Prince of Wales, in June, 1880. The new pipe has cost upwards of £33,000, and has been constructed in sections over a period of ten years. On his arrival, Lord Stalbridge was presented with an address of welcome on behalf of the Council, and then proceeded to a spot where two hydrant stand-pipes had been fixed, to which were attached a couple of hose lengths, and turned on the water. Immediately two powerful streams were thrown from 50 to 60 feet in the air. After allowing the jets to play for a few minutes, the water was turned off. A model in silver of the valve-key used by his Lordship to turn on the water was presented to him by the Chairman of the Council (Mr. M'Masters); and the ceremony concluded with three cheers for the distinguished visitor. The event was celebrated by a luncheon at the Imperial Hotel.

Liverpool Gas-Fittings Company, Limited.—In the report which the Directors of the Company will present at the annual meeting on the 12th inst., they state that the net profit for the year ended the 31st of March was £1508. Adding the balance brought forward makes a sum of £1633 to the credit of the profit and loss account. The Directors recommend a dividend at the rate of 10 per cent. with a bonus of 1s. per share (free of income-tax); after payment of which there will be left £133 to go to the next account.

New Yorkshire Coalfields.—It is stated that a Syndicate of Yorkshire, Nottinghamshire, and Derbyshire colliery owners have leased 7000 acres of land at Barnby Junction for the purpose of establishing a colliery. It is definitely known that there is a large deposit of coal in the neighbourhood, and the experts engaged in the work fully expect to tap the valuable Barnsley seam, 2000 feet down. Sinking operations are being commenced immediately; and it is anticipated that the colliery will shortly be turning out about 30,000 tons of coal per week.

Rhyl Water Supply.—At a recent meeting of the Rhyl Urban District Council, Mr. Wallis, in moving the adoption of the report of the Water Committee, mentioned that the past financial year had been the first in which the undertaking had managed to pay its way. Referring to the matter, the "Rhyl Record" said: "One is glad to note that, after many years of hard struggling with unfair odds, the Water Department has this year paid its way—an achievement which reflects the greatest credit upon our painstaking and capable Water Engineer, Mr. L. G. Hall, who has had formidable obstacles to overcome. No better tribute could be paid to anyone than the solid and the convincing success just attained."

Buenos Ayres (New) Gas Company, Limited.—The accounts of the Company for the past year, which will be submitted to the proprietors at the annual general meeting on Thursday, show that the profit, after writing off bad debts and making ample provision for doubtful ones, is £67,771. Adding the profits from other sources (£21,320) and the amount brought forward (£26,273), a total of £115,364 is produced. This sum the Directors recommend should be appropriated as follows: Debenture interest, £10,000; interim dividend of 6s. per share, free of income-tax, £21,000; to reserve, £42,436; final dividend of 8s. per share, making 7 per cent. for the year, tax free, £28,000; to be carried forward, £13,928. Out of the year's revenue, the sum of £27,946 was expended on the upkeep of the works, mains, &c., all of which are reported to be in a high state of efficiency.

A Challenge at Ilfracombe.—The usual statements having been inserted in the Ilfracombe papers in regard to electric light with the new metallic filament lamps being "cheaper than gas," Mr. L. Fletcher, the Managing-Director of the Welsbach Incandescent Gaslight Company, has issued his well-known challenge to instal a house in the town with Welsbach light if the electricity people will instal a precisely similar one with electricity, the consumption and candle power of each installation to be tested at regular intervals throughout the year by two independent experts—one gas and one electric. Should the result not prove that, light for light, the Welsbach light—allowing for renewals at current prices—comes out at one-half the cost of the Osram light, the Welsbach Company would pay for their installation and subscribe £50 to any local charity. If the contrary, the Electric Light Company would have to pay for the gas installation and give a like amount for a charity. It will be interesting to see whether this very fair challenge is taken up.

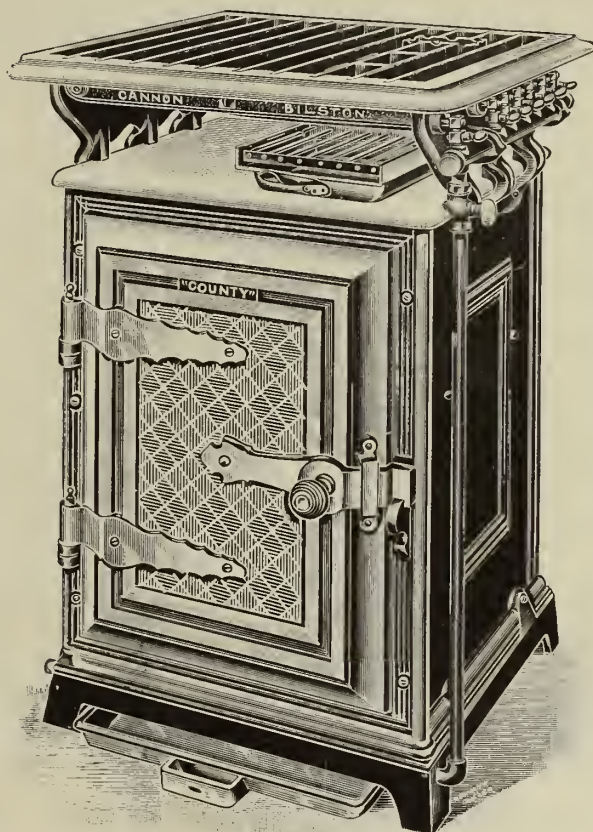
Gas and Electricity at Chelmsford.—Some outspoken remarks about the electric light were made in the Chelmsford Town Council when the Lighting Committee recommended that a few new lamps should be provided and lit by the Gas Company, at a charge of £3 a year—a petition having been received from certain residents that electricity should be employed. Alderman Feather expressed the opinion that the small electric lamp could not compare with the gas-lamps. The latter were three or four times better than what had been described as the "glow-worms." Besides, the electric lamps cost £3 3s., and the gas-lamps £3. He reminded the members, too, that they had nothing but complaints as to the electric lighting. In view of the time when the contract with the Electric Supply Corporation would expire, he thought this would be a good opportunity to compare the two systems of lighting. Mr. Osborn said it would be a gross insult to Messrs. Crompton to put up gas-lamps close to the Company's works. Mr. Farrow moved that electric light be provided, and said it was not fair to put up gas-lamps in this new district, seeing that the Electric Light Supply Corporation had the contract for the lighting of the borough. Mr. Driver said, though a shareholder in the Gas Company, he should second the amendment. Mr. Leach said the idea of those who recommended gas was to bring the Electric Supply Corporation "up to the scratch." The amendment was carried by 17 votes to 10.

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Australasian Agents:

JAMES HURLL & CO., Ltd., 20, Loftus Street, SYDNEY,
and Box No. 4 (G.P.O.) Dunedin.

Matlock and District Gas Company.—According to the last annual report of the Company, there was a profit of £2490 on the working in the year ended Dec. 31, 1908. Adding the unappropriated balance of £3573, this sum was brought up to £6065. This had to bear the interim dividend and the debenture interest, amounting together to £1568; leaving £4497 for disposal. The Directors recommended the payment of a dividend for the half year ended Dec. 31 at the rate of 6s. per share, which would require £1413; leaving £3084 to be carried forward. A large number of new services were laid during the past year. In consequence of the growing consumption of gas, it has become necessary to provide additional storage. The Directors have therefore entered into a contract for the erection of a new holder. They have also decided to increase the capital of the Company.

The Fulbourn Asylum Lighting Scheme.—It may be remembered that the question of the lighting of the Fulbourn Asylum, Cambridge, was some months ago the subject of much discussion by the Committee of Visitors; the difficulty before them being a decision as to the illuminant to be employed. Offers were received from the Cambridge Electric Supply Company and the Cambridge Gas Company; but in the result the offer of the former was withdrawn, and an amended offer of the Gas Company accepted, on the advice of Mr. Graham Harris, who had been consulted by the Visitors. He also advised that all the gas-burners in the Asylum should be of the most modern inverted incandescent mantle type. It was estimated that the annual cost of the lighting would be £303; and the new fittings and other matters made up a total of £1778. This amount has been apportioned between the county, the borough, and the Isle of Ely. At the meeting of the Visitors on Monday last week, it was reported that an agreement with the Gas Company had been prepared, and that it would be settled as soon as sanctioned by the three bodies concerned in the scheme.

The Master of the St. Pancras Workhouse has reported that a new system of up-to-date gas-fittings which has been installed cost £1079s., being £6 19s. 3d. less than the estimate; but that as the result of this expenditure the reduction in the cost of gas consumed during the last quarter was no less than £82 18s. 1d.

"Hints on House-Letting" is the title of a small but attractive pamphlet which has just been issued by John Wright and Eagle Range, Limited. It has been prepared with the view of inducing builders to pipe new houses for gas-heated appliances, instead of putting in the hot-water boilers and washing coppers now generally in use. Particulars and prices are given of the firm's "Sun" boiler and their "Gyp" portable copper.

Last Wednesday morning, the fully-clad body of Mr. R. Barry Peard, the South Wales and West of England representative of Messrs. T. Glover and Co., Limited, and Messrs. R. & A. Main, Limited, was found on the rocks at Porthcawl. He arrived in the town the previous Friday, and next morning left his hotel, as was supposed, for the purpose of taking a walk. From that time he was not seen until the finding of his body as recorded above.

At a recent meeting of the Ramsgate Corporation Gas and Water Committee, it was proposed, "That where the Engineer gives permission to an employee to join the Territorial Force, such employee be granted half-pay during the minimum time he must attend camp." Mr. Chapman entered a strong protest; characterizing the action of the Committee as mean in the extreme. It was pointed out, however, that the men would have their full military pay as well, and that there were from forty to fifty men in the department who were eligible to join; and, were full pay granted, the working of the department would suffer through so many being away at once. The proposition was adopted.

APPLICATIONS FOR LETTERS PATENT.

- 9182.—DYE, F. W., "Carburetted air." April 19.
 9211.—BEAN, H. R., "Generating acetylene." April 19.
 9251.—RAUTHMELL, T., "Generating acetylene." April 19.
 9327.—BRINDLEY, H. S. B., "Valves for control of pressures." April 20.
 9339.—CLIFF, A., and WILLIAMSON, F. W., "Gas-retorts." April 20.
 9379.—HILL, F. B., "Couplings for pipes." April 20.
 9434.—TIROTKA, B., "Incandescent gas-lamps." April 21.
 9468.—WITHERS, A. W., "Gas-producer plants." April 21.
 9473.—SCOTT-SNELL, E., "Air-gas." April 21.
 9482.—DOWNS, J. H., and WRIGHT, H. F., "Ladders for use with spirally-guided gasholders." April 21.
 9483.—WRIGHT, H. F., "Ladders for use with spirally-guided gasholders." April 21.
 9484.—DOWNS, J. H., and WRIGHT, H. F., "Ladders for gasholders." April 21.
 9485.—WRIGHT, H. F., "Water-lutes of gasholders." April 21.
 9487.—KAMP, W. J. A. VAN DE, "Preventing explosions and danger from the escape of gas." April 21.
 9518.—BENOT, M. C., "Analyzing gaseous mixtures and recording the result." April 21.
 9538.—ANDREWS, G., "Incandescent burners." April 22.
 9644.—HOPKINS, J. H., "Compressor or exhaustor." April 23.
 9688.—HEATH, A. W., and HARRISON, C. H., "Inverted burner." April 23.
 9720.—BARHAM, A. W., "Petrol-air gas." April 24.
 9723.—LEA, J. E., "Meter." April 23.
 9740.—OULTON, J., and NEWHOUSE, W. A., "Anti-vibration incandescent burner." April 24.
 9752.—CLOWES, R. S., "Mantle-rod." April 24.
 9757.—SPERRY, G. N., "Inverted burners." April 24.
 9783.—THORNTON, A. A., "Hydrocarbon lighting apparatus." April 24.
 9793.—DARGUE, W. H., "Production of acetylene." April 24.
 9798.—MENZ, A., "Compressing coal gas." April 24.

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ENGINEER AND MANAGER. Brighthouse Gas Department. Applications by May 15.
TRAVELLER (GAS PLANT). No. 5088.
CARBONIZING FOREMAN. No. 5093.

Situations Wanted.

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COMMISSIONS FOR NEW ZEALAND. No. 5091.
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GAS-COOKERS. Coventry Gas Department.
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STOCKS AND DIES. Laindon Gas and Water Company.

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Stocks and Shares.

ALDRSHOT GAS AND WATER COMPANY. May 18.
BROMLEY AND CRAVS GAS COMPANY. May 11.
CHIGWELL, &c., GAS COMPANY. May 18.
CROMER GAS COMPANY. May 11.
EASTBOURNE GAS COMPANY. May 11.
GUILDFORD GAS COMPANY. May 11.
HORNSEY GAS COMPANY. May 11.
ILFORD GAS COMPANY. May 11.
LEA BRIDGE GAS COMPANY. May 11.

Stocks and Shares—continued.

MAIDSTONE GAS COMPANY. May 11.
PINNER GAS COMPANY. May 11.
ROMFORD GAS COMPANY. May 11.
SOUTHEND GAS COMPANY. May 11.
SOUTHGATE GAS COMPANY. May 11.
TENDRING HUNDRED WATER COMPANY. May 18.
UXBRIDGE GAS COMPANY. May 18.
WANDSWORTH AND PUTNEY GAS COMPANY. May 11.

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(Regd. by Exam.). Teleg. 682 Central. Teleg. "Geologic,"
London. We sustain over quarter of a century's Experience
and Reputation for Patenting Inventions and Re-
gistering Trade Marks throughout the World.

Write or call. We attend and advise you free.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of
AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WEDNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

GAS TAR wanted,

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

DESSAU PATENT VERTICAL RETORTS.

FOR list of Installations, see "Journal,"

April 20, p. 1. of Centre.

THE DESSAU VERTICAL RETORT COMPANY,
Care of Mr. CHARLES HUNT, Consulting Engineer,
17, Victoria Street, WESTMINSTER, S.W.

BRISTOL RECORDING GAUGES
AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 28, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

TO GAS ENGINEERS AND MANAGERS.

THERE will shortly be announced in
the "JOURNAL" Particulars of a NEW
BURNER for STREET LIGHTING, which will be
known as the TWIN-LIGHT. There has never been
anything to approach it in efficiency; and we would
like all those interested in Public Lighting to look out
for the announcement mentioned.

ADVERTISER has a Large Fund to

INVEST in any Genuine Water or Gas Company.
Address No. 5085, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

APPLICANTS for the Position of

ASSISTANT WORKING FOREMAN, for Stove
Repairing Shops in a Large Sutherland Gas Company,
are THANKED for their Applications, and informed
that the VACANCY IS NOW FILLED.

BISHOP'S STORTFORD AND DISTRICT GAS
COMPANY.

APPOINTMENT OF SECRETARY.

CANDIDATES who sent in Applications
are THANKED for the same, and are informed
that the VACANCY HAS BEEN FILLED.

GAS-FITTER requires Situation. Good

in Iron and Compo., Slot Installations, Meter
Inspection, Incandescent Lighting, and all class of
Companies' Work. Gas Company's Apprenticeship.
Ten Years' Experience. Age 24. Excellent References.
Address No. 5086, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

ADVERTISER (Age 25), son of a well-

known Gas Engineer, desires Situation as
MANAGER of small Works, or ASSISTANT on large.
Five Years' Practical Experience of Gas Manufacture
and Distribution. Two Years Retort Setting. Com-
petent Draughtsman, Chemist, and Book-Keeper. Ex-
cellent Testimonials. Disengaged.

Address Jas. R. LOVE, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

GAS APPARATUS—A well-known

REPRESENTATIVE, with a Wide Connection,
having Terminated his recent Engagement, Desires to
Take up on Commission an AGENCY that, with active
working, will yield a good Turnover.

Address No. 5087, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

ADVERTISER, proceeding to New

Zealand in connection with the Gas Lighting and
Heating business, desires additional COMMISSIONS,
from Manufacturers and Others. Remuneration by
Result and Share of Expenses.

Address No. 5091, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

BOROUGH OF BRIGHOUSE.

APPOINTMENT OF ENGINEER AND MANAGER
OF GAS-WORKS.

THE Gas Committee of the Corporation

invite APPLICATIONS, from duly Qualified
Persons, for the post of ENGINEER and MANAGER
to the Gas-Works.

Make of Gas, 170 Millions.

Salary, £250 per Annum.

Applications, in Candidates own Hand-writing,
stating Age, Experience, present Occupation, when at
Liberty, together with copies of Three recent Testi-
monials, to be delivered to the undersigned, endorsed
on the outside "Gas Engineer," not later than Saturday,
the 15th of May, 1909.

The person appointed is to devote his whole time to
the Duties of this Office.

Canvassing, either directly or indirectly, will be a
disqualification; but forwarding typed or printed copies
of Application and Testimonials to Members of the
Committee is permitted. Names and addresses may be
obtained on Application with Stamped Addressed
Foolscap Envelope.

JAMES PARKINSON,
Town Clerk.

Town Clerk's Office,
Brighouse, April 23, 1909.

CARBONIZING Foreman required for a
large House of Inclined Retorts. Eight-Hour
Shifts. Wages, 50s. per Week.
Apply, by letter, stating Age and Experience, to
No. 5090, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

WANTED, a Traveller for Coal-Gas

Making Apparatus to REPRESENT a Firm of
Contracting Gas Engineers in South Wales and Mid-
land District, or Southern and Eastern Counties. Ap-
plicants must have had previous Experience.

Apply, by letter, Stating Age and Salary required, to
No. 5088, care of Mr. King, 11, Bolt Court, FLEET
STREET, E.C.

WANTED to Purchase, a Pair of Second-

Hand STOCKS and DIES to cut $\frac{1}{2}$ -inch, $\frac{3}{4}$ -inch,
and 1-inch Gas and Water Piping.

Price and Particulars to the LAINDON AND DISTRICT
GASLIGHT, COKE, AND WATER COMPANY, LIMITED.
Offices: 99, Cannon Street, LONDON, E.C.

FOR SALE—Three Purifiers, by Newton,

Chambers, and Co., 20 ft. square by 5 ft. deep.
Planed Joints, 18-inch Valves and Connections, with
Bye-Passes, Travelling and Lifting Gear. In Good
Condition. Being Removed for Extension.
Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE—Cheap, two lengths of

Section of Wrought-Iron HYDRAULIC MAINS,
25 ft. 6 in. by 2 ft. by 1 ft. 6 in., for Six Beds of Sixes,
Dip Pipes, Arch Pipes, and Ascension Pipes Complete.
Take-off at One End, with Two 8-inch Disc Valves;
also Eighteen Self-Sealing Eccentric Screw Cast-Iron
MOUTHPIECES, 20 in. by 15 in.

Apply to the MANAGER, Gas Company, Lichfield,
STAFFS.

FOR SALE, Cheap, the undermentioned

GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER
to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkin's VALVES, 12-inch, 10-inch, 6-inch.

Apply to SAMUEL WHILE and SON, 60, Queen Victoria
Street, LONDON, E.C.

THE Coventry Corporation Gas Depart-

ment have FOR SALE about 170 WESTERN
GAS-COOKERS, made by the Davis Gas Stove Com-
pany. These are excellent Gas-Cookers for Slot Con-
sumers and are only offered for Sale because of being
replaced by larger Cookers. They have been thoroughly
Repaired, Cleaned, and Renovated, and supplied with
New Grill Pans and Grids.

Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,

Engineer and General Manager.

Gas-Works, Coventry,
April, 1909.

TO RETORT MANUFACTURERS AND
OTHERS.

THE Gas Committee for the City of

Limerick are prepared to receive TENDERS for
the Supply, Delivery, and Fixing of RETORTS, &c., &c.,
required by them for the Year ending Dec. 31, 1909.

Forms of Tender and full Particulars may be obtained
on Application to the Engineer and Manager, Mr. H.
Hawkins, Gas-Works, Dock Road, Limerick.

Tenders, endorsed "Retorts, &c., &c.," to be sent in
addressed to the Chairman of the Gas Committee, Gas
Offices, William Street, Limerick, on or before Five
p.m. May 11.

The Committee do not bind themselves to accept the
lowest or any Tender.

By order,

H. HAWKINS, M.S.C.I.,

Engineer and Manager.

FENTON URBAN DISTRICT COUNCIL.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the above

Council invite TENDERS for the Purchase of the
Surplus TAR and AMMONIACAL LIQUOR made at
their Works during the Twelve Months commencing
from the 1st day of July next.

Sealed Tenders to be sent in not later than Thurs-
day, the 13th of May, 1909, addressed to the Chairman,
Gas-Works, Fenton, Staffordshire, and endorsed "Tender
for Tar, &c."

The Committee reserve to themselves the right of
accepting any Tender for the Tar or Liquor separately.
The Committee do not bind themselves to accept the
highest or any Tender.

Further Particulars may be obtained on Application
to the undersigned.

ROBERT SURTEES,

Engineer and Manager.

Cas-Works, Fenton,
Staffs., April 27, 1909.

FENTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Gas Committee of the above

Council invite TENDERS for the Supply and
Delivery of 9000 Tons of GAS COAL, BURG, NUTS,
or BEANS for the Twelve Months commencing the 1st
of July next.

Specification and Form of Tender may be obtained
on Application to the undersigned.

Sealed Tenders, endorsed "Coal," to be forwarded to
the Chairman, Gas-Works, Fenton, Staffs., not later
than Thursday, the 13th of May, 1909.

The lowest or any Tender not necessarily accepted.

ROBERT SURTEES,

Engineer and Manager.

Cas-Works, Fenton,
Staffs., April 27, 1909.

THE Corporation of Middleton invite
TENDERS for the Supply of 45 Gross of MANTLES for Street Lighting.
Further Particulars and Form of Tender, which will contain a Fair-Wages Clause, may be obtained on Application to Superintendent Kempton, Fire Station, Middleton.

Tenders, accompanied by Samples, addressed to the Chairman of the Watch Committee, and endorsed "Mantles," must be delivered at my Office not later than the 15th of May next.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
April 28, 1909.

BOROUGH OF CHORLEY. (GAS DEPARTMENT.)

TENDERS are invited for the Supply
and Delivery of the following REQUIREMENTS:—

GAS-MAKING FUEL.
OXIDE OF IRON.
HURDLE PURIFIER GRIDS.

All Particulars relative to above may be obtained from Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, addressed to me, to be delivered not later than Tuesday, May 18, 1909.

The Corporation do not bind themselves to accept the lowest or any Tender.

JOHN MILLS,
Town Clerk.

Town Clerk's Office, Town Hall,
Chorley, May 1, 1909.

MORLEY CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation are open to receive TENDERS for the Supply of from 12,000 to 13,000 Tons of GAS COAL required by them during a period of Twelve Months.

Forms of Tender and any further Particulars may be had on Application to H. J. Hemingway, Gas Office, Town Hall, Morley.

Endorsed Tenders to be sent to the undersigned not later than Saturday, May 15, 1909.

FRED THACKRAY,
Town Clerk.

Town Hall, Morley,
Yorkshire, May 1, 1909.

GUILDFORD GASLIGHT AND COKE COMPANY. COAL.

THE Directors of the above Company are prepared to receive TENDERS for the Supply of 12,000 Tons of Durham and South Yorkshire GAS COAL (Screened or Unscreened), to be delivered free at Guildford Station, between the 1st of July, 1909, and the 30th of June, 1910, in such quantities and at such times as required.

The Directors reserve the right to accept the whole or any portion of the Quantity offered, and do not bind themselves to accept the lowest or any Tender.

Tenders to be endorsed "Tender for Coal," and to be sent to Ferdinand Smallpiece, Esq., J.P., Chairman of the Gas Company, on or before Ten a.m. Friday, the 21st of May, 1909.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
May 1, 1909.

RAMSGATE CORPORATION. (GAS DEPARTMENT.)

THE Gas and Water Committee invite
TENDERS for the Supply of 20,000 Tons of Best Quality Soft Caking and Gas Producing Screened Durham or other COAL, delivered free into Carts on the Quay at Ramsgate Harbour, or free into the Stores at the Gas-Works.

Deliveries to be in Twelve Monthly Quantities as set forth in the Printed Particulars, and are to commence as from Aug. 1, 1909.

Tenders to be sent in not later than Noon on Monday, May 10, 1909, addressed to the Chairman of the Gas and Water Committee, Gas and Water Offices, Boundary Road, Ramsgate, endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender on Application to the undersigned.

WM. THOMSON,
Engineer and Manager.

Gas and Water Offices,
Ramsgate, April, 1909.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to
receive Sealed TENDERS for the Supply of Screened GAS COAL or Washed GAS NUTS, including Carriage to the Bridgnorth Railway Station, for One Year from, or soon after, the end of July next.

Evidence as to Quality of Coal must accompany each Tender.

The Coal or Nuts must be well Screened or Washed, free from Bats, Binds, and other Refuse, and be freshly got at the time for delivery.

Quantity required: About 2600 Tons in proportionate deliveries as directed—say, 70 per cent. during Winter Months, and 30 per cent. during Summer Months.

Sealed and marked Tenders must be sent to the undersigned not later than Saturday, the 15th of May.

The Committee reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Official Forms for Tender are not furnished.
By order,
J. H. COOKSEY,
Town Clerk,
Secretary.

Bridgnorth, April 29, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late Chas. Edwin Layton, Esq.

GAS STOCKS AND SHARES OF THE TOTAL

CAPITAL VALUE OF ABOUT £18,000

IN THE

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY,
HORNSEY GAS COMPANY,
LEA BRIDGE DISTRICT GAS COMPANY,
ILFORD GAS COMPANY,
ROMFORD GAS AND COKE COMPANY, LIMITED,
SOUTHEND GAS COMPANY,
BROMLEY AND CRAYS GAS COMPANY,
MAIDSTONE GAS COMPANY,
SOUTHGATE AND DISTRICT GAS COMPANY,
PINNER GAS COMPANY, LIMITED,
GUILDFORD GASLIGHT AND COKE COMPANY,
CROMER GAS COMPANY,
EASTBOURNE GAS COMPANY.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 11, at Two o'clock, in Lots.

Particulars of MESSRS. GOLDING, HARGROVE, and GOLDING, Solicitors, 99, CANNON STREET, E.C., and of the AUCTIONEERS, as above.

By order of the Directors of the

ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF £3000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

TENDRING HUNDRED WATER-WORKS COMPANY.

(Supplying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £2000 CONSOLIDATED
ORDINARY STOCK,

AND

£2000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

UXBRIDGE GAS COMPANY.

NEW ISSUE OF £4000 CONSOLIDATED STOCK,

AND

£3000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

PAIGNTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Paignton Gas
Company are prepared to receive TENDERS for the Supply of 4000 Tons of best approved GAS COALS, to be delivered in such Quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weighbridge.

Tenders to be accompanied by Practical Working Analysis, stating the Price of the Coal Delivered at Paignton Station (Great Western Railway), free of all Charges.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars may be obtained from Mr. C. G. Dawson, Gas-Works, Paignton.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of Coal, to be sent on or before the 8th day of May next, addressed to the undersigned, at the Gas Offices, 1A, Victoria Street, Paignton.

F. W. PUDDICOMBE,
Secretary.

Paignton, April 20, 1909.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-
light Company invite TENDERS for the Supply of about 19,000 Tons of Screened GAS COALS, to be delivered free at the Great Western or London and North Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1909, and ending June 30, 1910.

The Directors reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on Application at the Company's Works or by post, and must be sent to the undersigned on or before the 22nd day of May, 1909.

By order,

WM. BELTON, A.M.I.C.E.,

Secretary and Manager.

Gas-Works, Shrewsbury,
April 24, 1909.

BOROUGH OF WALSALL.

TENDERS FOR BENZOL AND FOR BENZOLIZED CREOSOTE.

THE Corporation of Walsall invite

TENDERS for about 6000 Gallons of 90 per cent. BENZOL for Enriching purposes; and also TENDERS for about 1000 Gallons of BENZOLIZED CREOSOTE, free from Naphthalene, to be delivered during One Year, from July 1, next, in Drums or in Casks, to the Corporation Siding at the Pleck Gas-Works, Walsall.

Further Particulars may be obtained from the Engineer, at the Pleck Gas-Works, Walsall.

The Corporation do not bind themselves to accept any Tender, and they reserve the right to divide the Contract between several Firms.

The Corporation will not accept the Tender of any Person or Firm paying less than the Standard Rate of Wages to their workmen.

Tenders, Sealed and marked outside "Tender for Benzol," or "Tender for Benzolized Creosote," are to be sent to the undersigned not later than Saturday, the 22nd of May inst.

When tendering for the Benzol, the amount of purity should be stated.

JOHN R. COOPER,
Town Clerk.

Council House, Walsall,
May 1, 1909.

BOROUGH OF WALSALL.

TO LIME MASTERS.

THE Corporation of Walsall invite

TENDERS for the Supply of about 800 Tons of LIME for their Gas-Works, and about 250 Tons for their Sewage Farm at Bescot, which will be required during One Year from the 1st day of July next, the deliveries to be in such Monthly Quantities as the Corporation may from time to time direct.

The Lime is to be handpicked and clear from Refuse and Ashes, and to be delivered at the Corporation Siding at the Pleck Gas-Works and at the Sewage Farm, Bescot, as required.

Payments monthly.

The Corporation do not bind themselves to accept the lowest or any Tender, and they will not accept the Tender of any Person or Firm paying less than the Standard Rate of Wages to their workmen.

Tenders, Sealed and marked outside "Tender for Lime," are to be sent to the undersigned on or before Saturday, the 22nd of May inst.

JOHN R. COOPER,
Town Clerk.

Council House, Walsall,
May 1, 1909.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the

above Corporation are prepared to receive TENDERS for the Supply of the following GOODS:—

1—14,000 Tons of Screened and Unscreened GAS COAL, NUTS, and SLACK.

2—LEAD PIPING (Gas and Water).

3—VITRIOL.

4—LIME.

5—BENZOL.

6—WROUGHT-IRON TUBES and FITTINGS.

7—2-inch, and 4-inch, CAST-IRON PIPES and SPECIALS.

Forms of Tender may be had on Application from the undersigned, to whom all Inquiries must be addressed; and all Offers must be made on the Official Forms, or they will not be considered.

Sealed and endorsed Tenders must be delivered to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancashire, on or before Twelve o'clock noon on Saturday, the 15th day of May, 1909.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices, Leigh,
Lancashire, April 28, 1909.

BOROUGH OF LEIGH.

(GAS DEPARTMENT.)

THE Gas and Water Committee of the

above Corporation invite TENDERS for the Removal of the Surplus TAR produced at their Works during the Year ending June 30, 1910.

Approximate Quantity, 850 Tons.

Forms of Tender and any further Information may be had on Application from the undersigned, to whom all Inquiries must be addressed.

Sealed Tenders, endorsed "Tender for Tar," must be delivered to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancs., on or before Twelve o'clock Noon, on Saturday, the 15th day of May, 1909.

The Corporation do not bind themselves to accept the highest or any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices,
Leigh, Lancs., April 28, 1909.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of COAL and CANNEL. Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager. Sealed Tenders, endorsed "Coal," to be sent to me not later than Tuesday, May 11, 1909.

By order,
Geo. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
April 15, 1909.

BOROUGH OF TODMORDEN.

THE Gas Committee invite Tenders for the Supply of COAL and CANNEL. Specification and Form of Tender may be had on Application to the undersigned. Sealed Tenders, endorsed "Coal," to be sent not later than the 15th day of May, 1909, addressed to the Chairman of the Gas Committee, Town Hall, Todmorden.

By order,
H. TALBOT,
Engineer and Manager.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the Supply of GAS FUEL. Forms of Tender and any other Particulars can be obtained from the undersigned. Sealed Tenders, endorsed "Gas Fuel," to be delivered at the Office of E. A. Plant, Esq., Town Clerk, Congleton, not later than Saturday, May 8, 1909. The Committee do not bind themselves to accept the lowest or any Tender.

J. SMITH,
Engineer and Manager.

Gas-Works, Congleton,
April 21, 1909.

BRISTOL GAS COMPANY.**TENDERS FOR GAS COAL.**

THE Directors of the above Company are prepared to receive TENDERS for the Supply of their requirements of GAS COAL during the Year ending the 30th of June, 1910.

Particulars and Forms of Tender may be obtained on Application to the undersigned, to whom also Tenders, Sealed and Endorsed "Tender for Coal," must be delivered not later than Ten a.m. on Wednesday, the 12th of May, 1909.

JOHN PHILLIPS,
Secretary.

Chief Offices, Colston Street,
Bristol, April 29, 1909.

HECKMONDWIKE GAS COMPANY.

THE Directors of the above Company invite TENDERS for the Erection of a GAS-HOLDER with STEEL TANK of 127 feet Diameter.

Full Particulars with Copy of Drawings, Specification, and Conditions of Contract, may be obtained from the undersigned on payment of Two Guineas, which will be returned upon receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Gasholder," and addressed to the Chairman, Gas Offices, Heckmondwike, to be delivered on or before Wednesday, May 19.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
F. D. RICHMOND,
Engineer and Secretary.

THOMAS DUXBURY & CO.,
16, DEANS GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,

STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
FOR SHIPMENT.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,

NEWBATTLE COLLIERIES,

NEWTONGRANGE, MIDLOTHIAN.

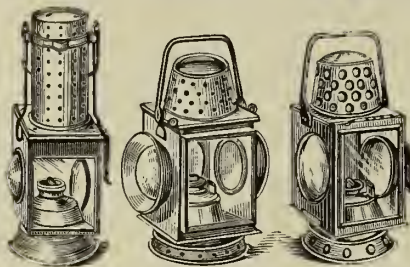
TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
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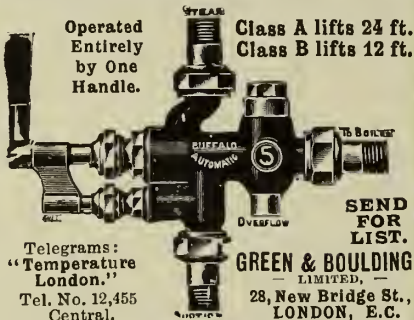
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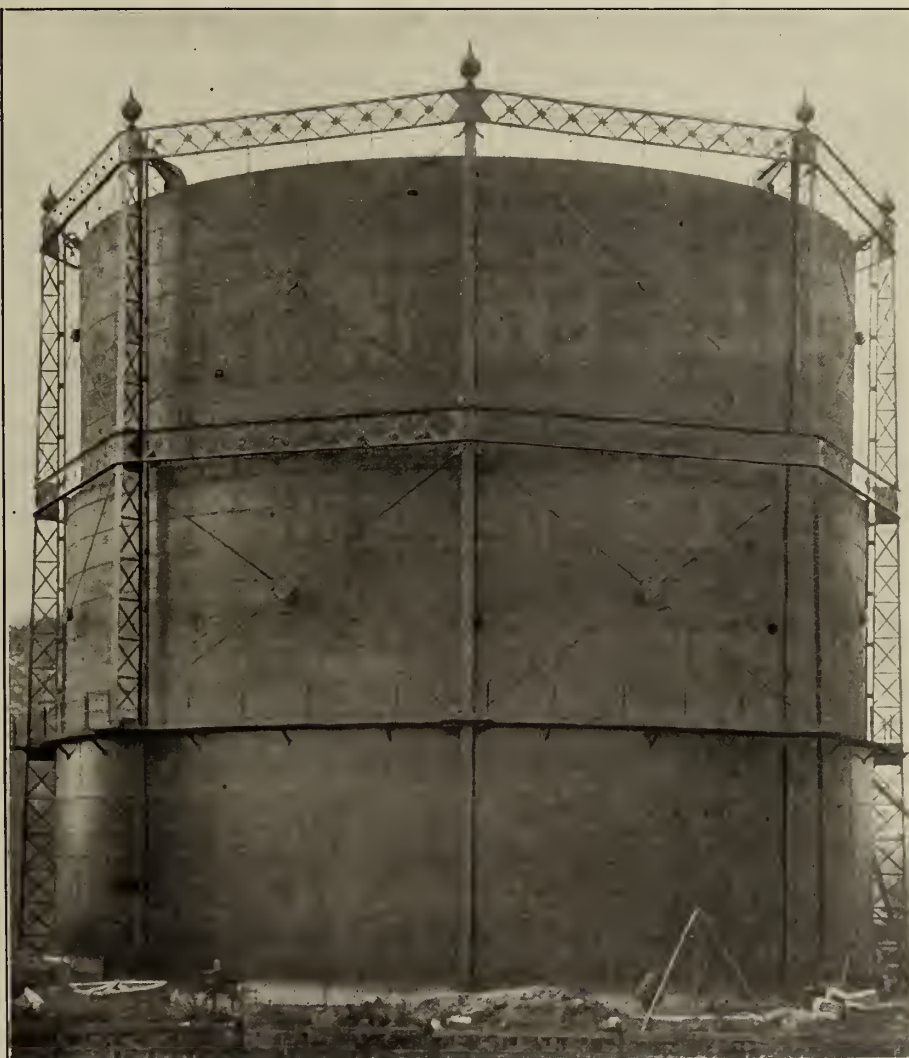
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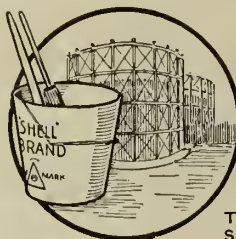
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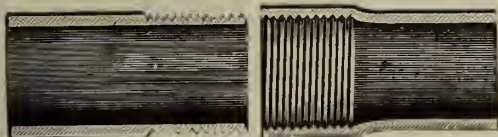
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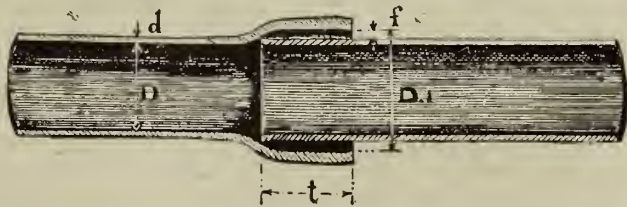
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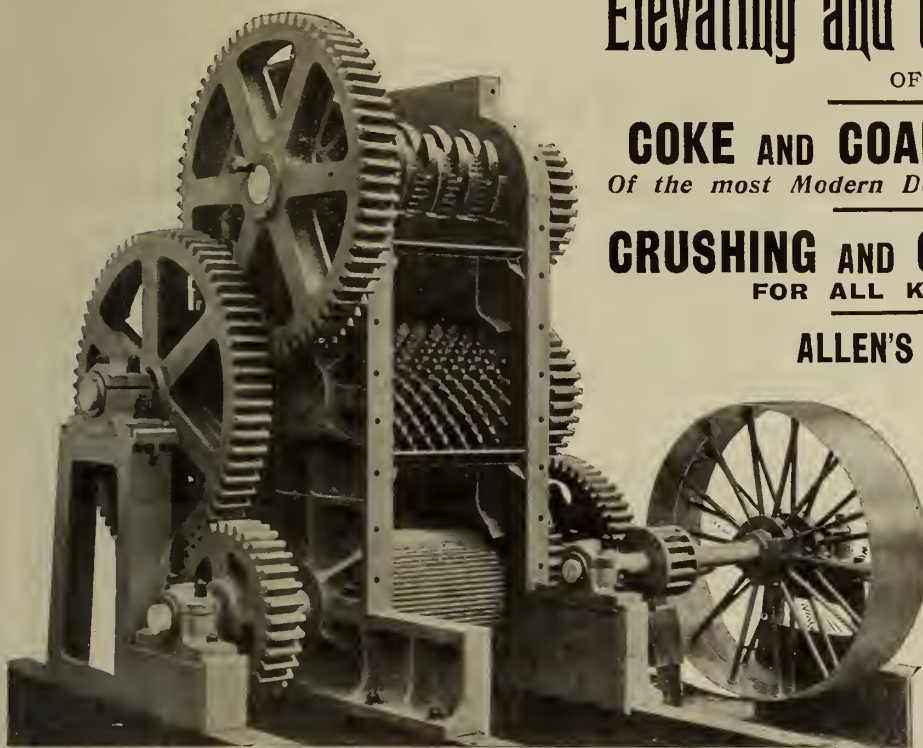
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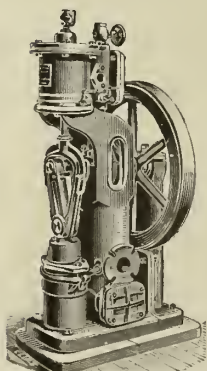


Fig. 703. "SINGLE RAM" STEAM-PUMP.

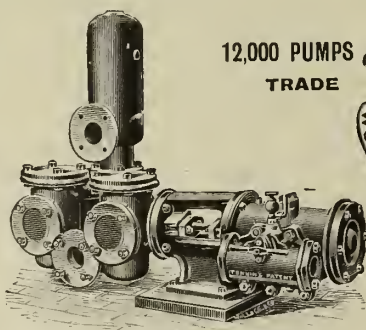


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

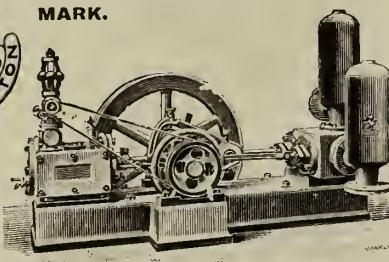


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

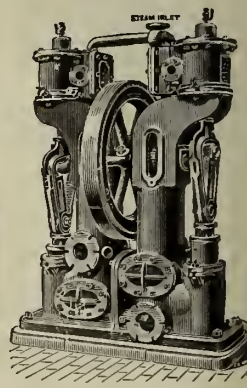


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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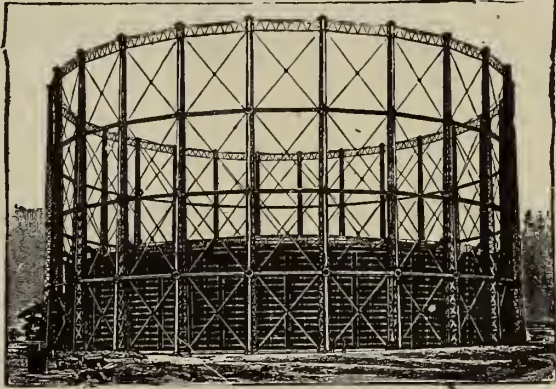
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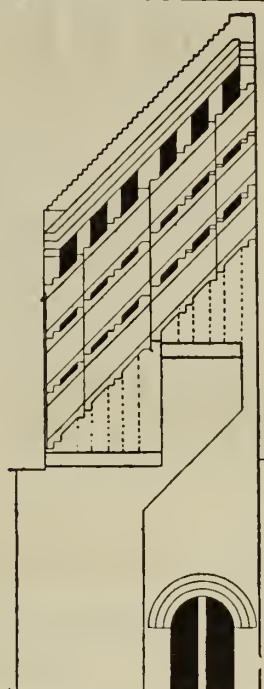
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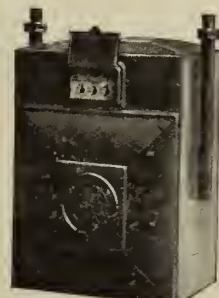
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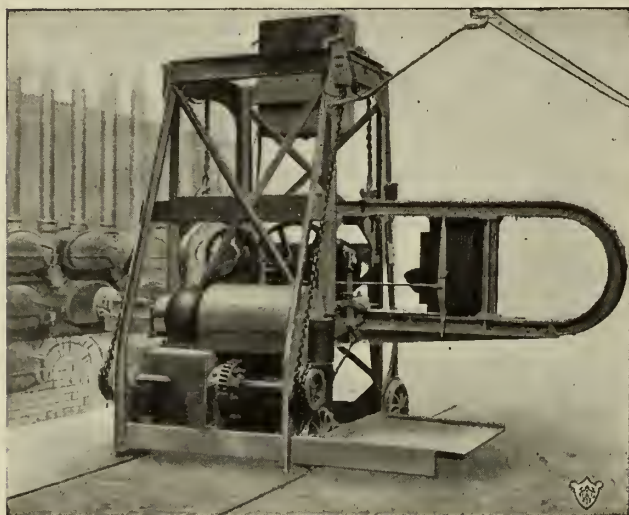
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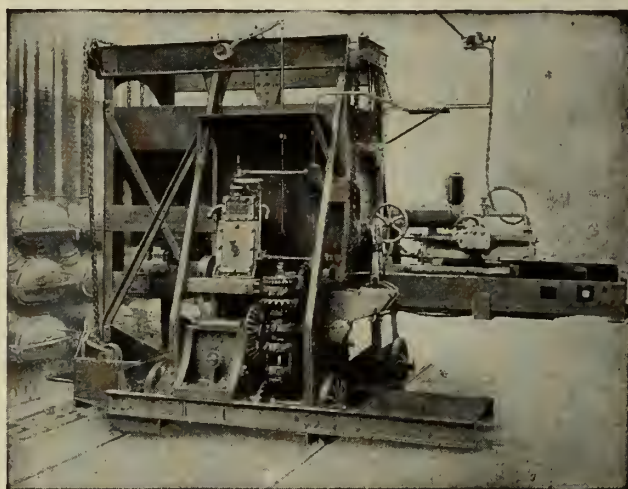
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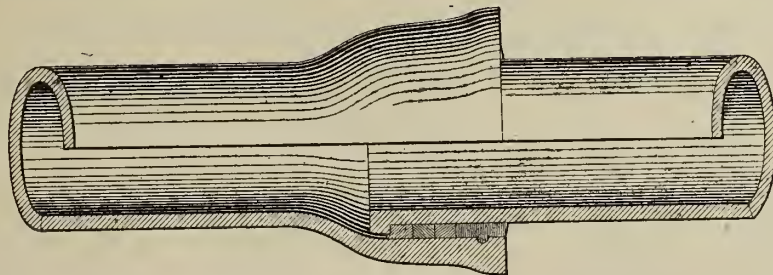
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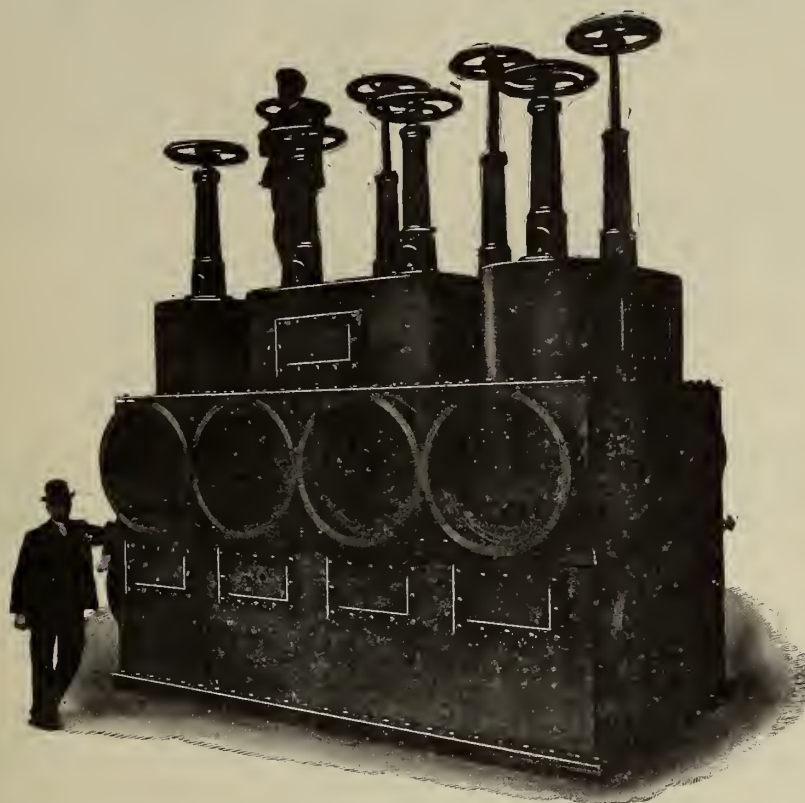
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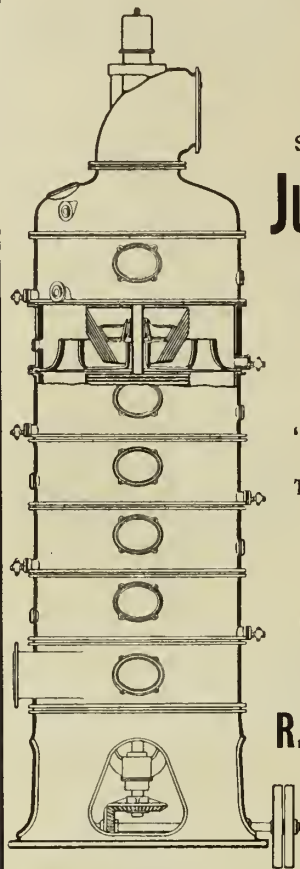
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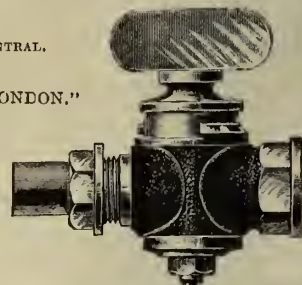
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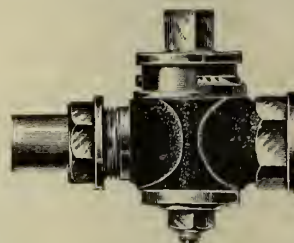
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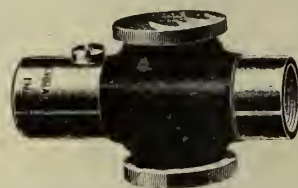
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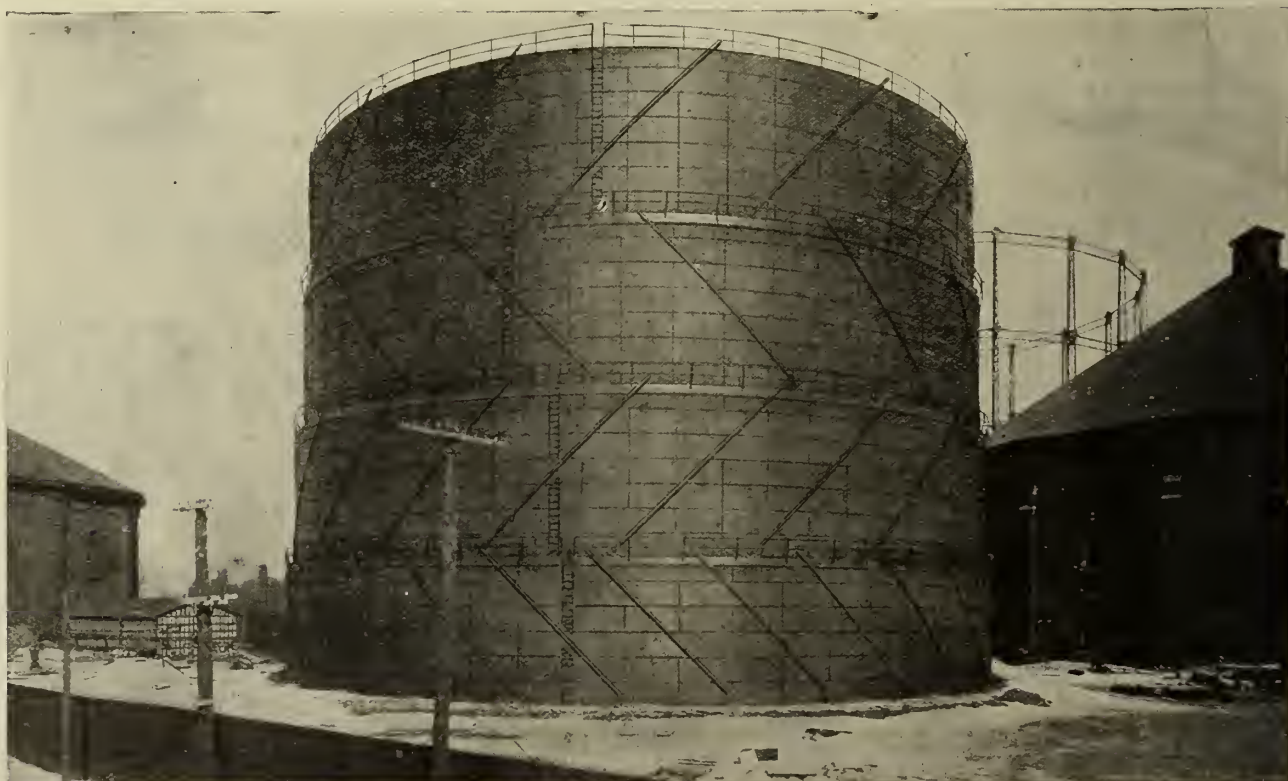
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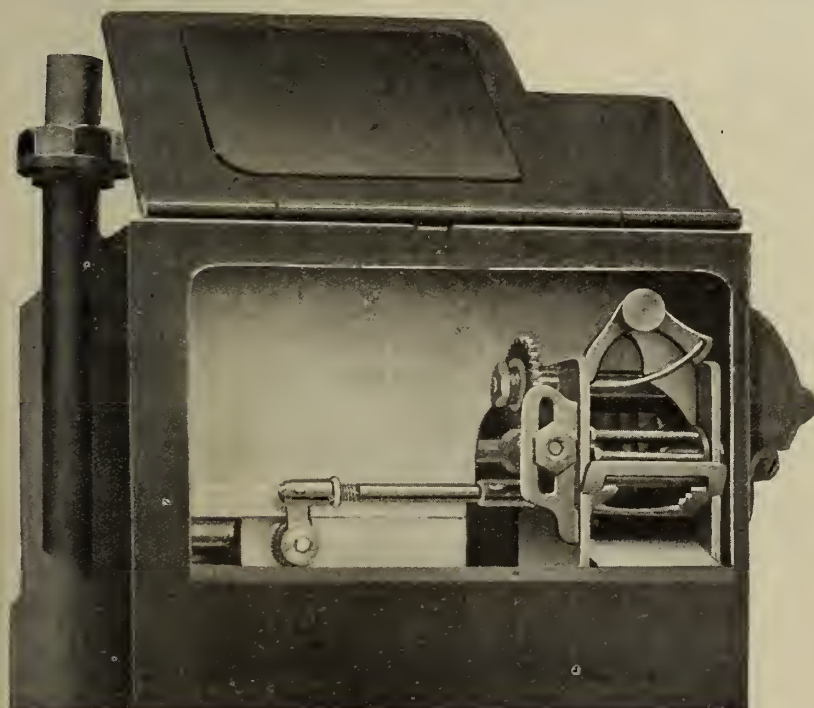


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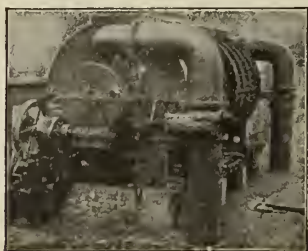
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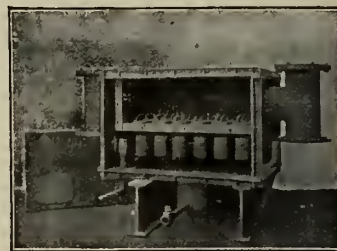
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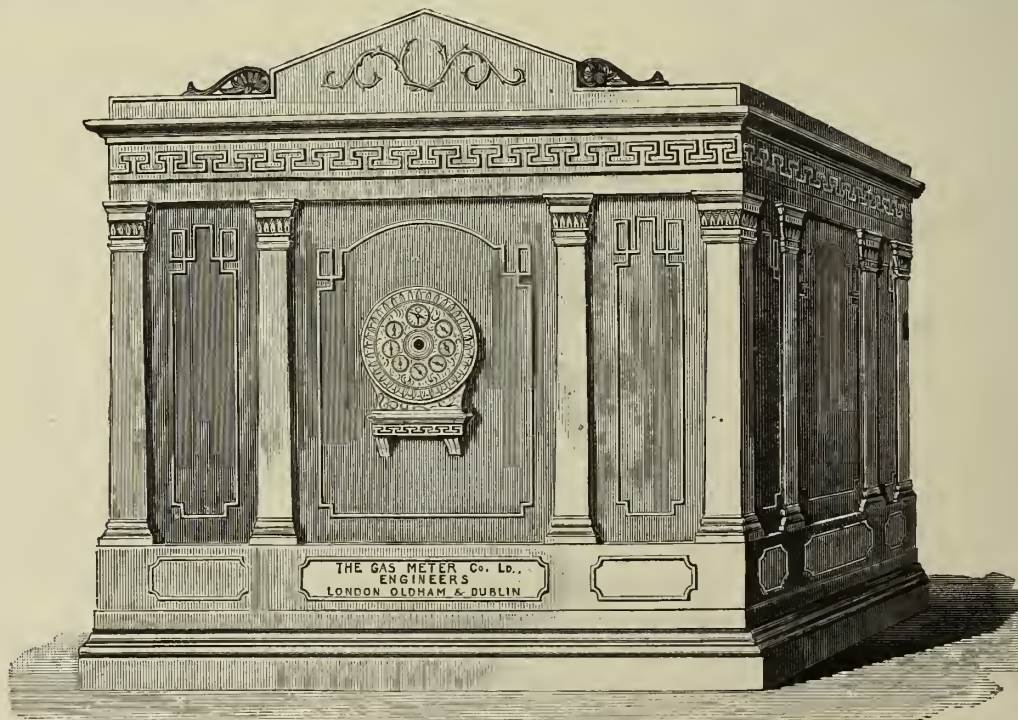
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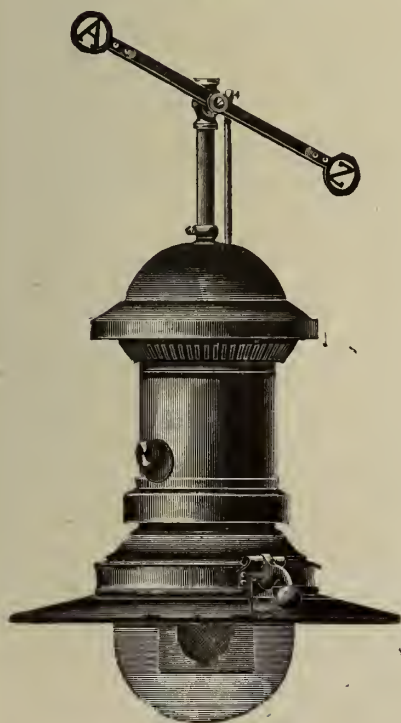
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Alkmaar, Holland	400,000	Flensburg, Sleswig	300,000	Preston	1,400,000
Antwerp, Belgium	1,500,000	Forst, Brandenburg	300,000	Reading	1,000,000
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Ashford	250,000	G. L. & C. Co., , (2nd)	10,750,000	Redhill (2nd)	300,000
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Aylesbury	150,000	G. L. & C. Co., Fulham	1,750,000	Reichenberg (2nd)	200,000
Barmen-Rittershausen	500,000	G. L. & C. Co., Nine Elms	2,750,000	Revel, Russia	350,000
Barrow	300,000	Gelsenkirchen, Westphalia	175,000	Romford	300,000
Bath	1,000,000	Gelsenkirchen (2nd)	350,000	Romford (2nd)	350,000
Belfast	1,700,000	Geneva, Switz.	500,000	Rotterdam, Holland	850,000
Belfast (2nd)	4,500,000	Gosport	200,000	Rotterdam (2nd)	1,500,000
Berlin—Charlottenburg	2,500,000	Göteborg, Sweden	300,000	Rotterdam (3rd)	750,000
Berlin—Rixdorf	650,000	Göteborg (2nd)	600,000	Rotterdam (4th)	750,000
Berlin—Rixdorf (2nd)	700,000	Graudenz, Prussia	200,000	Rotterdam (5th)	600,000
Berlin—Tegel	3,500,000	Guildford	350,000	St. Gallen, Switz.	225,000
Birmingham	1,500,000	Guildford (2nd)	200,000	St. Gallen (2nd)	225,000
Bishop's Stortford	200,000	Haarlem, Holland	850,000	St. Joseph, Mo.	750,000
Bochum, Westphalia	530,000	Hamburg, Germany	1,750,000	San Paulo, Brazil	700,000
Bognor	100,000	Hampton Court	500,000	Santiago de Cuba	400,000
Bordentown, N.J.	125,000	Hartlepool	750,000	Scarborough	800,000
Bournemouth	1,000,000	Hebden Bridge	200,000	Schweinf, Westphalia	100,000
Bournemouth (2nd)	500,000	Heidelberg, Germany	200,000	Shanghai	225,000
Bremen, Germany	550,000	Holyoke, Mass.	600,000	Shanghai (2nd)	225,000
Bremen (2nd)	950,000	Hong Kong	450,000	Shanghai (3rd)	1,600,000
Brentford	1,200,000	Hull	1,500,000	Southampton	800,000
Bridgewater	200,000	Innsbruck, Austria	200,000	Southampton (2nd)	500,000
Bridlington	150,000	Ipswich	750,000	Southgate	400,000
Bridlington (2nd)	200,000	Kampen, Holland	350,000	Southport	750,000
Brieg, Silesia	100,000	Kiel, Sleswig	1,000,000	Southport (2nd)	900,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	South Shields	650,000
Brighton (2nd)	1,850,000	Lausanne, Switz.	250,000	Stafford	500,000
Bruges, Belgium	200,000	Lawrence, Mass.	400,000	Staines	600,000
Brussels—Anderlecht	350,000	Lea Bridge	350,000	Stockholm	1,500,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (2nd)	350,000	Stockholm (2nd)	1,750,000
Brussels—Forest	1,000,000	Lea Bridge (3rd)	400,000	Stockport	600,000
Brussels—Koekelberg	1,000,000	Leeuwarden, Holland	400,000	Stockport (2nd)	600,000
Brussels—St. Gilles	1,000,000	Leiden, Holland	500,000	Stockport (3rd)	400,000
Brussels—St. Josse	1,000,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—St. Josse (2nd)	600,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville	750,000	Liège, Belgium	1,000,000	Swansea (2nd)	1,000,000
Brussels—Ville (2nd)	750,000	Liège (2nd)	750,000	Swindon	300,000
Brussels—Ville (3rd)	1,500,000	Lincoln	500,000	Sydney—Harbour	500,000
Brussels—Ville (4th)	350,000	Liverpool	3,500,000	Sydney—Harbour (2nd)	500,000
Budapest, Hungary	50,000	Liverpool (2nd)	4,500,000	Sydney—Mortlake	500,000
Budapest (2nd)	1,750,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlisle	600,000	Maastricht, Holland	200,000	Syracuse, N.Y.	850,000
Carlsruhe, Germany	500,000	Magdeburg, Germany	1,400,000	Taunton	225,000
Chilgwell	350,000	Maidenhead	225,000	Taunton (2nd)	350,000
Chorley	300,000	Maidenhead (2nd)	225,000	The Hague, Holland	1,000,000
Commercial, London	850,000	Maidstone	500,000	The Hague (2nd)	500,000
Commercial (2nd)	850,000	Malmö, Sweden	350,000	Tilburg, Holland	400,000
Commercial (3rd)	1,250,000	Malta	400,000	Tottenham	750,000
Commercial (4th)	2,000,000	Manchester	3,500,000	Tottenham (2nd)	750,000
Copenhagen	700,000	Manchester (2nd)	3,500,000	Tottenham (3rd)	350,000
Copenhagen (2nd)	2,500,000	Mariborough	100,000	Tottenham (4th)	1,000,000
Coventry	600,000	Mayence, Germany	700,000	Tottenham (5th)	1,000,000
Coventry (2nd)	600,000	McKeesport, Pa.	500,000	Tunbridge Wells	1,000,000
Cracow, Galicia	200,000	Merthyr Tydfil	300,000	Utrecht, Holland	1,000,000
Crefeld, Germany	500,000	Middlesbrough	1,250,000	Utrecht (2nd)	1,000,000
Croydon	1,250,000	Nelson	400,000	Verviers, Belgium	1,000,000
Croydon (2nd)	625,000	Newburgh, N.Y.	600,000	Vienna	3,500,000
Croydon (3rd)	625,000	New York	5,200,000	Waltham	400,000
Deventer, Holland	150,000	Nictheroy, Brazil	250,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	North Middlesex	150,000	Watford	300,000
Dorking	150,000	North Middlesex (2nd)	200,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex (3rd)	75,000	Wiesbaden, Germany	850,000
Dublin (2nd)	2,000,000	Norwich	1,000,000	Wellington, N.Z.	350,000
Dublin (3rd)	650,000	Norwich (2nd)	300,000	West Ham	1,500,000
Dundee	1,500,000	Nuneaton	125,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Oberhausen, Germany	175,000	Weston-super-Mare	350,000
Dunedin, N.Z. (2nd)	275,000	Ostend, Belgium	100,000	Weston (2nd)	350,000
Durham	200,000	Ostend (2nd)	200,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Perth, W.A.	125,000	Winchester	225,000
Eastbourne	1,250,000	Poole	1,500,000	Winchester (2nd)	125,000
Edinburgh	2,000,000	Port Elizabeth, S.A.	400,000	Zwolle, Holland	200,000
Epsom	225,000	Portsmouth	1,000,000	Zwolle (2nd)	200,000

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G. L. & C. Co.—Fulham (2nd)	750,000	St. Albans	700,000	Oldenburg, Germany	200,000
Ilford	650,000	Torquay	350,000	Croydon (4th)	550,000
Malines, Belgium	500,000	Lemberg (2nd)	500,000	Berlin—Tegel (2nd)	6,350,000
Louvain, Belgium	800,000	Bremen (3rd)	850,000	Stettin, Germany	880,000
Hampton Court (2nd)	600,000	Southampton (3rd)	600,000	Bucarest, Roumania	1,100,000
Courtrai, Belgium	250,000	Leiden (2nd)	575,000	Namur, Belgium	175,000
Vienna (2nd)	2,500,000	Wolverhampton	1,500,000	Swansea (3rd)	450,000
Allenstein, Germany	200,000	Frankenthal, Germany	175,000	Rhymney Valley	165,000
Brentford (2nd)	850,000	Cracow (2nd)	200,000	Norwich (3rd)	500,000

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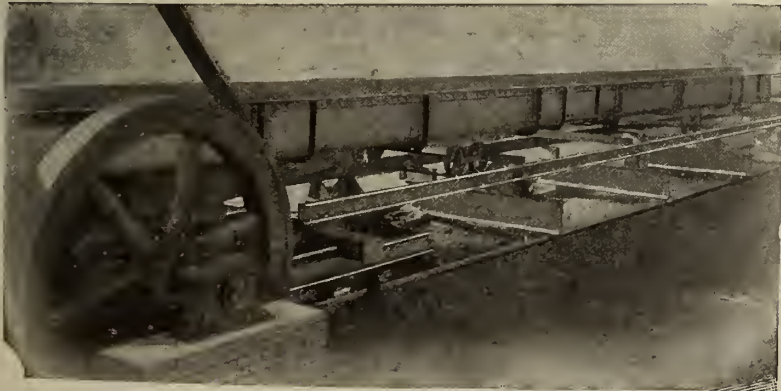
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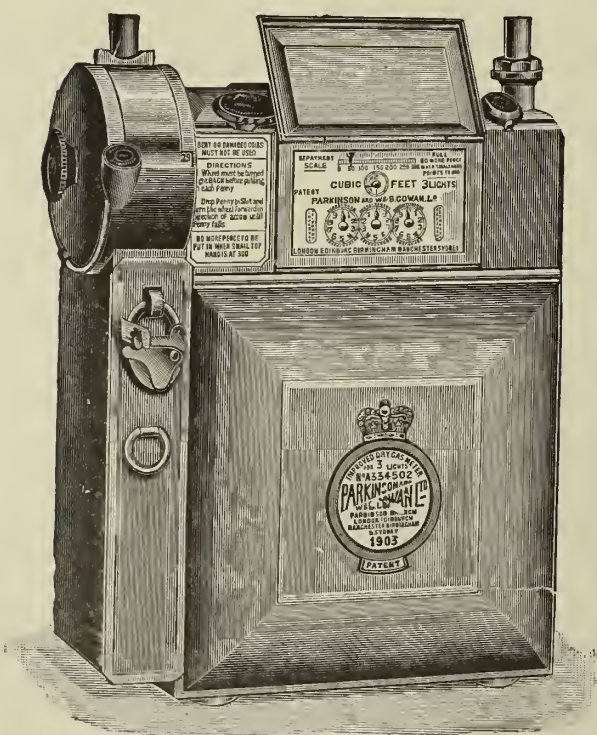
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EDITORIAL NOTES—GAS, &c.

Limitation of Gas Profits for the Rates.

OF acts of justice ever performed in the Parliamentary Committee Rooms, there occurred last week almost simultaneously two of the most momentous character, in connection with the gas section of the Salford Corporation Bill and the water section of the Oldham Corporation Bill; and what happened in respect of the latter will also have effect in the gas section. The simultaneous action in the Upper and Lower Houses, it is sincerely hoped, may be taken as indicative of Parliament having at length resolved, as local authorities come up for judgment, to put an end to the abuse that has all too long existed in dealing with the finances of their trading undertakings. The inquiry into municipal trading of not long ago revealed the widespread character of these abuses; but nothing effectual has yet been done to bring our local governors under better control in respect of them. One object of instituting the Local Legislation Committee at the opening of the present session of Parliament was to make an effort to co-ordinate the practices and statutory powers of local authorities; and one direction in which co-ordination can, with advantage, be effected, is to bring about, as quickly as possible, a limitation of the profits they may make from their trading undertakings, in the same way that limitation is rigorously applied to statutory private enterprise. We will not deal in this part of the "JOURNAL" this week with what has occurred in the case of Oldham; a short reference to the matter will be found in the final paragraph of "Notes from Westminster" on a succeeding page. The more important pronouncement, in regard to the limitation of gas profits appropriated in aid of the rates, is that of Lord Donoughmore's Committee in the Salford case; and the decision will meet with general approval by gas men. Comment, however, should be prefaced by the remark that the Salford Gas Department has not by any means been mismanaged; and it is only on the question of profit appropriation and the inequalities it brings in its train that we are at variance with the Corporation, and all other local authorities of whom they are but an example in this matter. If the decision of Lord Donoughmore's Committee succeeds in passing through the House of Commons, the gas profits which may henceforth be transferred to the aid of the rates in Salford will be 1 per cent. on the outstanding capital. In addition, statutory obligation is put upon the Corporation to charge all the expenses of the public lighting to the lighting rate; and the amount of the Department's carry-forward is likewise limited; but a reserve fund on the ordinary lines is allowed. These, shortly stated, are the points imposing limitation; and all profits made beyond are to be applied to the reduction of the price of gas.

The principle of the restriction of the profits of municipal trading, after capital and maintenance charges have been met, is correct and equitable. In the case of gas companies working under the sliding-scale or under a maximum price, the distribution of profits is limited; and, in recent sessions of Parliament, companies have been hedged in still more by the special purposes fund, and by a prescribed maximum carry-forward. But no such restriction has been placed on municipalities, with the result that they have, by progressive stages, exercised their unbridled licence in a manner that cannot be excused, and that ought not to be longer tolerated. Look, for example, at the table on p. 321 of our issue last week. The small compilation shows that the contributions of the Birmingham Gas Department last year for public purposes amounted to the large sum of £90,890. Look again at the Manchester Gas Department, which has had as much as £60,000 taken from it in aid of the rates in a year, and makes a normal contribution of £50,000. This year it was only proposed to contribute £26,495 in aid of the rates; but the Committee have been reluctantly compelled to increase the sum to £50,000. Look at Salford, with its contribution of £320,000 in twelve years in aid of

the rates within the borough. And only recently there has been prominence given in these columns to what Oldham has done in the same way, including the taking of gas without payment for public purposes. These are only a few among the outstanding instances of this violation of freedom, which freedom it is high time should be curtailed with a firm hand, in view of the inequality of taxation, and therefore injustice, that it inflicts.

The existing excesses are the result of a continuous growth from an old-time ordinance that had inception under conditions altogether different from those obtaining to-day. Many large ratepayers are not now, as formerly, patrons of municipal gas undertakings, but are of the municipal electricity concerns, which contribute little, or probably nothing, to the rates. A large proportion of gas consumers—the prepayment ones—nowadays are of the poorest in a community. Furthermore, municipal gas undertakings are constantly extending their supply area, and enlarging their business, beyond the administrative borders of the local authority. In these points, there is abundant reason for the curtailing to a specified amount—in fact, we should prefer to see the municipal profit-appropriation system completely abolished—of the profits that may be allocated to the rates within the borough. It is no new thing this limitation of profits. There are Scotch undertakings that are not allowed to make profits in excess of the needs of the undertakings. Municipal management of trading undertakings over the Border is intended to be carried on with a single eye to cheap and efficient service. Joint Gas Boards in England are not allowed to make profits; the federation of towns in the Potteries district is bringing into existence there a like policy; and Widnes and Glastonbury are confined to the amount of benefit that may be extracted from the gas undertakings, and therefore from the consumers. But in most cities and towns where there is municipal ownership of the public trading concerns, the gas undertaking has been the milch cow; and the gas consumers have patiently borne the resulting inequality. It is to be hoped they will do so no longer; but will agitate for relief, and persevere until they get it.

The municipal apologists for the existing system croak about the rates being pledged in respect of the gas-works loans. They charge very dearly for the accommodation. A Shylock never exacted more onerous terms. In many places, the plea has sufficed for the extraction of hundreds of thousands from the pockets of gas consumers—amounts, in fact, in the aggregate, equal in cases to the total of the loans raised. Yet the rates have never been called upon to bear a penny loss; and never will be. Such a contingency is more remote than ever with the wider difference than in the past between prices charged for gas and the maximum allowed. Should, however, there happen to be a deficiency in future on the trading of the gas undertaking in Salford, and the rates make it good, the new clause provides for the return to the rates of the amount from succeeding profits. So far as the security of the rates for the gas-works loans goes, it is a mere formality. The profits, on the other hand, extracted from the consumers have a corporeality that has no correspondence with the empty formality. In this connection, Lord Donoughmore's Committee thought it was their duty to legislate for a condition that suggests the prospective extinction of the gas industry, by making the out-districts before them proportionately responsible for any outstanding loans should at any time there be a total discontinuance of the use of gas. The out-districts may look with composure upon the provision, and adopt an attitude of supreme indifference to their fate. The provision is an unnecessary one; but its existence will harm no one. The only thing the gas consumers, inside and outside the borough, need worry about is that the new protective clause in all other respects may suffer no defeat in the remaining stages of the Bill.

If the out-districts of other English municipally gas-supplied cities and towns follow up the success in the Salford case (if carried through Parliament), it would not surprise

us to find it giving impetus to the formation of Gas Boards. Bearing on this point, it is clear—it was seen in the Salford case, and it has been seen in other cases—that local authorities owning gas undertakings are reluctant to allow any dismemberment of their concerns, by the sale to outside districts of the portions of the distribution plant situated therein. They would sooner give up the right to the excess price usually allowed in the outer areas. The policy of differential prices in the case of territory beyond the administrative bounds of an authority owning a gas undertaking, was to the front in the Salford proceedings. It is one that has reasonable argument on its side, when there is a limitation of the amount of profits that may be applied in relief of the borough rates, or when such appropriation is altogether disallowed. The out-district consumers, however, bearing their share of the legitimate charges upon the gas undertaking, cannot be blamed for objecting to a perennial contribution to the relief of the rates within the area of the authority in possession of the gas undertaking.

It is expected there will be an attempt on the part of Salford to get rid of the profit-limitation clause that has come upon them as a total surprise, by pleading in the Lower House that its existence in the Bill is a violation of the Standing Orders. But it is competent for the authorities of the Lower House to say that it is a case in which they will dispense with the Standing Orders. If they say it in this instance, then it will be for the Upper House to say the same thing in connection with the Oldham Bill, in which questions of finance of much the same order have been dealt with by the Local Legislation Committee of the House of Commons. But many changes are made in Private Bills by Parliament that have not been referred to in the notices of the Bills. For instance, the London Electricity Companies went last year to Parliament with an intercommunication scheme; and Parliament in the same Bill introduced clauses constituting the London County Council the purchasing authority in 1931, instead of the Borough Councils, who already possessed purchasing powers under the General Electric Lighting Acts. No notice of this was given, nor were the ratepayers asked for their consent. The power of Parliament is large; and the Salford Corporation to-day realize it. Many local authorities will anxiously watch the progress of the Corporation Bill. At the moment, it looks as though the only means of escape is the withdrawal of the whole measure; but such a course would merely mean the repetition of the fight in another session.

On the Continent—Vertical Retort Adoption.

It is interesting to occasionally cast ones eyes abroad to see how the times are dealing with colleagues and the industry in other countries and under other governmental and working conditions. The opportunity is especially afforded by the half-yearly reports of the Imperial Continental Gas Association and the addresses, which are always illumined with good point, of the Chairman (Mr. J. Horsley Palmer) to the proprietors. Carrying on its operations in various parts of different Continental countries, the Association occupies a unique position in the world's gas industry; and it focuses within itself the results of a remarkable diversity of experiences—administrative and technical. The Directors' report and the address of the Chairman to the proprietors last Tuesday, form together excellent chapters in the technical, the commercial, and the financial history of the concern. In the commercial and financial aspects, it is ever-expanding; and in its technical history, change in magnitude and system of operation proceeds unceasingly.

In this last-named respect, it has been the privilege of the "JOURNAL" to give to British gas engineers from time to time an account of the materialized work of the men of ability that the Association have had and have in their service. Change from old method to new has been traced; and the change still proceeds. Look at the present report. At most of the stations the mutations of time have their representation. At Antwerp, the new Hoboken works, growing up on virgin soil so far as gas production is concerned, are nearing completion, and additional producing and holder capacity is at most of the other works being brought into existence. But a particularly noticeable feature is the extension of the vertical retort system. The system has become established in a remarkable manner in the gas-works of Germany. In the operations of the Association, it was for some considerable period confined to Berlin; and Berlin passed from the experimental stage to large working installations before any of the other stations took up the

new mode in carbonization. At the Mariendorf station at Berlin, in addition to previous installation, a further six settings have been completed; and the erection of a third retort-house, with fourteen settings of twelve vertical retorts, is in hand. But at other stations of the Association, substantial installations are now being made. At Aix-la-Chapelle, twenty settings of tens are going in; at Brussels, twelve settings of tens; and at Frankfort, also twelve settings of tens. This is all very significant. With the Association, the Chief Engineers at the various stations are treated as having an individuality in responsibility, and their technical views and advice meet with the greatest respect in the London Board-room. It may be taken that the installation at Aix-la-Chapelle represents the choice of the late Mr. James Drory; the installation at Brussels, that of Mr. H. Salomons; and the installation at Frankfort, that of the veteran in gas engineering Mr. William Drory. And as to Berlin, British gas engineers know, both by work and word, how Mr. Edward Körting regards the vertical retort system. In this country we have to confess to an admiration of the bold manner in which contemporary engineering judgment in Germany has gone so conspicuously in favour of the intermittent vertical retort system. And yet there is no tormenting regret that German colleagues should have led in this matter. In the spirit of true professional rivalry, we are not without hope that, just as our friends have learned of us in the past in the matter of carbonization, and just as we are learning of them in the present, they may also learn of us in connection with the vertical retort system in the future.

We will not dwell longer on the constructive technical work. There is another noteworthy feature in the operations of the Association that is both technical and administrative in character, and that is the action of the Association in constantly adding new territory lying on the borders of present supply areas. The action of the Board in this regard is philosophic. They are looking to the future, and providing for its protection and assurance. With the competition of electricity, the business of gas undertakings will have, in the time to come, to be gathered in over larger areas. The growth cannot be expected, under all the circumstances of the times, to be continuous within the old limits—either on the Continent or in this country. The Directors of the Association are devoting a material proportion of their time to the suburbs of their existing supply areas that have a prospective fertility. Concessions with outside communes are always in process of negotiation; and the distribution arteries of the undertakings are ever being carried further outwards—so much so that last year 117 miles of mains were laid. The same process of outer expansion has been a feature of British gas-works policy during recent years. But the Association are going further still. With electric lighting powers at their backs, they, where there is a demand for electric light in a suburb, take up the supply in conjunction with gas; and now they find that, at their Brussels station, it will be economical to construct a central electricity station for the purpose, and still the necessity for large new gas-works there is well above the horizon. In speaking of business development, an experience unlike that, generally speaking, of British gas undertakings in these times, is noticed in the classes of new consumers that are connected. Here, as a rule, at present, the prepayment consumers preponderate in the new connections. Of an increase of 48,325 consumers mentioned in the half-year's report of the Association, no less than 28,003 were ordinary consumers, and 20,322 were prepayment ones. The point has interest.

We will not refer here to the commercial and financial results of the half year. Those interested will turn to the report of the proceedings to read the story on their own account. There is one point of a personal nature. The Association have had in their service talented families of engineers whose names will be written large and stand perpetually in the technical annals of the great undertaking. Eloquent indeed was the tribute paid by the Chairman to the memory of the late Mr. James Drory, the Chief Engineer at Aix-la-Chapelle, who has so recently passed from the scene of his active duties. This tribute brought to light two facts that must be extraordinary in the history of industrial concerns and of official service under one corporate body. Of ten brothers forming the gifted Drory family, no less than eight have, to use Mr. Palmer's own expression, devoted their lives and work to the Association—several as Chief Engineers. Mr. James Drory served the Association

42 years. Three brothers who predeceased him, and who were also chiefs of certain principal stations of the Association, also served exactly the same period—42 years! Truth is stranger than fiction. Mr. William Drory, of Frankfort, still holds his official position, though having been in the service 54 years. The record is indeed extraordinary; but what stands out with great prominence are the places that honour and duty have ever occupied in the Drory family. The story as told by the Chairman was brief; but what a history and a record rest beneath the few sentences!

Examinations and the Range of Knowledge.

IN the last two issues of the "JOURNAL," there have appeared the lists of questions set by the City and Guilds of London Institute Examiners in "Gas Engineering" and in "Gas Supply"—respectively Mr. W. Doig Gibb and Mr. J. H. Brearley. From the questions candidates had ample choice of subject-matter on which to exercise themselves, to show their proficiency in the lower or higher grades of study of the art of gas-works engineering, and gas manufacture, distribution, and utilization. There can be no complaint about the range of the questions, or of the variety of subjects, or of the fair distinction made to test the knowledge of minor and major candidates by both Mr. Gibb and Mr. Brearley. But there are two or three points that, after perusing the questions, suggest themselves for a few observations. One is that marks in addition to those allotted to the questions ought, in some way, to be awarded to candidates according to the variety of subject-matter dealt with in their answers, because the greater the variety of subject-matter treated upon, the greater the evidence of the distribution of the knowledge of a candidate—from construction and functions of plant throughout processes and use. To show what we mean, let us take the questions in the ordinary grade of "Gas Engineering." There it is possible to pick out more than eight questions that most youths in a minor position in the chemical laboratory of a gas-works could answer, and though possibly not able to reply to a single constructional question or make a sketch, they would come out with honour equal to those who answer constructional and other questions, and are capable of making decent illustrative sketches. The questions for long past have indicated the position, and the very proper position, that the examiners have given to gas-works chemistry; but there is this one objection, which shows where in these examinations there may be equality of honour for inequality of knowledge.

Another point that strikes the critical reader of the questions is that it is necessary that candidates should keep themselves well posted in current technical intelligence, by following closely the information published weekly, in addition to their practical daily work, attending lectures, and studying text-books. If the examinations induce an interest on the part of students in current technical literature, this must be regarded as one of their excellent effects. There are questions in the examination lists, treating of matters that have not come under the direct experience of many British gas engineers, much less of candidates for examination. There are questions, too, upon subjects that the text-books have not overtaken. Technical history grows rapidly—more rapidly than the writing, study, and sale of gas text-books. Take, for example, question 9a in the Ordinary Grade of the examination in "Gas Engineering." The candidate is there asked: "If a spiral-guided [Gadd and "Mason] telescopic holder be constructed in a concrete tank, why is it not necessary to provide radial movement on the guide-rollers attached to the holder itself, and equally necessary to provide this on the guide-rollers fixed to a tank?" Many gas engineers who have had no personal experience of spiral-guided holders, or have not read up the latest information on them, would stumble over this question, and be quite unable to give a ready, clear answer to it. We doubt whether many of the candidates knew precisely what is meant by "radial movement on the guide-rollers;" and we should be surprised to learn that any substantial proportion of them attempted to reply to the question. Let it not be supposed this matter is being dealt with in any captious spirit. On the contrary, the point is being made to show the value of keeping as far as possible in line with the publication of current technical news. Take another example. In the Honours Grade in "Gas Engineering," the first question asked the candidates to name the chief points of difference in, and the special advantages claimed for, (1) the Woodall-Duckham vertical

retort system, (2) the Dessau vertical retort system, (3) the Munich chamber system, and (4) Love's 45° inclined retorts. Few (if any) of the students can have had the opportunity of inspecting these various systems; there have been no practical experience of two of them in this country, and experience, as yet, restricted to few works with the other two. For the candidates to name the chief points of difference between the systems, they must have given, as they ought to have given, very close attention to the published information on them. To both questions here selected for illustration there were alternatives; but, notwithstanding, we hope the moral has been clearly pointed.

Now that the examinations are divided into two sections—gas engineering, and distribution and use—they are a far more critical test of the knowledge of the candidates, as the examiners have greater scope. The combined certificates, too, are of much greater value than the single one of old. The questions in the Ordinary and Honours grades of "Gas Supply" likewise cover a large range of subject-matter; but though this is only the second year of these examinations, we see that Mr. Brearley has introduced the idea, which commends itself, of putting certain questions in the form of diagrams, with instructions as to the points to which the candidate is requested to devote attention. This departure is one which is undoubtedly in the right direction for getting at the real technical accomplishments of the candidate. There is another point we are glad to see. It is not considered that the education of a student of gas distribution and utilization is complete without a knowledge of the electrical competitor. The examiner draws the candidate upon practical points that the gas manager or the distribution superintendent will more and more have to deal with in the commercial struggle between the two illuminants. That is as it should be.

Quickened Combustion.

THE lecture which Professor W. A. Bone delivered before the meeting of the North of England Gas Managers' Association on the 1st inst. was reproduced, and was also the subject of comment, in last week's "JOURNAL." One or two of the points raised in it may, however, with advantage be referred to again. For instance, we may gain enlightenment on the principles of action of gas fires or stoves by contrasting the ideas of the late Mr. Frederick Siemens on the proper conditions for heating by flame with recent knowledge as to the effect of surfaces in quickening combustion. Siemens held that for the attainment of the maximum degree of efficiency in heating, radiation from the free-burning flame must be relied upon. He was able to achieve a moderate measure of success in the construction of gas-stoves, in which the flame was not brought in contact with any surface by applying to them regenerative principles. By means of a supply of pre-heated air to the free-burning flames, he succeeded in increasing their temperature very greatly, and consequently the proportion of radiated to total heat emitted by them. To this day, gas-stoves constructed on these lines are very common in Germany, and in many other Continental countries, where the English type of gas-fire, with its fire-clay, asbestos, or iron "fuel" raised to incandescence by the play thereon of bunsen flames, is not, we believe, appreciated at its proper worth. We fear the Continental makers of gas heating-stoves have been afraid to rely on the teachings of practice rather than the dictates of the theory of the moment. They have not, however, had to grapple with the prejudice of the English householder in favour of a cheerful "open" fire. We believe there need be little or no loss of efficiency by the adoption of the incandescent open type of fire in place of the free-flame stoves of the Siemens pattern.

It is now apparent that there is theoretical ground for the support of this belief. It has been proved that surfaces may have a most powerful influence in quickening combustion—or we should prefer to say, generally, combination—in gases. Much depends on the nature of the surface. Thus with hydrogen and oxygen, combination commences at about 430°C. with porous porcelain and magnesia, and at 200°C. with oxide of iron. No combination takes place till much higher temperatures in the absence of contact with the surface of these or other heated materials; and the conclusion is that the presence of such surfaces facilitates or quickens combustion. The choice of surfaces is, however, very important; and it may be that it is the superiority of iron or oxide of iron to fire-clay in this respect which accounts for the very high radiating power of iron-fret gas-fires as

compared with fire-clay ball fires. The late Mr. Thomas Fletcher was a firm believer in the iron-fret fire; and we are not aware that the results of his investigations as to the relative proportion of radiated to total heat with this and fire-clay ball fires have ever been seriously disputed. However this may be, it is evident that gas-fires may be improved by selecting carefully the incandescing material or "fuel" with a view to securing the greatest quickening of the combustion. If, further, the regenerative principle is applied to some extent to gas-fires using such materials, there is no question that the type will universally supersede the old free-flame Siemens pattern stove, which still is predominant in many Continental countries. There are often evolved and upheld in academical institutions theories which only tally with a part of the observed facts of practical experience; but at the present time there is as strong a theoretical backing for the "incandescent" type of gas-fire as for the free-flame gas-stove. A few years ago, academic theory was all in favour of the latter.

Companies and the Super-Tax.

In the few comments on the Budget proposals that appeared in our editorial columns last week, allusion was made to the apprehension that existed as to the intention of the Chancellor of the Exchequer in the matter of the super-tax of 6d. on incomes above £5000. There was some fear that this super-tax might be applied to joint-stock companies. Mr. Lloyd George, however, has made it abundantly clear during the past week that this is not so, but the extra tax will only apply to individuals having incomes above £5000. The additional 2d. is bad enough for shareholders to have to bear. The Chairman of the Imperial Continental Gas Association estimates that the 2d. represents £5150 more to be handed over by them to the Chancellor of the Exchequer.

Gas Companies as Electricity Distributors.

Several gas undertakings supply gas for driving engines for the generation of electricity for lighting and power purposes; and where the gas is supplied at a reasonable rate, users testify that the costs work out lower than the same supply can be purchased for from the local distributors. There are gas companies now who believe that, in certain districts, they can do better than independent electricity undertakings in the matter of general electricity distribution. No doubt there will be electricians who will consider the mere thought a gross piece of impertinence; but electricians are not unanimous on the point. The gas undertaking is in existence; and it can offer all sorts of conveniences which spell economy in working. On the other hand, there are risks attached to the business; and whether it is wise to enter into it, or to stick to the sole development of the gas business without running an alternative commodity, is a matter for decision in each case. No general expression of opinion will apply to all cases. But where there is territory at present unoccupied by electricity, gas companies are considering the question of offering the alternative supply; and in certain cases parliamentary powers have been obtained, and in others are being sought. The subject is further treated upon in our "Electricity Supply Memoranda."

Miners and the Eight-Hours Act.

The Eight-Hours Act and its effect on the industry has again been taking up a large share of attention in mining circles during the past week. The Miners' Federation of Great Britain held a special conference in London, which extended over three days; and decisions were come to which have not so far had the effect of "clearing the air," for, by the latest accounts, the attitude of the men remains just as uncertain as ever. The Federation have declared against the acceptance of any reduction in wages as a consequence of the operation of the Act, and also against working an extra hour per day under the sixty-days clause; but within these limitations, the South Wales Federation are left to negotiate with the owners. Should any district be attacked on the wages question as a result of the shortening of hours, then the Federation are pledged to give support to this district in resisting the attempted reduction. In addition to this, it was decided to support the Scottish miners in maintaining a minimum of 6s. a day. Thus it is seen that the Federation have made up their minds to the extent that, if they can avoid it, there is not to be any sacrifice

by the miners in the matter of wages consequent on the passing of the Act. While therefore the South Wales miners are left free to negotiate with the owners within the limitations laid down by the Federation of Great Britain, these limitations are such that there appears to be little, if anything, left to them with which to negotiate. They are, of course, still left free to take; but what can they give in exchange? It will be remembered that there has been much discussion in South Wales over a contention of the owners that the coming into force of the Act would automatically terminate the existing wages agreement, which would otherwise run on into next year; and that the last suggestion of the owners was that, in view of the conflicting opinions of Counsel consulted by either side, the final settlement of this point should be referred to a High Court Judge. The men's representatives at the time promised to bring this proposal before the Federation of Great Britain. The decision that any reduction in wages will be resisted to the utmost may be taken as their answer; for the owners would have no object in terminating the agreement unless it was felt that existing wages could not be fairly maintained under the new conditions. Hence matters in South Wales look, if anything, a little less promising even than they did before; and, in addition to this, it is thought in some quarters that the determination of the Federation of Great Britain to support the Scottish miners in maintaining a minimum of 6s. per day renders imminent the danger of a conflict in that coal-field. The situation from the owners' standpoint is summed up by a remark made in the course of an interview in South Wales with a director of a large company, who is reported to have said: "If the men think they are going to be paid the same wages for eight hours of work as they now receive for nine, they are making a great mistake."

Revocation of Patents Procedure.

Applications for revocation of patents have been growing since the new Patents Act came into force. The provision has been found useful, and has assisted in preventing violation of the terms of the Act. But like most things that are in the nature of innovations, defects and advantages have only developed themselves by experience. The Comptroller-General has found it necessary to make some new rules in respect of the procedure in the matter of revocation applications; and they are important, and should be noted by those who contemplate such action. With the application for revocation, evidence is to be left at the Patent Office, by way of statutory declaration, stating the particulars on which the applicant relies in support of the allegations contained in the application; and the copy of the application delivered to the patentee or his agent is to be accompanied by copies of the evidence. Within fourteen days, unless further time is specially granted, the patentee is to leave at the office evidence, by way of statutory declaration, stating whether or not the allegations contained in the application are correct; and, if incorrect, giving the particulars upon which he intends to rely in answer. Should the applicant then decide to proceed, he may deliver further statutory declarations in reply. Following are provisions dealing with an intimation by the Comptroller as to whether there shall be a preliminary hearing, or whether he intends to deal with the whole case at one hearing. There are other provisions, including one which arranges that, in the event of an application being uncontested by the patentee, the Comptroller, in deciding whether costs should be awarded to the applicant, will consider whether proceedings under the section might have been avoided if reasonable notice had been given by the applicant to the patentee before the application was filed. The Comptroller desires to suppress applications having no prospect of success, or which are merely made to extract information concerning the patent.

Accident Insurance for Investors.

At first blush, there seems to be a useful idea hidden behind the four words of this heading—useful in these days of a certain character of gas and water company promotion. The Water and Gas Securities, Limited, whose operations are directed from Victoria Street, S.W., have sent broadcast a booklet containing information as to the investment of money by small capitalists. In the booklet are also particulars of a free £500 accident insurance policy, which will be granted to all "investors doing business through this Company." It is a novel idea. But in the wildest flights of our imagination, it has never occurred to us that gas

and water securities would come to this—that business in them would be done in conjunction with a free insurance policy after the manner of cheap diaries and weekly literature of a more or less popular class. It is no fault of gas and water securities that business in them should be dragged down to such a low level. The discredit is on the shoulders of Water and Gas Securities, Limited. It is evident that the Company require the support of some means of making their operations attractive; otherwise they would not angle with any other bait than the “sound investments” themselves. The Company candidly confirm the supposition; for the policy is only to be “granted to investors doing business through the Company.” Now if the Water and Gas Securities Company would offer a free insurance policy to be applied to speculative gas and water promotions (which do not as a rule work out quite in accordance with the promises of the issued prospectuses), there would be some sense in the new plan, and the policy would be valuable—at any rate, it would have been during the past few years. But the policy now on offer refers to accidents to the person, and covers infectious diseases. However, it is not the first time that the Company known as the Water and Gas Securities, Limited, have come under our notice. We have letters in our possession which show that they have been identified in pushing appeals for capital in concerns that have not (however highly the Managers of Water and Gas Securities, Limited, may have regarded them) met with our approval, and upon which some reflection has been made in these columns.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
May 3	Previously acknowledged	9165	9	7
„ 6	W. H. Bennett, Dartford		0	10 6
	J. Chamberlain, London	2	2	0
	William R. Davey, Newbury	1	1	0
	G. S. Frith, Frodsham	1	1	0
	John Furniss, Slaithwaite	1	1	0
	Arthur Graham, Mansfield	1	1	0
	Alfred T. Harris, Market Harborough	1	1	0
	Phillip G. Moon, Bournemouth	1	1	0
	North of England Gas Managers' Association	26	5	0
	Frank Osmond, Dorchester	0	10	6
	Yorkshire Junior Gas Association	7	7	0
„ 7	E. G. Dickinson, Lower Sydenham	1	1	0
	Robert Watson, Doncaster	1	1	0
„ 8	London and Southern District Junior Gas Association	4	4	0
„ 10	Bernard P. Bezan, West Norwood	1	1	0
	G. B. Irons, Gosport		10	6
	W. R. Irons, Saxmundham		10	6
Total		£9216	18	7

Use of Tar for Roads.—The Hertfordshire County Council have decided to spend during the summer £2300 to tar-spray the roads under their control. Last year they treated 21½ miles in this manner, at a cost of about £40 per mile. This portion is to be tarred again; and, in addition, about 40 more miles of road are to be tar-sprayed. This is in consequence of the Highways Committee having come to the conclusion that tar-spraying by machines is the most efficacious method of preserving the roads from the effects of motor-car and traction-engine traffic. The authorities of the following places are also going to spend approximately the sums named on similar work: Bucks, £3000; Kent, £5000; Surrey, £3500; East Sussex, £4500; Middlesex, £4500; Essex, £3000; Bristol, £3000; and Wandsworth, £2500. The amount to be spent by the Kent and Essex County Councils is the same as last year; but in the case of the other authorities it has been very largely increased.

French Directory of the Gas and Lighting Industries.—We have received from the office of the “Journal de l'Eclairage au Gaz et à l'Electricité,” 7, Rue Geoffroy-Marie, Paris, the edition for the present year of the “Répertoire des Industries Gaz et Electricité,” the first publication of which appeared in 1895. The contents of the volume, which occupy 725 pages, and have been carefully revised and brought up to date, include a complete list of gas-works, with particulars of the localities served from them, as well as the names of the managers and the local plumbers and gas-fitters. The details furnished in the portion of the book devoted to electricity are calculated to meet all requirements. In each section there is a special chapter giving the names of the larger companies, their capital, offices, directors, &c. The “Répertoire” has been produced under the editorship of M. Maurice Germain, and it will maintain the success achieved by its predecessors. The price is 4 frs., post free to places out of France.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 405.)

BUSINESS on the Stock Exchange was again last week quite unable to rise to a point of even moderate activity, and there was no very strongly marked characteristic. The tendency in the earlier part of the week was fairly good. But it was not maintained throughout, and some leading lines closed weaker. Special circumstances in others operated the other way; and altogether there was considerable irregularity. On the opening day the tone was moderately good. The Foreign Market was supported, gilt-edged stocks were bought, and Consols rose ¼; but the Railway Market was weak. The course of things on Tuesday was on similar lines; Consols advancing ⅜, and Rails remaining dull. Wednesday opened without any change; but business was so quiet that closing prices gave way for lack of support. The indisposition to activity continued on Thursday and shook prices again. Consols lost ¼, and other Home Government securities gave way. Friday was cheered by strength developed in several lines—notably South African and Copper securities. Home railways recovered a little; but the gilt-edged division were only poorly, and Consols fell again. Saturday was very quiet, and movements were slight and irregular. Consols managed to lose another ⅜. In the Money Market, there was just the same state of plethora and ease. Discount rates held on for a time, but gave way at last. In the Gas Market, business was quite up to an average level; some undertakings developing unusual activity. Despite one or two reductions here and there, the general tendency was good, and several advances in value were effected. In a great number of Suburban and Provincial issues, the quotations were drawn in closer by advancing the buying prices a point. In Gas-light and Coke ordinary there was no change, though transactions failed to touch 104 and ranged only from 103 to 103¾. In the secured issues, the preference made from 105½ to 106½, and the debenture from 85½ to 86. South Metropolitan was much more active, and changed hands at from 123 to 124½. The debenture made 85 and 85¾. All Commercial issues advanced; the 4 per cent. marking 108½ and 109½, the 3½ per cent. 102½ and 103, and the debenture 82½ and 83. In the Suburban and Provincial group, Alliance and Dublin old fetched 17½ and 17½, British 42½, Hastings 3½ per cent. 94½, South Suburban 120½ and 121½, ditto preference 123 and 123¾, ditto debenture 125 free, Tottenham “B” from 109¾ to 111, and West Ham 120. In the Continental companies, Imperial was a point stronger, at from 186 to 187, ditto debenture made 96, Union from 99½ special to 100¾, ditto preference 140½, European fully-paid 24, ditto part-paid 17½ and 18, and Tuscan 9 free. Among the undertakings of the reinoter world, Bombay made 5½ and 5½, Buenos Ayres 13½ and 13½, ditto debenture 96, Cape Town preference 5½, Monte Video 12½, Primitiva from 7½ to 7½, ditto preference from 5½ to 5½, ditto debenture 96 and 96¾, River Plate from 14½ to 14½, and San Paulo preference 11½.

ELECTRICITY SUPPLY MEMORANDA.

Gas Companies as Electricity Suppliers—New Schemes—Advantages and Disadvantages—No General Principles of Policy can be Applied—A Few Questions for the Electricity Sales Manager of West Ham.

THERE is a fresh development in recent years in the parliamentary history of gas undertakings. Quite a number have obtained, by Acts passed in recent sessions, the right to apply for Electric Lighting Orders; but of those who have so applied, few have yet put the powers into actual operation. There are a small number of concerns, too, that have obtained electric lighting powers direct from Parliament. Of those who have done so in recent times, the Ascot Gas Company is the only one, so far as we are aware, that has put down electricity plant, and is actually engaged in the electricity business. The result of operations by the Ascot Company in the first half year to June last was a loss of £97, and in the half year to December, a profit of £129. This indicates that, other than the capital charges, nothing has been lost on the electricity department. There is, of course, the question as to the amount of gas business that has been forfeited owing to the opportunity the householders have had to change over to electricity. On the other hand, had an independent company been formed for the supply of electricity, there is not the slightest doubt that those people who desired to use electricity for illumination would for that purpose have left the Gas Company. In business, one cannot govern personal fancies, when the practical questions of expense, reliability, and so forth are treated as matters of profit moment. The Ascot Company secured a small amount of profit last year on electricity supply; and it is likely they will go on for a time increasing that profit. But, in such a district, it cannot be long before saturation level is reached.

The most extensive schemes that have yet been brought forward for the amalgamation of electricity with gas supply under company administration are those of the Aldershot and Yorktown Companies, both of whom, as was seen by “Notes from Westminster” and “Parliamentary Intelligence” last week, have Bills in Parliament this session incorporating electricity powers; and these have a fair prospect of going through. The electricity

sections of the Bills deal with areas that have not yet attracted independent electricity concerns. Of course, all such electricity undertakings that are brought into being in conjunction with gas undertakings, will be subject to purchase by the local authorities in whose districts the business is carried on, at the end of periods defined in the General Electric Lighting Acts, or at shorter periods agreed upon by the undertakers and the authorities and specified in Private Act or Provisional Order. The Walker and Wallsend Company will always rank as being the first Gas Company in the country to distribute electricity; but some years ago now, they disposed of the undertaking to the local Electricity Power Company, and they were not particularly sorry to get rid of it. We have not to forget that times have changed since then. Metallic filament lamps have altered the position. Gas has not stood still; and it continues to be the more economical and all-round serviceable agent. Despite the cheapness of modern incandescent gas lighting, no doubt more people will be found who will adopt electricity for illumination now that the cost of the current has been reduced in respect of light obtained in comparison with the cost with carbon filament lamps. On the other hand, in considering the question of the amalgamation of gas and electricity supplies, it must not be overlooked that the metallic filament lamps make it far more difficult to work up to a remunerative level an electricity concern in a purely residential area. Of course, there are well-known instances of municipal gas and electricity undertakings being successfully run under one administration, and without the injury of fierce competition. There is Leicester for example; and there in 1907, after meeting sinking fund and interest charges, a profit was made of £4617. Stafford and Longton are other examples; and in both instances the last published accounts show small surpluses. These, however, are manufacturing districts, and not residential ones; but the profits are less in proportion to the capital employed than in the case of the gas undertakings.

The time has gone by when, in most really profitable districts for electricity supply, any thought can be given to the amalgamation of the two concerns—even if it were considered that such an amalgamation would be desirable, and the undesirability is a very common view among gas men. Looking at the matter from the point of view of gas undertakings with areas in which there is no electricity supply, there are advantages and disadvantages to be advanced, *pro* and *con*, for the joint business. The advantages, however, appear to be more favourable to the electricity than to the gas consumers. There are several economies derivable by the electricity supply through being linked up with the gas-works—economies both in generation and distribution. The gas company have, as a rule, land to spare for the generating-station; fuel and water supply are at hand (or at any rate can be obtained cheaper in view of the quantity required by the two concerns); administration and establishment charges will not be greatly raised; gas and electricity distribution work could often be carried on simultaneously; and inspection and collection could be performed by one and the same staff. All such points are favourable to the amalgamation of the electricity supply to the gas undertaking, rather than the formation of an independent company for the former. There is, by the way, the further point that many gas undertakings have already small electricity plants for the generation of electricity primarily for propelling and operating their retort-house machinery.

There are, it is seen, economies for the electricity consumer derivable from gas and electricity supplies being carried on by one company; and with the benefits of those economies the electricity consumer ought to be well satisfied. The disadvantage of amalgamation is that the gas consumer stands in danger of having to bear any loss there may be on the electricity supply. The accounts for the two concerns, however, should be kept strictly separate. There is admittedly a difficulty in this; but it should not be an insuperable task to fairly allocate the proportion of expenses attributable to the electricity undertaking. In defence of the gas consumers, too, it ought to be made an indispensable condition of such an amalgamation of business that, after a definitely prescribed period at the start, the charges for electricity should be so ordered that the electricity concern in no wise imposes any burden on the gas undertaking. These considerations suggest that it is quite possible there are areas in which an electricity concern could, through the economies offered by amalgamation with the gas undertaking, be made a paying one, where one could not be successfully run independently, through having nothing to depend upon but the revenue from electricity for lighting. There are many electricity undertakings running separately to-day that are doing badly, but which, joined up to a gas undertaking on a reasonable capital, might be made remunerative. Perhaps gas companies looking about for new fields to conquer might pick up electricity undertakings cheap that have despairing shareholders hanging to them. However, the question of entry into this business is one for all gas companies to decide for themselves from their own knowledge of the requirements of their area, or any electrically unattached part of their area, of gas supply. It is a matter upon which no general principle of policy can be laid down. The risks must be varied from the standpoint of the investment of capital; and therefore individual circumstances must decide. It will be seen from the report of the meeting of the Imperial Continental Gas Association in another part of the "JOURNAL" to-day that they are extending into the business of suburban electricity supply in a no mean fashion.

The electricians are sorely vexed that they cannot prove by a straightforward trial that lighting by electricity used with the new metallic filament lamps is as cheap as lighting by gas by the aid of modern incandescent burners. In the attempt to make amends in the public eye for this incapability on their part, they have commenced to quote, in the public press, comparisons of consumers' accounts for corresponding periods—gas being used in the earlier period, and metallic filament lamps in the later. But they conveniently forget to state whether the whole of the gas has been used for lighting, and whether any part has been used for cooking and heating. In most cases they also forget to inquire whether the whole of the gas consumed for lighting was by incandescent gas-burners, or, in whole or in part, by flat-flame burners; they also refrain from saying whether there was a more lavish use of the gas in the number of hours or extent of the lighting. Among those who have published figures is our old friend Mr. H. H. Holmes, the Sales Manager of the West Ham Corporation Electricity Department, whom we have had the pleasure of meeting in controversy before, and whom we are equally glad to meet again. The figures that he has published appeared in the "Daily Mail;" and they are unaccompanied by certain of the particulars enumerated above which are necessary for proper judgment to be made of the value of his comparisons. The figures were republished in a letter in our "Correspondence" columns last week from Mr. H. N. Clark, the Assistant Engineer to the West Ham Gas Company. Our correspondent pointed out that Mr. Holmes had offered to give any *bonâ fide* inquirers the names and addresses of the consumers whose accounts were quoted. Mr. Clark applied for the names and addresses; but, by some twist of the imagination, Mr. Holmes does not consider him to be a *bonâ fide* applicant, as he thinks he requires the information for business purposes. We suggest to Mr. Holmes that his refusal is a confession of weakness. How can Mr. Clark or anyone else in the West Ham Gas Company hope to win back from electricity consumers whose accounts are only one-third or one-quarter what they were when using gas? Well now, if Mr. Clark is not a *bonâ fide* inquirer, we hope that Mr. Holmes will regard the "JOURNAL" as coming within the designation. We ask Mr. Holmes for those names and addresses, in order that inquiry may be made to test the accuracy of the assertions contained in his letter, or at all events to see whether they are capable of being discounted.

There are a few questions we should like to put to Mr. Holmes about his figures; and we hope he will answer them. He makes two definite statements—that these householders emphatically declare that "the light [electric] is better than that they were obtaining from gas;" and that "incandescent burners were used in [*sic*] the gas supply." The first question we have to ask Mr. Holmes is, Does he himself believe the consumers are obtaining from electricity a light better than they were obtaining from gas? We take, as an example only, the last comparative figures he quotes for the purpose of asking another question bearing upon this point of the "better" illuminating power from the lower expenditure for electricity. The money spent for gas by the consumer was in a given period £4 17s., and for electricity in the corresponding period £1 4s. The price of gas is 2s. 8d. per 1000 cubic feet, and that of electricity 3d. per unit. Now at 3d. per unit, £1 4s. will purchase 96 units. Mr. Holmes, we think, will not dispute that a unit with the metallic filament lamps is equivalent to 800 candle-hours; therefore 96 units will be equivalent to 76,800 candle-hours. With gas at 2s. 8d., £4 17s. will purchase 36,372 cubic feet of gas. Now if from these 36,372 cubic feet, the consumer merely obtained an illuminating power equivalent to that from the electric metallic filament lamps, he only realized 2'16 candles per cubic foot of gas consumed, by using gas in incandescent burners. That is to say, 76,800 candle-hours ÷ 36,372 cubic feet = 2'16 candle-hours. Our second question to Mr. Holmes therefore is, Does he really believe that this consumer only obtained 2'16 candles per cubic foot of gas consumed in incandescent burners? Further comment will depend on his answer. The third question is, whether, in the whole six cases he quoted, incandescent gas-burners were exclusively used? Fourth, whether the hours of lighting and use approximately coincided? Fifth, whether any of the gas was used for cooking and heating? Sixth, is any gas used now *plus* the electricity? We admit that much is being asked of Mr. Holmes; but, if that gentleman is a lover of fair play, he will agree not too much.

Apropos of electrical charges, we read in a contemporary that on April 19, a consumer was summoned by the Grantham Urban Electric Supply Company for £3 5s. 1d., a quarter's lighting, rent of fittings, &c. Defendant said the amount of the claim was out of all reason, being over 5s. a week for light. He added that he had complained that the meter was wrong, but the Company did not seem to attend to it. The Bench made an order for payment in full. We will let this pass without comment.

At a meeting of the Junior Institution of Engineers, to be held at the Royal United Service Institution, Whitehall, to-morrow evening, Mr. T. S. F. Gibson, Assoc.M.Inst.C.E., of the South Metropolitan Gas Company, will read a paper on "The Construction of Coin-Freed Mechanisms as applied to Gas-Meters." The author will sketch the origin and development of the system, and show the effect of the adoption of slot-meters in his Company's district. He will give illustrations of the different mechanisms; and models will be exhibited.

PERSONAL.

Mr. J. E. WILSON, the Chairman of the Gas Committee of the West Bromwich Corporation, was last Wednesday elected an Alderman on the Town Council.

As mentioned in the Scotch Notes this week, Messrs. J. SMITH and S. DICKIE have been appointed Joint Managers of the Dumbries Corporation Gas-Works, in succession to the late Mr. George Malam.

At the recent annual general meeting of the Institution of Civil Engineers, Mr. F. W. CROSS, the Engineer of the Lea Bridge District Gas Company, was transferred from the class of associate members to that of members.

In answer to the advertisement appearing in the "JOURNAL" for the 6th ult., 85 applications were sent in for the position of Engineer and Manager of the Shipley (Yorks.) Gas-Works; and the appointment has been conferred upon Mr. H. BLAKEY, who is at present at Morecambe, to which place he went from York. He is only twenty-eight years of age.

In response to the invitation which appeared in the "JOURNAL" for the 30th of March, between 90 and 100 applications were made for the position of Secretary of the Bishop's Stortford Gas Company. As announced last week, the appointment has been made; the successful candidate having been Mr. SYDNEY E. KNOWLES, who has for eight years been the Accountant of the Salisbury Gas Company.

Mr. W. McLEAN ROSS, who in 1899 succeeded his father as Manager of the Stonehaven Gas Company, has resigned, having accepted the position of Assistant Gas Engineer to the Bundabergs Gas Company, Queensland. During Mr. Ross's management, the annual make of gas at Stonehaven has increased from 7 to 16½ million cubic feet; and the gas-works have been greatly improved and brought up to date. It is interesting to note that grandfather, father, and son have been in successive management at Stonehaven for the past 61 years.

After holding for twenty-three years the position of Gas Engineer and Manager to the Bolton Corporation, Mr. WILLIAM SMITH is retiring, mainly on account of ill-health; and, as recorded in another part of the "JOURNAL," testimony was borne at the meeting of the Town Council last Wednesday to the efficient manner in which he had discharged his duties, and regret expressed that he had been compelled to place his resignation in the hands of the Gas Committee. Mr. Smith held the position of Manager of the Darlington Gas-Works before going to Bolton. One of his sons is at Carlisle, and another at Darwen.

A very successful function took place at the Crystal Palace Club on Wednesday last in connection with the Crystal Palace Old Students' Society, when the President (Mr. H. C. H. Shenton, Assoc.M.Inst.C.E.) and Mrs. Shenton, supported by the Principal of the Crystal Palace Engineering School (Mr. J. W. Wilson, M.Inst.C.E.) and Mrs. Wilson, received a large contingent of the members with their ladies, and a representative number of present students, who were all invited to attend. The company also included Mr. Charles Hawksley, Past-Pres. Inst. C.E., and Mr. R. Elliott-Cooper, M. Inst.C.E., with other honorary members of the Society. The objects for which the function was arranged were fully realized in the re-union of members returned from appointments in distant parts of the world. The Society now includes a membership of 360, out of a total of 1800 students who have passed through the Crystal Palace Engineering School; and Mr. Percy Griffith, M.Inst.C.E., the Hon. Secretary and Treasurer (No. 54, Parliament Street, Westminster), will be glad to hear from any old student who is not now a member, with a view of securing his support.

Yorkshire Junior Gas Association.—A meeting of the Association will be held next Saturday at Bradford, when a paper on "Iron and Its Corrosion" will be submitted by Mr. W. Cranfield. A paper on "Gas Pressure" will also be read. An excursion in June is being arranged for, which will bring this session's programme to a close.

Recent Wills.—The late Mr. Howard Charles Ward, the Deputy-Governor of the Gaslight and Coke Company, whose death was recorded in the "JOURNAL" for the 23rd of March, left estate of the gross value of £162,052, with net personality amounting to £146,723. Almost equally valuable was the estate of the late Mr. C. Tacon, for many years Chairman of the Eye Gas Company; amounting to £122,497 gross and £107,922 net.

Tar Macadam for Roads.—We have received from Messrs. Charles Griffin and Co., Limited, a volume entitled "Dustless Roads: Tar Macadam," by Mr. J. Walker Smith, the City Engineer of Edinburgh, and formerly Engineer of Barrow-in-Furness. It is a practical treatise for engineers, surveyors, and others, and embodies the results of observations and experiments made by the author with tar macadam, which he considers can be advantageously and economically employed for the abatement of the dust nuisance on roads brought about by the changes which traffic has undergone within recent years. He has divided his matter, which occupies 216 pages, into fifteen chapters, to which are appended some valuable tabulated replies to queries submitted to engineers all over the country, on the subject of tar macadam and the tarring of macadamized surfaces.

NOTES FROM WESTMINSTER.

Profits and Rates and Illuminating Power.

It has been a busy week in the Committee-rooms for measures dealing with gas; and there have been some surprises in store—particularly over the questions of appropriations from gas profits on the part of local authorities for the relief of the rates, and of the unfair action in burdening the gas undertakings, and therefore the consumers, with the expense of the gas used for public lighting. The decision of a Lords Committee in the case of the Salford Corporation has come as a "bolt from the blue," and has created such an amount of consternation that the Corporation representatives would have gladly withdrawn the gas section, if, under the ruling of the Chairman of the Committee, it had not necessitated the sacrifice of the whole Bill. But it is possible a further attempt will be made to get rid of the prohibition set on the enjoyment of the "sweets" of municipal trading, during the journey of the Bill between the Lords and the Commons, if the authorities will allow this to be done, by dropping the gas section overboard. The Oldham Corporation have also seen fit to come to terms with the outside areas in respect of gas finance, to an extent known in the lobby. But the information will keep until it is brought in definite shape before the Committee to-day. The Alliance and Dublin Gas Company have got their Bill through the Lords—illuminating power, test-burner, sulphur clause, and so forth. The Committee, in fact, got wearied of hearing the washed-out tale of the objectors; and the Chairman stopped the Hon. J. G. Fitzgerald, K.C., in replying for the promoters, every time he touched on one of these topics, with the remark, "You need not address yourself to that," or something akin to those words. The same in the other Committee rooms—the whole time that was devoted to these questions was so much time wasted. Parliament has for the time being settled the matter of illuminating power and the method of testing, and Parliament is not going back upon what it has done, nor is it going to accept the inference capable of being drawn from certain evidence, that the whole of the technicians of the gas industry—save perhaps half-a-dozen men—have run mad, and the half-a-dozen are the only sane ones left. The gas engineers who back the opposition to the settled procedure in these matters would serve their clients much better by telling them candidly that there is nothing to be gained, but that there is money to be lost, in the Committee-rooms by further quixotic hostility. Committee after Committee all of different constitution, session after session, have patiently heard everything that the opponents have had to say; and the effect has been consistently the same—the representations of the latter have been unanimously rejected. And who can wonder when the authentication of experience is on the other side! Is it not now time to acknowledge the uselessness of spending money and time in further antagonistic operations against the inevitable? It is quite clear, too, that other parts of the cases of opponents are injured by the over-doing of this one in respect of illuminating power. There have been further Unopposed Bills before the Lord Chairman and the Unopposed Bills Committee of the Commons—among them the Ammanford Bill. Certain water measures have also moved forward a stage. The Gaslight and Coke Bill is still in a state of suspension. The measure was on the paper twice last week—Tuesday and Thursday, and Mr. Thorne then repeated his objection; but there is now a time fixed—8.15, or as soon after as convenient—next Thursday evening for the Bill to be again brought forward. The fixing of the time suggests that Mr. Thorne will at last be called upon to state the grounds of his objections, and the fate of the Bill will then be decided.

Limitation of Profits for Rate Relief.

In last week's "Notes," reference was made to the gas section of the Salford Corporation Bill, which was under the consideration of Lord Donoughmore's Committee. The decision of the Committee overshadows all else of interest in the measure and the proceedings. For, as a matter of fact, the powers sought by the Corporation in respect of new works, capital, reduction of illuminating power from 17 to 14 candles, and the adoption of the new test burner, stand complete. The Corporation got all they wanted, and something more. The addenda to what they sought came upon them with so much surprise that they were for the time being absolutely confounded; but, as soon as possible, they set themselves seriously to consider, aided by Mr. Balfour Browne, K.C., how they could escape the forfeiture of existing freedom imposed by the Committee upon them in the interests of equity and fair taxation. The matter was the main topic of conversation among gas men in the Committee rooms from Tuesday afternoon throughout the week; and there was a considerable amount of satisfaction expressed over the indication given that at last Parliament has begun to apply itself to the protection of gas consumers under municipal supply. It is worth repeating here that the Local Legislation Committee of the Commons had been doing something much the same in connection with water supply at Oldham; and that the Oldham Corporation had (we think in consequence), in regard to gas, entered into an agreement that will prove a good thing for the consumers. But to the Salford Bill. The out-districts were in opposition. They did not produce anything remarkable on the subject of illuminating power or the new burner, on which subjects Mr. Isaac Carr was the principal witness. But on the question of the appropriation of gas profits to rates, the position they took up was a strong

one. There was some complaint on the part of the Corporation that the out-districts were trying to evade the bargain made in 1895. But the complaint was a poor one. It is recognized in the Committee rooms that, when new powers are sought, then is the time to come forward and ask for reasonable revision. Their Lordships agreed that the action of the out-districts was quite a proper one.

The out-districts claimed that there should be a limitation of the profits carried to the borough rates by the Corporation. The evidence of Mr. William Cash was a cogent piece of reasoning on this subject; and Mr. E. H. Stevenson supplemented it by some excellent points. During the last twelve years, the amount transferred from gas profits in relief of the rates—after all the other financial obligations of the undertaking had been discharged out of the gas revenue—has been no less than £320,000; the sum appropriated last year being £30,000. Mr. Cash thinks, and with him we are in agreement, that this should have gone to the reduction of the price of gas, both within and outside the borough. Touching upon the question of the provision of profits by the out-districts to relieve the rates of ratepayers within the borough, Mr. Stevenson points out that the spirit of the law as to equality of price in the borough and out-districts is really abused, by the rates of Salford gas consumers being relieved to the equivalent of 6d. per 1000 cubic feet. The decision of the Committee on the subject in brief is, as embodied in a clause now forming part of the Bill, that the Corporation may charge a fair price for gas which will enable them to meet, in addition to the ordinary expenses and maintenance of the undertaking, sinking fund and interest charges on the outstanding capital, put to reserve fund $\frac{1}{2}$ per cent. upon capital until equal to 10 per cent., appropriate in aid of the borough rates 1 per cent. on the outstanding capital (as suggested by Mr. Cash), with a limitation of the carry-forward to a sum sufficient to meet sinking fund and interest, and the appropriation for the district fund, for a year—any balance to be devoted to the reduction of the price of gas. Any deficiency on the undertaking met from the rates is to be a charge on the next profits. Differential rates are to be abolished in the out-districts represented before the Committee; and a statutory obligation is put on the Corporation to charge the lighting fund with the cost of public lighting. These are all matters that can be endorsed as reasonable. In the event of the undertaking becoming a total loss, and the outstanding capital becoming chargeable on the rates of the borough, the out-districts of Eccles, Swinton and Pendlebury, Worsley, and Barton are to bear their proportion of the loss. This is the only peculiar part of the decision. The Corporation made an attempt, after fully grasping the import of the decision, to jettison the gas section of the Bill; but the Committee would not sanction this. The Corporation will, in all probability, now submit, when the Bill reaches the Commons, that the new clause is not in compliance with the Standing Orders. The various matters are dealt with in our editorial columns, so that at this point they may be left in these "Notes."

A Unanimous Verdict. The Corporation of Dublin and the County Council of Dublin took up an anomalous position in connection with the Alliance and Dublin Consumers' Gas Company's Bill, which was before Lord Ludlow's Committee the greater part of last week. They complained—reflecting their historical antagonism—of the past administration of the Company, with whom nothing was right; they also complained of the proposals of the Company on coming to Parliament to put themselves into a proper position to better meet the requirements of the city and the surrounding district, and to shape their practices on the lines approved in these times by the greater part of professional gas men as the best for the altered needs of the consumers, and sanctioned year after year by Parliament. The Bill is "an ill-considered one" said Mr. Thomas J. Cotton, the Gas Examiner and Superintendent of the City of Dublin. To which reply may be made that the attitude of the Corporation towards the Bill showed much greater "ill-consideration;" for, if their evidence meant anything at all, it was that they desired to perpetuate the conditions of which they complained. There were, among their representatives, the advocates of that which is obsolete; and the evidence put forward in support of the opposition case was punctuated with extravagance. Lord Ludlow is himself, by profession, an old legal hand; and Counsel and witnesses found the professional acuteness of his Lordship had not been deadened by his abstention from active practice. The qualifications of his Lordship make the more significant the announcement at the close of the critical examination of the proposals of the Bill, and the attempt of the Corporation witnesses to weaken the case of the Gas Company, that it was the Committee's "unanimous" opinion that the Bill should proceed.

The Gas Company had present, among others from Dublin, Alderman W. F. Cotton (the Chairman), Mr. Francis T. Cotton (the Secretary and Manager), and Mr. W. F. Cotton, jun. (the Engineer). The experts who had been taken into consultation by the Company were Messrs. Corbet Woodall, H. E. Jones, Charles Hunt, E. H. Stevenson, W. R. Herring, and Arthur Valon, Professor Vivian B. Lewes, and Mr. John F. Simmance. These, of course, were not all called as witnesses. The Company's Bill covers new capital, conversion of existing capital, new works, land powers, reduction of illuminating power, the new test burner (the absurdity of flat-flame testing still exists in Dublin), and abolition of the sulphur compounds clause. The powers are not by any means being asked for prematurely; and they are needed to put the

Company into a sound position in respect of its property, operations, and finances. The need was proved—not only in respect of the Company, but of the consumers, and the extension of business. Of course, the Corporation, as owners of an electricity undertaking that has not shown a financial record of which there is occasion to be proud, and in connection with which there has recently been expert (financial and electrical) recommendation as to an increase in the price of the current, are no doubt most desirous that the Gas Company shall not be placed in a better position to carry on a more strenuous and effective opposition than in the past. Their obstructive tactics on this occasion are probably traceable more to this than to anything else. A very interesting remark fell from one local witness who was called to give the Gas Company a good character; and it was that his firm have changed from electric lighting to gas, not on account of the economy, but on account of the quality of the light. But a member of the Corporation (Mr. John J. Farrell) declared—this being on a par with other fanciful statements made on behalf of the opposition—that electricity is "about half the price of gas," and yet the electrical undertaking is still in its infancy! The "infancy"—this is the seventeenth year of the working of the concern—is a long one; but really Mr. Farrell ought to have been the last to appear in opposition to a competitor doing business with a commodity costing twice that which he specially favours.

However, the Company's capital is said to be high. This was explained to be due to the facts that originally three concerns competed in Dublin, that there is a great mileage of mains in comparison with the business, and other disadvantageous circumstances due to location. Combined with the fact that they have to make a "fancy" article for sale (tested by a flat-flame burner), and that the cost of coal delivered on the works is heavy, the same reasons account for the somewhat high price of gas. The Company were willing to concede 3d. off their standard price in respect of the reduction of the illuminating standard to 14 candles, but, of course, this was not considered sufficient by the opposition. Among the more prominent witnesses for the Corporation were Mr. Thomas J. Cotton (Corporation Gas Examiner and Superintendent), Dr. Frank Teed, Mr. Isaac Carr, and Mr. J. G. Newbigging. The evidence ran mainly on the question of the illuminating power and the test burner. The threadbare assertions as to detriment to the consumers, which assertions are knocked on the head daily by the experiences of hundreds of thousands of consumers, were trotted out. The reduction of illuminating power was declared to adversely affect every type of burner for illuminating purposes, cooking and heating stoves, and gas-engines; and so consumers are compelled to use more gas. There should, in consequence, be startling increases in consumption in the areas where the illuminating quality of the gas has gone down, which there are not. There should be extraordinary increases in the amounts of consumers' accounts; but there are not. Perhaps certain of the opposition witnesses would disagree if we suggested that the reasons for this are to be found in two statements made in the course of the evidence. Dr. Teed, for the Corporation, said: "By the different illuminating power suggested, they would lose 50 per cent. or more on the flat-flame burner, and (only) 15 per cent. of the heating power." Professor Lewes remarked: "The difficulty of developing the full heating power of high candle-power gas is greater than with low candle power gas." This is in agreement with the experiments of other scientific authorities. But why go into the old melange of hostile assertion! Manchester uses the "Metropolitan" No. 2 burner for testing, and supplies a high candle-power gas. There were—of course, unjustifiable—complaints of gas in Manchester not long since. In districts where the illuminating power of gas has been reduced, there has been a falling off of complaints regarding both gas and accounts. These are hard practical facts; and the evidence of such facts is irresistible.

Oldham Test-Burner and Finance.

The only points raised on the gas part of the Oldham Corporation Bill, when before the section of the Local Legislation Committee presided over by Sir Francis Layland-Barratt, were the proposed adoption of the modern testing clause and the power to be taken to work up residuals. Mr. William Newbigging and Mr. Tim Duxbury supported the Gas Department's proposals; while Mr. Isaac Carr was the principal witness in opposition. Consumers within the borough did not entertain any suspicion that the new test-burner would inflict damage upon them; but in the expressed view of the out-districts, the burner is going to create something wonderfully prejudicial to them. Time will show them they have been too credulous. Who had worked them up to the knowledge as to the supposed terrible evil of the "Metropolitan" No. 2 burner, we have not heard; but the knowledge could hardly have been their own much before they lodged their petition. There were local gentlemen who came along and solemnly averred they were apprehensive of some evil. They seemed sincere enough until one of the number stated that he did not object so much now as he did in the beginning. His frankness was much appreciated, as it showed the little solidity there was in the foundation of his views. The cotton spinners in the out-districts had been induced to think that flat-flame burners were essential to their well-being; but it was shown that there was no difficulty in adapting, and giving them the advantage of, the incandescent burner for their purposes. It was amusing to southerners accustomed to the splendid light afforded by 14-candle gas used in the incandescent burner to hear this evidence against gas that, with

the "Metropolitan" No. 2 burner, will be showing 18 to 20 candle power. However, the Corporation are to have the new burner as their standard; and the power sought as to the manufacturing, converting, and utilization of residual products. The opponents wanted a provision inserted in the residuals clause giving legal remedies in the case of nuisance; but the Committee did not think this essential. There was a larger matter, and that a financial one. The out-districts were, as recent references in the "JOURNAL" have shown, asking for the revision of the financial terms between themselves and the Oldham Corporation in respect of the gas undertaking. It will be seen, in a later paragraph with the side-heading of "Oldham Water Bill," how they succeeded before the Committee in the case of the water undertaking. The Corporation thereupon apparently thought it wise to step down from the pedestal they had mounted in this matter in respect of the gas undertaking, and to come to terms with their opponents. These terms will be introduced to the Committee to-day; so that we will not make special reference to them this week.

99, Cannon Street. We should think the persons engaged in the promoting business at this address will be rather chary in going to Parliament in future in quest of statutory powers for gas and water supply, and having the finger pointed at them as the promoters of the Amman Valley Gas Company. Mr. Baker, the Parliamentary Agent for the Ammanford Bill, and Mr. E. H. Stevenson did not spare them before the Unopposed Bills Committee on Thursday. The Ammanford Bill, under which the Amman Valley works are to be taken over by arbitration, was forward for consideration. The Amman Valley concern is to-day a perfect wreck. "The capital was inflated," said Mr. Baker, "and the Company was promoted under somewhat discreditable circumstances;" and Mr. Stevenson's faith in No. 99, Cannon Street, is at such low ebb that he does not think the shareholders will ever get back a penny of their money. That is bad. However, we shall be glad to hear from any shareholders who do, in order that congratulations may be extended to them. Their position is indeed a parlous one; and they are to be sympathized with as much over their losses as their foolishness in so easily falling victims to the specious declarations of the professional promoter. The idea originally was that the Ammanford Gas Company should take over the whole of the capital of the Amman Valley Company that has been *bonâ fide* subscribed and spent; but the authorities of both Houses have positively declined to allow any transaction other than at a price fixed definitely by arbitration. The future of the Ammanford concern is better assured in this way; and the new concern will start with a financially clean slate. The intense local feeling there is against Eaton and his associates is seen by the condition precedent to the withdrawal of the opposition of the local Council, that the promoters of the Ammanford Bill had to agree that they would in future have nothing whatever to do with the Amman Valley promoters. The Ammanford Bill proceeds.

Home Office Delay. Through delay in the receipt by the Unopposed Bills Committee of the Home Office report on the Harrogate Gas Bill, the Committee were unable to consider the matters raised therein, and to give a final decision when the measure came before them on Thursday last. Government Departments ought to show a little more promptitude than this, and set a good example. The Company, among other things, asked for authority to supply suction-gas plant where required beyond the termini of their distribution plant; and the Home Office apparently require any authorization given in this regard to come under the same conditions as have been applied to other power-gas supplies in recent sessions. The Home Office seem to be persuaded there will sooner or later have to be some general legislation affecting power-gas supplies; and they want to ensure that whatever power is given now shall not, in addition to conditions ordinarily imposed, be exempt from any regulations designed in future. However, the preamble of the Bill has been declared proved, subject to changes in clauses at the next sitting of the Committee.

Oldham Water Bill. The Oldham Corporation, in connection with the water section of their Bill must, before the Local Legislation Committee had finished with it, have come to the conclusion that Parliament is not now particularly friendly to the "grab-all" policy in connection with the conduct of municipal trading undertakings. There was great discussion before the Committee over the objection of the out-districts to the differential prices applying to water supply in the outer areas; and to that discussion Mr. Arthur Andrew, the General Manager of the Gas and Water Undertakings, and Mr. E. W. Drew (Messrs. Wood, Drew, and Co.) contributed largely. Differential prices between the inside and the outside of a borough have for a long time been recognized by Parliament as fair, in view of the greater expense attaching to the supply in the outer districts. On the other hand, in fixing the amount of the excess price, it should not be forgotten that the local authority concerned are allowed to go into these outer districts for business purposes, and there is a value in that which should not be overlooked in fixing prices. Between water and gas, however, there is a difference—that in the case of the former more often than not there are no profits available to be carried to the rates. In Oldham, for instance, only once in 55 years has anything been transferred to the relief of the rates from water profits. The Committee confirmed the differential charges; but they have gone further by ordering that the profits of the water undertaking should in future be divided *pro rata* between the Corporation and the various

outside authorities. We cannot see the wisdom of this. It is preferable not to have any surplus after proper provision has been made in the interests of the undertaking; and it is preferable not to have any complications between the inside and the outside authorities. If, however, the decision assists in the prevention of profit-making on the water supply, so much the better. Another, and correct, decision of the Committee is that the right to a free supply of water now enjoyed by the Corporation is to cease. We have always been averse to the expenses of public services being met from any municipal trading undertaking, as in our view it is one of the most iniquitous forms of indirect taxation—more so in the case of gas than water. It is true that since 1903 the Oldham Corporation Departments have been paying 4d. per 1000 gallons of water, but that is not the cost of the water into the reservoirs. They will pay the proper sum in future; and the full outlay on the public service concerned will be distributed equitably over the whole body of ratepayers.

THE PATENT OFFICE IN 1908.

THE Twenty-Sixth Annual Report of the Comptroller-General of Patents, Designs, and Trade Marks, for the year 1908 (which bears the signature of Sir C. N. Dalton, who has since retired from the position), once more refers at some length to the new provisions in the Patents and Designs Act of 1907, which, it is remarked, "have been largely made use of."

The section of the Act which empowers the Comptroller to require typical samples and specimens to be furnished in connection with an application for a chemical invention, was introduced to mitigate an evil complained of by British chemical manufacturers—that many specifications relating to chemical inventions (notably artificial colouring matters) were to a large extent of a speculative character, and indicated products which had not been actually prepared; their production being merely presumed from theoretical considerations. Under this provision, during 1908, samples and specimens were required in no less than 112 cases; and generally speaking no objection was raised to the demand. In some cases, as a result of the requisition, a fuller and more accurate description of the products has been inserted in the specifications, or they have been otherwise amended. Yet another provision which was made use of in 265 cases, relates to those instances in which the examiner may have reported disconformity between the complete and provisional specifications. It is pointed out that it is now possible for the Comptroller to cancel the provisional specification and treat the application as having been made on the date on which the complete specification was left. It sometimes happened that the examiner found, when pursuing his investigations on the complete specification, that the whole of the invention described in the corresponding provisional specification had been anticipated by a prior patentee. In some of these cases the complete specification comprised patentable subject-matter which had been discovered by the applicant when developing his invention, or which, though in his possession at the time, was omitted intentionally or otherwise from the provisional specification. In order that the applicant should not be deprived of the benefit of his improvement by the refusal of the grant of a patent, it is now possible for the Comptroller to grant a post-dated patent in respect of it. Other provisions of which more or less extensive advantage has been taken are the one which allows the filing of a single complete specification and the grant of a single patent in respect of inventions described in two or more cognate provisionals; and those that enable applicants or patentees to apply for patents of addition in respect of improvements on their inventions without renewal fees being payable on them, that enable patents which have lapsed in consequence of the unintentional non-payment of renewal fees to be restored by order of the Comptroller, and that empower the Comptroller to revoke patents under certain conditions.

Turning to the particulars of last year's work of the Patent Office itself, it is seen that there was in 1908, as compared with the preceding twelve months, again a slight falling off in the number of applications for patents, and a larger proportionate decrease in the number of complete specifications filed. The figures for the last four years have been: 1905—applications, 27,577; complete specifications filed, 18,806. 1906—30,030 and 18,243. 1907—28,915 and 18,829. 1908—28,598 and 17,746. The number of applications received from women numbered 572 in all, which was a trifling improvement on the 560 of the preceding year. The number is, however, always a very small proportion of the total applications. Of all the applications for patents, 17,907 were received from persons resident in England and Wales, 1260 from Scotland, and 344 from Ireland. As regards the Colonies, applications from Australia, New Zealand, and Canada show a decided decrease; and there was a general decline in the number received from foreign States—the principal exceptions being France, Holland, Russia, Switzerland, the Argentine Republic, Brazil, Mexico, and South America. The applications from Germany (3059) decreased by 277; and those from the United States (2644) by 442. Of all the foreign countries, France provided the third largest number of applicants—1056. Patents were sealed upon 16,060, or 55·5 per cent., of the applications made in the year 1907; and out of 12,346 patents sealed upon

the applications made in 1895, 471, or 3·8 per cent., were maintained for the full period of fourteen years. The total number of patents which expired in 1908 was 15,943, and the number of new patents sealed was 16,284. Thus the number in force was increased during the year by 341.

As to the official examination under the 1902 and 1907 Acts, it is pointed out that all the complete specifications numbered as of the years 1905, 1906, and 1907 (to Oct. 31) have now been dealt with. During this time, 81,744 applications were filed, in respect of which 51,006 complete specifications were lodged. The investigation showed that of 46,353 cases finally accepted, 3194 (or 6·9 per cent.) were reported by the examiners as having been anticipated wholly, and 26,455 (or 57·1 per cent.) as having been anticipated in part, while in 16,704 cases (or 36 per cent.) no anticipations were reported. In the great majority of instances where anticipations had been reported amendments were made to meet the difficulty. The report says it is noticeable that since the introduction of the present system of examination, many more applications than before have been abandoned voluntarily. Thus in the ten years prior to 1905 the average annual number of applications which became void owing to the fact that the corresponding complete specifications were not accepted within the statutory period was 196; but of the applications filed between Jan. 1, 1905, and Dec. 31, 1907, no less than 4437 (or a yearly average of 1479) became void owing to this reason.

Referring to the subject-matter of the patents, it is seen that "locomotion" still occupies a prominent place, in connection with motor-cars; while activity in the allied branch of "attempts to abate the dust nuisance" is exemplified by many inventions relating to road-tarring machines, compositions for treating the surfaces of roads, &c. Flying-machines continue to exercise an attractive influence on inventors; but electrical subjects, we learn, have in general fallen off in numbers, with the exception of the incandescent lamp and the galvanic battery. Among other things, attention has been devoted, owing to the increasing importance of india-rubber in the commercial world, to processes for the regeneration of waste rubber and the synthetic production of rubber or rubber-like products. In previous issues of the report there has been given a classification of published complete specifications according to the system adopted in the Patent Office publications; but this is absent on the present occasion.

Last year the receipts from patent fees were £262,890, as compared with £265,012 in 1907; from designs fees, £5189, against £5473; and from trade marks fees, £17,358, compared with £18,447. The receipts from the sale of publications were £11,898—making the total receipts £297,335, as against £300,389 for the preceding year, or a decrease of £3054. On the other hand, the expenditure, at £179,531, exhibits an increase of £3301.

Institution of Mining Engineers.—At the general meeting to be held in London on the 27th and 28th inst., under the presidency of Dr. R. T. Moore, one of the papers will be entitled "Comparison between the Value of Surplus Gas from Regenerator Bye-Product Coke-Ovens and Steam produced by the Waste Heat from Bye-Product Coke-Ovens, with special reference to the Evence-Coppée New Bye-Product Ovens;" the author being Mr. Mansfeldt H. Mills.

The Bryan-Donkin Gas Exhausting and Compressing Plant.—We have received from the Bryan Donkin Company, Limited, a copy of the new edition for the present year of their catalogue of gas-exhausting plant. The descriptive matter is preceded by some views of the interior of the works at Chesterfield, which show how extensive and well-equipped they are. A description is given of parts of the improved Beale exhaustor, and it is succeeded by some observations on gas-exhausters generally. Exceedingly well executed illustrations follow of various types of exhausting machinery, accompanied by a description of the leading features. Exhaustors for small gas-works and others electrically driven are shown. The rest of the catalogue, which is well printed and enclosed in an artistic wrapper, is devoted to regulating, governing, and other plant, including the Company's patent rotary double-stage gas-compressor, driven by a gas-engine, for high-pressure distribution.

Coke Breeze for Concrete.—In an article on "Concrete Aggregates" in the current number of "Concrete and Constructional Engineering," Dr. John S. Oweis makes the following remarks on coke breeze: "Coke breeze is very light, and therefore makes a light concrete, which is also very fireproof. It is liable to contain dust and other impurities, such as sulphur; and care should be exercised in its use. I have seen concrete made from so-called coke breeze which absolutely refused to set at all, and had to be removed and reinstated. Breeze concrete is specially suited for suspended floors, owing to its lightness. It possesses also the advantage that it can be nailed to. It is not, however, strong, and should only be used when lightness is of great importance. Coke breeze weighs about 35 lbs. per cubic foot; hence the lightness of the concrete. It is very porous, but not so absorbent as its porosity would lead one to expect, as the cavities contained in it are mostly closed, being formed by the bubbles of gas evolved during coking. The walls of these cavities are highly polished and dense, but very thin. It is difficult, therefore, for water to obtain access to them. The material is peculiar in structure, and has certain properties which make it valuable as a concrete aggregate."

PROFIT AND LOSS IN MUNICIPAL TRADING.

MUNICIPAL trading continues to furnish examples of the confusion of thought which exists in many minds as to what is to be regarded as profit on businesses conducted in the public interest. The gentleman who, at the Barnstaple Town Council meeting last week, objected, as recorded elsewhere, to a deficit of £476 on the electricity account being described as loss, is by no means a solitary specimen of his class. There are many men who, in regard to municipal undertakings, seem to be utterly incapable of appreciating not only the principles of sound financial administration which are at the basis of all successful trading, but who cannot distinguish between profit and loss in such cases. What ordinary people call loss is euphemistically described at Barnstaple as an insufficiency in the revenue account to meet the capital charges. It is to be hoped the ratepayers who will have to find the money to make up this insufficiency will appreciate the distinction. Truth to tell, however, there are many municipal undertakings, especially those for the supply of electricity, which would fall into the class of those which have an income too small and an expenditure too great, if all the charges which could be legitimately debited were entered up against them. Most of them, by dipping liberally into the pockets of the ratepayers for public lighting, or by charging an excessive price for the current for working the municipal tramways, manage to make a show of providing the funds to meet the charges for capital. Few make adequate provision for depreciation of plant. It is a common failing with corporations to consider the sinking fund charge sufficient to cover depreciation. The temptation to take this course is very great when there is little or no surplus of revenue, and it is considered necessary to produce a "profit." In such cases it is preaching to deaf ears to say that depreciation is a matter which should be considered quite apart from the sinking fund. If municipal undertakings were to be conducted on the same lines as well-managed businesses in private ownership, there would be no talk of surplus or the allocation of profit to the relief of rates until a sufficient sum had been set aside to provide for current repairs, for the equalization of future repairs and renewals, for the contingency of obsolescence, and for a reserve against bad years. The number of cases in which this is done is exceedingly small, partly, no doubt, because of the constant and growing demand for contributions from these undertakings to relieve the rates, and partly because of the general lack of a sense of responsibility to the future. The law provides that certain funds shall be set aside for the redemption of capital; and when he has fulfilled this legal obligation, the average councillor is content to let posterity look after itself.

GAS AT THE IMPERIAL

INTERNATIONAL EXHIBITION.

THE time is approaching when the Imperial International Exhibition at Shepherd's Bush will be opened. The precise date of the inauguration ceremony is May 20. There has been considerably less noise made over the preparatory stages of the exhibition this year than last; and there are rumours afloat that there has not been on this occasion any violent rush for space for exhibiting purposes. Some of the great buildings are empty; and in others but little space has been taken up. From current talk, it appears there will be some difficulty in showing a title to the designation "International Exhibition," as representing the arts and industries of the various nations. There is no doubt the White City will henceforth find its proper level as a big place for popular summer recreation, and little else. The site, it is stated, has been enlarged from 140 to 150 acres; and the roadways will be in much better condition than last year. Capital roads have in fact, been constructed with a broken brick foundation and well-gravelled surfaces—the height being raised by about 1 foot. To enable visitors to get about the grounds with—this anyway is the design—the minimum of fatigue and the maximum of comfort, a complete tramway system, 3 ft. 6 in. gauge, has been installed; the length of track laid being about 4 miles. The illuminations, it is announced, will be on a larger scale than last summer; the lights numbering considerably over a million.

There will be no special demonstration of gas or electricity through joint enterprise. But the large section of the grounds beyond the "flip-flap" and within the further border of what was known last year as the Grand Avenue of the Colonies, will again be lighted by the new 1500-candle high-pressure lamps of the James Keith and Blackman Company, Limited. These lamps, it may be remembered, numbered 230; the pressure at which the gas is supplied to them is 54 inches; and they are economical in consumption—25 cubic feet sufficing for a light of 1500 candles. The lamps have been standing in position the whole winter; and though the weather has been very tempestuous and severe, they do not look any the worse for wear—in fact, the majority of the mantles are still hanging in the lamps just as they were left when the lighting ceased on the closing day of last year's exhibition. A little cleaning up, and remantling where necessary, and the lamps will be in readiness for the opening day.

In addition to this outdoor lighting, the firm will also have the lighting of an interior space some 300 feet square—representing

90,000 superficial feet. This is the large space in the Machinery Hall that connects up the two long arms, in one of which the Gas Section was located last year. This portion of the Machinery Hall will be lighted by 56 of the 1500-candle power Keith high-pressure lamps, which will be controlled, in similar manner to the exterior lights, from the compressors. The compressors will be situated in about the same position as they were last year. The plant will be in duplicate; and each compressor will be capable of dealing with 10,000 cubic feet of gas at a pressure of 54 inches, or 2 lbs. per square inch. They will, it is arranged, be direct-coupled to two $8\frac{1}{2}$ -horse power gas-engines. The plant will contain other new features. One is a no-load starting device. The importance of this will be appreciated by all who have had any experience with gas-engines direct-coupled to machinery. The compressors and engines being direct-coupled, they will be more compact and present an altogether neater appearance than the plant on view last year. Then there are continuous lubricating devices and oil-separators; any oil that is carried off with the gas being, when passing through the latter, deposited and returned to the compressor. There being no Gas Section on this occasion, the compressing plant will stand alone; but it will be found well worth an inspection.

Up to the present, comparatively little progress has been made with the exhibits that are to occupy the Machinery Hall. As, however, there is to be no united effort in the way of a Gas Section, the chief interest to gas men will, apart from the high-pressure lighting, be the Smoke Abatement Section, in which will be several exhibitors well known for their different specialities for reducing the common atmospheric nuisance of urban life. This smoke abatement exhibit will be situated in the portion of the Machinery Hall lighted by the high-pressure lamps. This part, in fact, is the only one that has been retained for engineering and kindred exhibits this year. In it the James Keith and Blackman Company will have a stand, at which their different types of lamps will be on view. Certain other exhibitors are also arranging for the lighting of their displays by high-pressure gas-lamps of smaller units than the 1500-candle power ones. In this way, gas lighting will secure additional demonstration at the exhibition.

Of course, the great success this year is, next to the lighting of part of the grounds, the securing of the illumination of the Machinery Hall; and the demonstration here of the use of high-pressure gas for large interiors will certainly be of advantage to the industry. The Brentford Gas Company, within whose district of supply the exhibition lies, will, of course, be supplying the gas; and Mr. Alex. A. Johnston, the Company's Engineer and Manager, sees before him a fair prospect of selling about the same quantity for exhibition consumption as last year. Of course, the closing down of the Canadian and Australian Sections will represent fairly heavy losses to counterbalance, as in both instances gas-engines were used last summer for generating electric current. However, there will be certain new users of gas this year; and Messrs. Lyons and Company, Bovril Limited, and others will be making additional demands for gas.

The following are the exhibits that will be employing gas for power purposes:

Associated Newspapers, Ltd.	One 115-Horse-Power Engine.	(New)
Scenic Railway.	Two 100 "	"
Scott-Snell Scenic Aeroplanes.	Two 68 "	(New)
Canadian Toboggan	One 26 "	"
Spiral Railway.	One 50 "	"
Wiggle-Wobble	One 26 "	(New)
Spiders' Web	One 16 "	"

Messrs. Lyons and Company (the Exhibition caterers) will have in use twenty-four meters, ranging from 30 lights to 100 lights, for cooking, heating, and lighting, and also eighteen large cookers. These include additions upon last year.

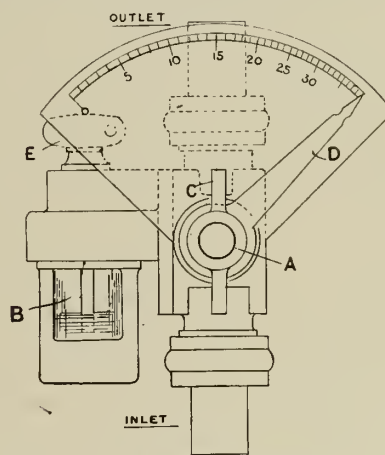
The Bahamas House is now being fitted up with Messrs. A. E. Podmore and Co.'s new "Oriental" three-cluster inside inverted gas-lamps. The Chinese Pavilion has also a complete gas installation for interior lighting by Mr. W. Edgar's new inverted lamps. Both these are new installations. The whole of the lavatories, numbering about 60, have complete gas installations for lighting purposes—representing additions upon last year.

The following have adopted gas for lighting, heating, and cooking: Irish Village, "Lemco" and "Oxo" (new), Bovril Castle (increased), Shanley's Chair Offices, Police Sections, Ambulance Sections, Moutal Sweet Company, African Nougat Company, Stringertype Manufacturing Company (new), Seymour and Co., Engineers, Birmingham (new), Messrs. Josephine (Machinery Hall), Messrs. M'Vittie and Price, Messrs. Godfrey Phillips and Co., and Messina Earthquake exhibit (new). Therefore, though there is no special joint exhibit this year, the effects of gas will be seen, and its utility will be in evidence.

As stated earlier in this article, the Electricity Companies of London are not this year making any special display; but the Simplex Conduits, Limited, have put up a model house, including an electrically-equipped dining-room, drawing-room, bedroom, and kitchen, for the purpose of bringing to public notice their metallic filament lamps, and electric cooking, heating, and ventilating apparatus. The site they have taken is between the Garden Club and the Grand Restaurant. A separate exhibit of the kind is greatly to be preferred to one mixed up with numerous others having nothing in common.

A RATE-OF-FLOW MEASURER AND LEAKAGE DETECTOR.

"THE basis of economy is prompt and accurate measurement." These words appear at the top of a circular with which Mr. O. Nelson, of 32, Cheapside (the sole agent for London), introduced to us the handy instrument illustrated, and which is described as Gibbs' gas-meter and leakage detector. Gas engineers and consumers are decidedly interested in both economy and prompt and accurate measurement; and therefore the new contrivance for effecting both gas measurement and waste detection appeals at once for consideration. Mr. George J. Gibbs, the inventor, has displayed acuity in inventiveness in several directions, and an instance is this particular appliance. In it, he strikes, so far as recollection carries us, quite a new line for the purpose of accomplishing the objects in view. The uses of the appliance have been demonstrated to us in a short interview; and the degree of practical service can easily be ascertained by gas engineers by obtaining a sample. The new appliance is specially recommended for such places as railway stations, yards and sheds, mills, factories, and warehouses; and, furthermore, it can be made for gas-mains of all sizes—in fact, it is claimed that no rate of flow is too small to be measured, and none too large. "A rate of flow," the information is given, "as small as 1 cubic foot per hour through a 12-inch main can be immediately detected and measured. The same accuracy is attainable throughout any range of sizes, whether it be for a 36-inch main or a $\frac{1}{2}$ -inch service-pipe."



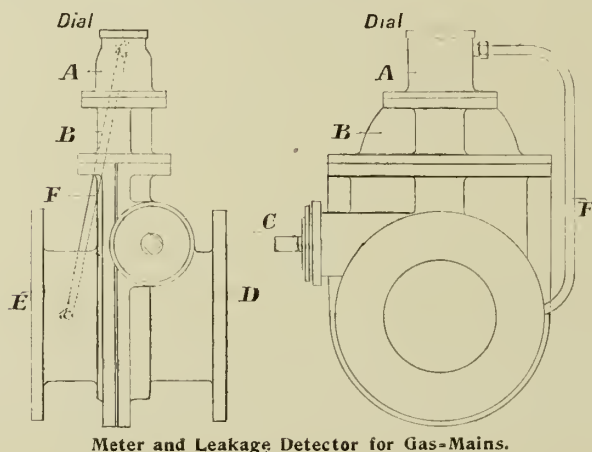
Gibbs' Meter and Gas-Leakage Indicator.

The demonstration witnessed with one of the "meters" and gas-detectors—a small one for a $\frac{1}{2}$ -inch pipe—showed that the appliance is very sensitive; and an examination was also conclusive that it is not an instrument that will readily get out of order, or depreciate in the matter of accuracy. Looking at the illustration, there is the connection and body of the appliance, with a quadrant and pointer mounted on it, and at the side a small manometer, in which the sealing liquid is merely water, the glass container of which is quickly cleaned, when necessary, by simply unscrewing the outer metal shield. But now for a more detailed description. Consulting the illustration, A is a specially constructed gas-cock, with gas inlet and outlet as shown. To the body of the cock is attached the dial graduated to read cubic feet of gas per hour. The index finger D is attached to the plug of the cock, and moves with it. In normal working, the cock is used exactly as any ordinary cock, and stands full open as shown in the illustration. But when measurement of gas consumption or leakage is to be made, the cock is gradually closed by means of the handle C till bubbles of gas appear in the detector B. The index finger D then indicates on the dial the rate at which gas is passing through the cock. The principle on which the apparatus works is that for a given rate of flow of gas through the cock—say, 10 cubic feet per hour—there is a definite position of the plug and index which causes the detector B to show, by bubbles of gas in the liquid, the small definite difference of pressure on which the dial scale is based. The detector B is fitted to the side of the cock, and is a specially sensitive and simple form of manometer, which only indicates the one particular pressure difference for which the meter is constructed. An arrangement of small ports or passages in the body of the cock and detector enables the difference of pressure between the inlet and the outlet of the cock to act on the detector. The small cock E which serves to put the detector out of action is the exact counterpart of the bye-pass cocks which are sometimes fitted to ordinary stopcocks.

When it is desired to know how much leakage is taking place from the gas-pipes and fittings in a house or other establishment, all burners are turned off, and the cock is gradually closed as described above until the bubbles appear in the detector. The index finger D then shows on the scale how much gas is leaking to waste. It is thus obvious that the urgency of any necessary repairs may be at once determined, and also, by further test, whether such repairs have been complete and efficient, and the use of high-pressure gas which is now coming into vogue makes the employment of some such device the more desirable.

Before referring more explicitly to the method of using the instrument, it may be said that these gas-cock detectors are made in sizes for $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, and 2 inch pipes; and larger sizes of pipes have to be dealt with separately.

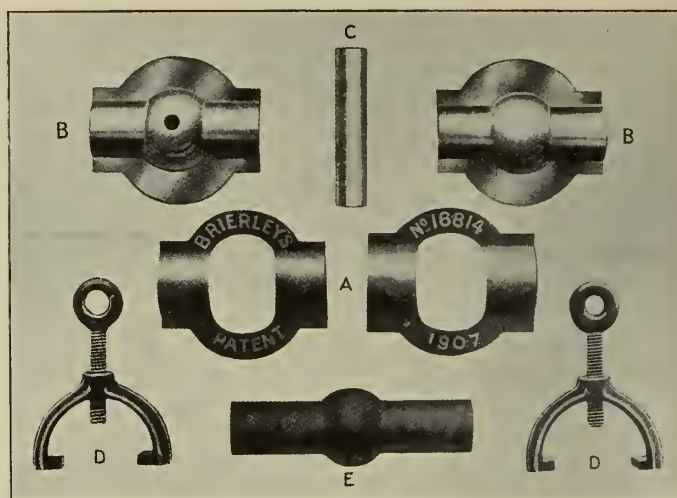
Now as to the method of using the appliance, it is first necessary to observe that sufficient water is in the glass tube B to submerge the end of the small brass tube—just enough to cause the lower end of the thicker tube to appear below the surface of the water when viewed horizontally. Then turn the small cock E so that the end through which the small hole is drilled is towards the main cock. The main cock, being full open, must then be gradually closed until a bubble of gas appears at the lower end of the small brass tube in the water. The index finger D will then show on the dial the rate at which the gas is passing through the pipe. This rate of flow, when no gas is being usefully consumed, represents the amount of leakage that is going on. When it is desired to know the amount of gas consumed by any particular apparatus, two readings should be taken, one with the apparatus in use and one without. When the detector is not in use, the small cock E should be turned so that the small hole is away from the main cock; the water-gauge being then hermetically sealed. In case it is necessary to replenish the water (which is very unlikely) the brass cage surrounding the glass tube B may be unscrewed by the fingers, when the tube B can be withdrawn, and water put in to bring it to the proper working level. The detector should be fitted at the commencement of the gas-pipe through which the gas to be measured is passing; and the intention is that the detector should be left permanently in position like an ordinary stop-cock, so that the information as to gas consumption and leakage may be obtained promptly at regular intervals. The accuracy of the detector, it is understood, is not affected by any change in gas pressure. In addition to consumption and leakage, the detector meets a variety of useful ends. It will obviously give warning if any burners are turned on when they should be off, and report when repairs to any pipe or fitting are necessary, and, when done, by further test if the work is well done. It is worth noting that the leakage of 1 cubic foot of gas per hour represents a loss of no less than 8760 cubic feet per annum. The point is frequently overlooked.



Meter and Leakage Detector for Gas-Mains.

A few words as to the application of the meter and leakage detector to large mains. In the illustration we have shown a large and specially constructed sluice type of valve, the wheel for opening and closing which is fixed to C. The hand-wheel may be arranged horizontally or vertically at any desired distance from the body of the valve. The indicating manometer is enclosed within the casing A, which is provided with a plate-glass top; and the dial which indicates the rate of flow of the gas, is also situated beneath the same glass plate. The dial and manometer may be placed at any distance or in any direction from the valve. The lettering of the illustration represents: D the inlet side of the valve; E the outlet; and F is a small pipe to carry pressure to the manometer, which is specially designed to show only the one particular pressure difference for which the dial is graduated. B is merely a cap to the sluice chamber, and may sometimes serve as an extension-piece to carry A. The dial is usually graduated to show cubic feet per hour, and may refer to any given pressure or range of pressures. The appliance in the form here described is designed for mains of any diameter from 2 inches upwards.

Attention has also been drawn by Mr. Nelson to Brierley's patent apparatus for making joints for lead piping. Again we have a simple means of effecting economy; and what is more, an expert is not required to make a trustworthy, clean, and presentable joint—in fact, the old method of making plumbers' joints in lead-piping by wiping and soldering is, by the patent, quite revolutionized. The requirements and method are absolutely simple. All that has to be done is this: A brass or other metal core C is fitted into the ends of the pipes to be jointed. Then a metal mould A, with copper or other metal lining B, is clamped on the pipes by clamps D. Molten lead is poured into the mould; and by means of a blow-lamp, the pipe ends and the surrounding lead are fused together, resulting when cooled in a perfect homogeneous cast E. By this method any sizes of pipes can be jointed; either simple or multiple branch joints being equally well made. Joints made



Brierley's Apparatus for Making Joints to Lead Piping.

in this manner are said to be much cheaper, more durable, and more perfect than those made in the old manner with solder. As only lead is used, expansion and contraction are equal throughout the pipe. This in itself is an improvement—especially in hot-water pipes where there is a great variation in temperature, as the unequal contraction and expansion of dissimilar metals is one of the chief causes of leakages at joints of water-pipes. But the great thing is the expedition in the making of joints; and time saved is money earned.

THE ROSS PATENT MANTLE.

An Asbestos and Ramie Structure.

As far back as Jan. 21, 1908, there appeared in our columns a special article describing the Ross patent mantle, about which there were novel features which had been introduced for the set purpose of strengthening the mantle physically, and producing certain effects conducing to improvement in illuminating power. During the past year, the mantle has been exploited in Germany with a success that has, we are assured, given every gratification to the holders of the patent; and now business in the mantles in the United Kingdom is being developed by the Patent Appliances Company, of 6, Holborn Viaduct, E.C., of which Mr. Charles W. Neumeister is the Manager. The information as to trials made in this country, and the resulting increasing demand, confirm the claim to the mantle being one that possesses individual merit.

Let us recall certain of the features, which give the mantle—both for vertical and inverted burners—a distinctive character among articles of its kind. In the first place, the mantle is neither knitted nor woven, but is braided—the point of advantage claimed for this being that the mantle possesses greater elasticity than one that is knitted or woven. A second point is found in the combination of materials employed in the construction of the mantle—asbestos and ramie. Six-fold asbestos threads form ribs running vertically, and threads of the same material but of less substance supply diagonal bracings (as it were) between the ribs, joining up in manner so as to distinctly show a diamond shape. The spaces between are filled in with braided ramie. In the making, the stocking is not so wide as is the case in the ordinary form of manufacture; and in shaping the head of the mantle no pleats are formed. The ability to narrow the stocking, and make a head free from pleats, is due entirely to the braiding of the threads forming the fabric, and the interlacing with the asbestos ribs—this giving the power to draw the threads tighter at the top, and so giving a closer mesh there. When the stocking is stretched and placed on a conical shaped mould to give it form, and the asbestos threads are pulled taut, the mantle assumes the conical shape without a single ruck in the head. The construction—as here described—supplies the ground for the submission of the patentee that strength is given to the head, and that the liability of the bottom of the skirt to fray is reduced. Moreover, the mantle maintains a good shape throughout its life. The illustration is reproduced from the notice we inserted of the patent specification on Aug. 4 last (p. 337). It does not give any correct idea of the mantle as completed, but is merely to illustrate the vertical asbestos ribs and diagonal cross supports.

Further merits presented to notice by the owners of the patents are that the fabric, through being braided, offers a uniform surface to the impregnating solution, possesses a large field of illumination relative to size, has greater constancy in respect of illuminating

power, and retains its maximum illuminating power for a considerable period. In respect of illuminating power, it may be remembered that, in the previous article, it was stated that our information attributed to a mantle of this type used on an ordinary burner, consuming 150 litres of gas ($5\frac{1}{2}$ cubic feet), an illuminating power of 136 Hefner units, or, in other words, 26 Hefner units per cubic foot of gas. This is such a remarkable result, that there was an inclination to a little feeling on our part that some mistake had been made, or at all events that such a return must have been obtained under some special conditions. But we are assured by Mr. Neumeister that there was nothing special about the tests, that they were made by recognized photometrists, that the pressure was an ordinary one of about 16-10ths, and that subsequent tests have shown that the original claim was justified. Dr. H. Bunte, of Karlsruhe, reports as follows on the mantle: "The consumption of the upright 'C' mantle is about 125 to 129 litres per hour, at a pressure of 35 to 38 mm., and that

of the inverted is 79 litres per hour at a pressure of 35 mm. The lighting power increases during the first thirty hours. The mantle has great resisting power against vibration and shocks, as the fabric, and particularly the ribs, are firm and of a good and uniform nature, in consequence of which the light is distributed symmetrically in all directions of the horizontal plane." The photometrical value is one that most gas engineers will be curious to test on their own account; and the opportunity now offers.

There is no question that mantles that are both cheap and nasty are a disadvantage to the gas industry. They are expensive in the long run, and create an amount of labour that is an annoyance to the user. The "Ross" mantle is not put forward as being in the class of cheap mantles, but as one that will save labour by its durability, and will consequently be worth the money asked for it. Mantles for all types of burners and pressures are made on this system; and the finish of all those that have been under inspection may be described as clean and neat.

ADDITIONAL WATER STORAGE FOR LONDON.

Opening of the "Beachcroft Reservoir" at Honor Oak.

Last Wednesday afternoon, in brilliant sunshine, but accompanied by an unpleasantly high wind, London was provided with a substantial addition to its water storage, by the opening—by the Right Hon. the Lord Mayor (Sir George Wyatt Truscott), in the presence of a large gathering of ladies and gentlemen—of a new covered reservoir for filtered water, which has just been completed by the Metropolitan Water Board in the vicinity of the Honor Oak Station of the South-Eastern and Chatham Railway Company. The following particulars of the reservoir are taken from an interesting *souvenir* prepared for the occasion; the illustrations being reproductions of photographs placed at our disposal by officials in the Engineering Department of the Board.

The new reservoir, which is the largest of its kind in the world ever constructed at one time and under one contract, is situated on land $28\frac{1}{2}$ acres in extent, purchased in 1897, within the boundary of the Camberwell Borough Council, near the north side of Peckham Rye. The Act which authorized its construction was obtained by the late Southwark and Vauxhall Water Company in the year 1894, and an extension of these powers was granted by Parliament in the session of 1906.

As the material found on the site was very suitable for brick-making, the first step taken towards the construction of the reservoir was the manufacture, on the site, of the bricks that would be required. This work was commenced in 1898. The Company proceeded to erect a large Hoffman kiln, brick-making machinery, and house, also a steam brick-dryer, by means of which 19 million bricks were manufactured. By the adoption of this course, a large saving in the eventual cost of the reservoir

was effected, as not only was the expense of the carriage of the bricks avoided, but that of removal, cartage, and disposal of the surplus material was rendered unnecessary. In November, 1905, after the Metropolitan Water Board had taken over the duties of the Company, tenders were invited for the construction of the reservoir, and eventually the tender of Messrs. Moran and Son, Limited, was accepted for the execution of the work.

The top water level of the reservoir is situated 144 feet above Ordnance datum. Its principal use is to afford low-pressure service to the south-eastern portion of the Board's area—though, by means of mains which exist beneath the River Thames, it will be possible to transfer the supply to the northern side should it at any time be necessary. The reservoir is constructed on the natural clay formation, the bottom being of concrete formed as inverted arches crossing each other at right angles, each apex of the groining being prepared to receive brick columns or piers, of cruciform section. The thickness of the brickwork is 1 ft. 6 in., and the width across the piers 4 ft. 6 in. These piers carry the roof, which is also of brickwork, and consists of a series of parallel segmental arches running the whole length of the reservoir from north to south. The distance from centre to centre of the piers is 21 ft. 6 in. in both directions; consequently the reservoir is divided into cells or bays, 21 ft. 6 in. square. Segmental jack arches, at right angles to the segmental parallel arches mentioned above, run from pier to pier throughout the series.

Two division walls at right angles to each other divide up the reservoir into four sections. These walls are cambered back to back; the space between them being filled in solid with concrete. The outer retaining walls are of concrete, lined on the inside with brickwork; headers being provided on every fourth course to bind into the concrete. The retaining wall varies in thickness at the



The "Beachcroft Reservoir" at Honor Oak—General View during Construction.

base from 6 feet to 16 feet according to its depth, and, in addition, each bay is provided with a buttress reaching in most instances to the first pier. On the north and south sides, and also along a portion of the west side, the buttresses are carried farther; and in places where the pressure is greatest those for the retaining wall are carried back to the fourth bay from its face. The interior faces of the bays against the outer wall on the north side, and considerable portions of the east and west walls, are plain vertical brickwork; but the faces of the bays against the south wall, and several of the bays on the east and west walls, are constructed with vertical segmental arches similar to those in the division walls.

Draining channels running north and south are formed in the inverts on the floor of the reservoir. These are connected together near the intersection of the division walls, and lead into pockets formed in each of the four sections of the reservoir wherein 30-inch emptying-pipes and sluice-valves are fixed. At the point of intersection of the division walls, a circular valve chamber 24 feet in diameter is formed, extending from the top to the bottom of the reservoir. To this chamber the various supply,

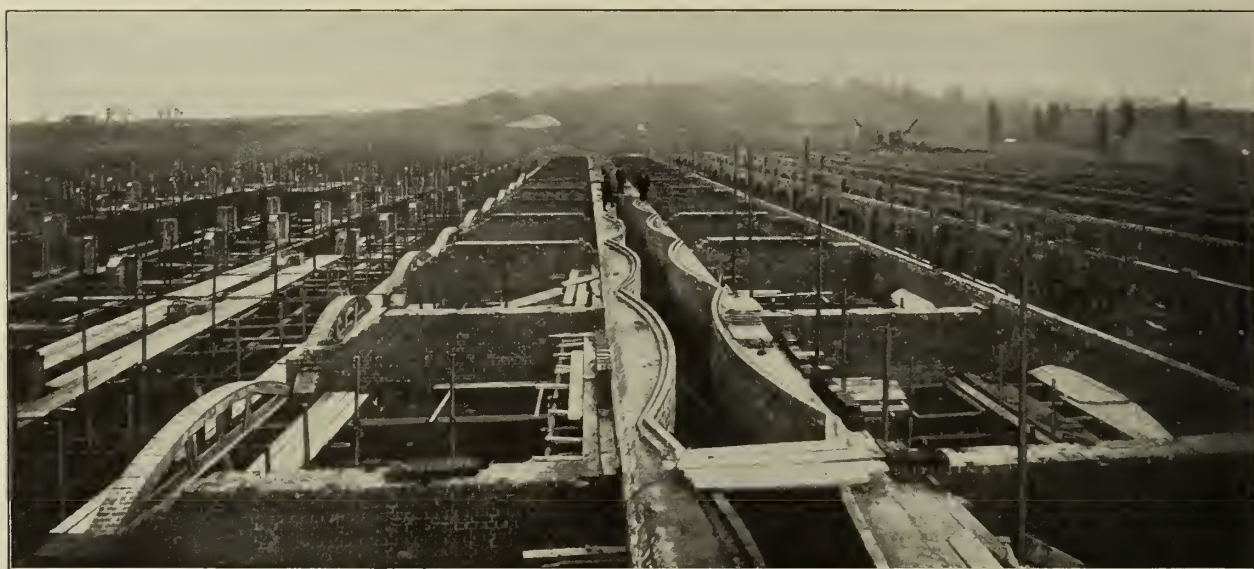
draw-off, and intercommunicating pipes are carried; 42-inch and 36-inch sluice-valves being fitted to the various pipes for the purpose of controlling the water to and from each reservoir. The valves are manipulated from the interior of a valve-house constructed over the valve-well at the top of the reservoir.

In addition to the brick arched covering of the reservoir, there is spread over the roof a layer of 6 inches of cement concrete, covered with a thin layer of neat cement carefully trowelled over. The remainder of the covering consists of clay and the top soil originally taken from the site, forming a level surface over the whole extent of the reservoir. Air-pipes, 6 inches in diameter, are placed at intervals over the bays, for the purpose of ventilation and to allow of the escape of air during the process of filling, or to admit air while the water is being drawn off.

Round the outside of the retaining outer walls is a puddled clay wall 3 feet thick taken down to the London clay, into which it is made water-tight. The top of the wall is carried on to, and is connected with, a layer of clay extending over the roof of the reservoir. The earthen embankment, which extends along the north side and portions of the east and west sides where the top



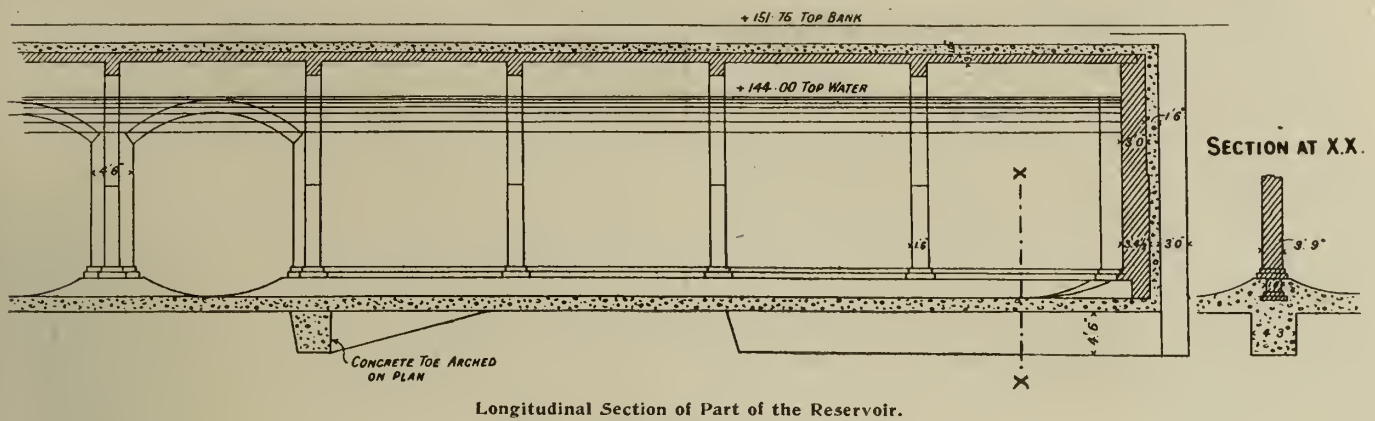
View of Interior of Reservoir, showing Form of Floor.



View showing Division Wall in Centre of Reservoir.



Arches for Supporting Roof of North-East Reservoir.



Longitudinal Section of Part of the Reservoir.

of the reservoir is above the natural surface of the ground, is laid at a slope of $2\frac{1}{2}$ to 1 on the east side, and $3\frac{1}{2}$ to 1 on the north and west sides, and is formed of alternate horizontal layers of earth and burnt ballast—20 inches of the former to 4 inches of the latter.

The reservoir, which measures 824 feet in length between the walls, with a maximum width of 587 feet, occupies an area, including the banks, of about $14\frac{1}{4}$ acres. The actual water area is a little over 10 acres; and the top water level is 144 feet above Ordnance datum. The bottom of the main body of the reservoir is at an elevation of 122 ft. 6 in. above Ordnance datum; the depth of water being 21 ft. 6 in. A portion of the north-eastern section of the reservoir is 12 ft. 6 in. deeper than this; so that the greatest depth of water is 34 feet.

In the construction of the reservoir, a large amount of material was used; the number of bricks being over 16 millions—all made from the material taken out of the excavations. Concrete, in the proportion of 6 to 1 of Thames ballast and portland cement, amounting to 95,000 cubic yards, was used in the foundations, walls, floor, and covering of the reservoir; the quantity of cement used being 20,200 tons. The lengths of the covering arches, if placed in a single line, would reach about four miles; while the length of the jack arches connecting the piers totals over three miles. The quantity of excavation below the natural surface of the ground was 173,000 cubic yards; and upwards of 14,000 cubic yards of clay were used in the puddle wall, &c.

The reservoir is divided into four sections, each capable of being filled or emptied independently of the others. The source of supply is a 42-inch pipe connected by a branch to the Board's 42-inch main, which conveys filtered water from the pumping-station at Hampton to the Nunhead reservoirs—a distance of about 17 miles. The outlet-pipes are also 42-inch. Each of the four divisions of the reservoir communicates with, and is connected to, a series of valves in a valve-house, situated at the junction of the four sections of the reservoirs, whence the water is distributed to the Board's districts as required. The outlay upon the reservoir, including the cost of the land and other expenses, will amount to approximately £236,000.

Adjoining the reservoir is situated a deep-well pumping-station; the well being 11 feet in diameter and of a depth of 300 feet, about 150 feet of which is into the chalk. Headings or tunnels have been driven in several directions, amounting in length to about 3400 feet; and a large quantity of water has been tapped and is brought to the surface by means of two sets of three-crank vertical triple-expansion engines, coupled to 18-inch deep-well pumps of 5-feet stroke. The steam for the plant is generated by six Babcock and Wilcox water-tube boilers. The water thus pumped can be either delivered into service-mains for conveyance to the Nunhead or the Forest Hill service reservoir, or into the new reservoir.

The whole of the works were designed and have been carried out under the supervision of Mr. J. W. Restler, M.Inst.C.E., the Chief Engineer to the late Southwark and Vauxhall Water Company, and now Deputy Chief Engineer to the Board.

The Opening Ceremony.

The visitors began to arrive shortly after two o'clock, and proceeded along the top of the reservoir, the site of which was gaily decorated with flags, to the central valve-house, where they were able to see, at the bottom of a spacious well, how the large mains were connected, and inspect the series of valves, by Messrs. Glenfield and Kennedy, Limited, by which the water will be directed into the required section of the reservoir, and the three Venturi meters (two in operation) automatically recording the quantity delivered. Close to the valve-house they found access to the interior of the reservoir, which was lighted by incandescent electric lamps. The sight which presented itself—the rows of vast arches stretching away into the distance—must have astonished many of the visitors, especially the ladies. Owing to the conformation of the floor, care had to be taken in walking over it; but attention had been called to this matter on the paper setting out the order of proceedings, and, moreover, boards had been laid to facilitate movement. A raised platform had been erected above the inlet-pipe, where the ceremony was to be performed; and others were provided at a lower elevation on either side.

The Lord Mayor, who was accompanied by the Lady Mayoress,

and attended by the Sheriffs, arrived at the reservoir about a quarter past three, and was received by the Chairman of the Board (Mr. E. B. Barnard, M.P.), the Vice-Chairman (Mr. G. S. Elliott), and the other members of the Reception Committee, and conducted to the upper platform, upon which were assembled members and the chief officials of the Board, representatives of the municipal authorities of London, and specially invited guests, including Sir Henry E. Knight, the Chairman, and some of the Directors, of the late Southwark and Vauxhall Water Company. The guests having assembled, Mr. Barnard, before asking the Lord Mayor to perform the ceremony which he had kindly undertaken, made a few remarks on the importance of the Board's work in providing a supply of water adequate in quantity and satisfactory in quality for some 7 million people. With regard to the reservoir they were inaugurating, he expressed his pleasure at seeing the Chairman and some of the Directors of the late Southwark and Vauxhall Water Company, as it was they who had been responsible for the great work in its inception. Apart from this, its completion was one of the many services which a progressive Water Board were rendering to London. He dwelt upon the value of the engineering knowledge and sound advice of Mr. Restler, by whom (as the Company's Chief Engineer and the Deputy Chief Engineer of the Board) the work had been designed and carried out. He concluded by asking the Lord Mayor to turn the water into the reservoir, which he said was to be named the "Beachcroft," after his predecessor in the chairmanship of the Board. Before complying with the request, his Lordship paid a tribute to Sir Hugh Myddelton for his great achievement in bringing a supply of water to London, and pointed out that it was to private enterprise—that of the Water Companies—that this supply had been maintained and developed. It was now in the hands of the Water Board, who had to be governed by a "two-power standard." They had to bear in mind not only the growth of London, but also the possibility of a great drought. He therefore congratulated them on the completion of the reservoir, of which he said he should like to have been the Engineer or the Contractor, and expressed his pleasure at learning that it was to receive the name of Beachcroft, which had long been associated with municipal affairs in the City of London.

Mr. Restler then presented the Lord Mayor with a key, and explained how, by means of electric connections, the water would be made to flow into the reservoir when the key was used. His Lordship then turned on the water, which shortly afterwards began to rise like a huge fountain from the upturned end of the inlet-pipe, and flow over the floor of the reservoir. A powerful beam of electric light was thrown on to the jet to illuminate it; and the beautiful effect elicited hearty cheers.

The visitors then ascended to the surface, and assembled in a marquee, where the rest of the programme was gone through. Mr. Barnard presided, and called upon Sir Henry Knight to make a few remarks. In doing so, Sir Henry referred to the circumstances which led to the decision to construct the reservoir, and to the difficulties which had attended the work. He said the Southwark and Vauxhall Water Company were faced with the necessity of preparing to meet contingencies; and they determined on constructing the reservoir now completed. He testified to the ability displayed by Mr. Restler in the capacity of Engineer to the Company, and claimed that they handed over to the Water Board the best set of works of any of the London Water Companies. He heartily congratulated the Board on the completion of the reservoir, and the Lord Mayor on having discharged a great Metropolitan duty in declaring it open. He expressed the opinion that more stores of filtered water of a similar character to this were needed for London. Mr. C. E. Hearson, the Chairman of the Works and Stores Committee of the Board, proposed a vote of thanks to the Lord Mayor and the Lady Mayoress, and gave some interesting particulars in regard to the early history and present extent of the Metropolitan Water Supply; pointing out that the addition of the reservoir just opened brought up the storage to 304 million gallons. Mr. G. S. Elliott, the Vice-Chairman of the Board, seconded the proposition, and it was carried by acclamation. His Lordship acknowledged the vote, and proposed a similar compliment to the Chairman, with whose response the proceedings closed.

Light refreshments were then served in an adjoining marquee, and the company gradually dispersed; many of the visitors, before leaving, inspecting the pumping-station.

"ROSTIN" AUTOMATIC LIGHTING APPARATUS.

A New Departure.

[COMMUNICATED.]

Most gas engineers are by now well acquainted with the Rostin system of automatic lighting for street-lamps, which is in more than one respect distinct from any other apparatus at present on the market. The principal distinctive feature is that it not only consists of the working part which regulates the supply of gas to the burner, but is also using an arrangement for the purpose of regulating the admission of gas into the working parts and the exhaust of same, and thus controls the movements of the working parts according to requirements. Besides this, the most important advantage is that it enables the apparatus to utilize the full pressure of gas in the mains for the operation—not merely relying upon a small margin over and above the maximum day pressure. Consequently, having a great available motive force, the apparatus does not require a special increase of pressure to be given in order to operate the lamps. The distinctive features of the Rostin apparatus have enabled it to be successful in many districts where other makes of apparatus have failed to meet the requirements of the lighting authority. In places where, owing to the large area supplied and the difficulties of distribution, no special conditions of pressure can be created, the Rostin apparatus has been found to work absolutely correctly with the ordinary increase of pressure which has to be given to cope with the evening consumption.

The arrangement consists of valves, working on the principle of the U pressure-gauge, which govern and regulate the admission of gas into an expanding chamber consisting of a steel bell sealed in mercury. This bell is fixed directly under the burner, and in rising turns by means of a ratchet-wheel an ordinary lamp-cock; this latter arrangement being also only found in the Rostin apparatus. Variations in the construction of the bell—sometimes a diaphragm—with weights on top or a tensioned spring holding same down, with different mechanical arrangements of levers, cocks, valves, &c., are extremely numerous, and constitute the bulk of the many pressure appliances in existence.

There is no doubt this system of regulating the admission of gas to the operating chamber by valves permits the widest range of fluctuating pressure to take place without any danger of the lamps being extinguished or lighted other than at the correct times. Briefly, it may be said that, where a weighted bell or diaphragm is used, the lowest point to which the pressure may drop after lighting-time without the apparatus engaging for the process of extinguishing must be in excess of the maximum day pressure. But with the Rostin, it is the minimum pressure obtaining at any time between lighting and extinguishing times—thus making the apparatus more reliable in cases where, owing to varying consumption, the height of pressure cannot be guaranteed.

The trouble of guaranteeing a certain height of pressure has been the obstacle which has in the past prevented the adoption of automatic lighting by pressure by those towns where the difficulties of supply produce fluctuations of pressure so extensive and so irregular that an apparatus relying upon a pre-determined height of pressure could be worked only with great precautions. That such districts do exist, cannot be denied. They are generally to be found in those large towns where the consumption is heavy and irregular, and which, by the fact of having to supply a large area of public lighting, would be the most likely to receive the greatest benefit from adopting the automatic system.

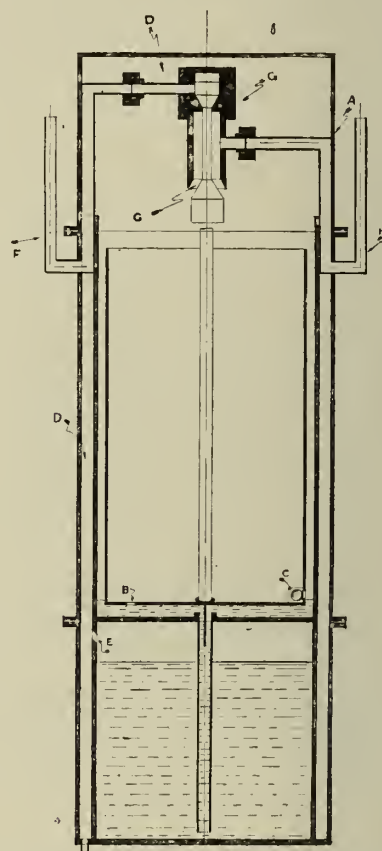
In order to overcome exceptional cases of this nature, Mr. A. E. Broadberry, the Engineer and Manager of the Tottenham and Edmonton Gas Company, and Dr. Rostin have recently devised an apparatus which is of special interest, inasmuch as it renders any pre-determined height of pressure unnecessary, and at the same time gives the central control which can only be obtained by a pressure system. From long experience and a close study of gas distribution, these gentlemen have found that variations of pressure due to vagaries of consumption produce diagrams showing that the rise and fall of pressure due to the above conditions takes place comparatively slowly; and only when a definite increase of pressure is given at the governor-house do the diagrams show a sharp, quick rise. To produce an apparatus that will answer to this quick, sharp rise, and at the same time be unaffected by a slow rise irrespective of the height of pressure attained, has been the object aimed at by Mr. Broadberry and Dr. Rostin; and it may be truly said that, in succeeding in this object, they have rendered signal service to the gas industry.

The principle of the new arrangement now under notice can be best understood from the accompanying outline diagram. It represents the section of the case made of special composition capable of withstanding corrosive action. The interior of the case is divided into two main sections; the lower one consisting of a chamber filled with a non-freezing and non-evaporating mixture of glycerine and water, and the upper containing a spring-balanced float shown only diagrammatically. The two chambers are separated by a horizontal metal partition, which has at its centre a pipe extending downwards nearly to the bottom of the lower chamber. In the wall of this outer case is constructed a tube D, having an inlet into the lower chamber at the point E. To this pipe is led an elbow F, which is connected to the stand-pipe of the lamp. It will be seen that pressure of gas in F will cause the level of the glycerine mixture to fall in the lower chamber; and

the surplus of liquid will be forced through the central pipe into the upper chamber, until a balance is secured.

The float in the upper chamber is provided on its lower surface with a small hole B, of a known diameter, which is accurately gauged to allow the glycerine mixture to flow slowly into the interior of the float. Evidently, then, should pressure be brought to rise gradually in the gas system, the level of the glycerine will rise to equal height simultaneously within and outside the float, and no movement of the float will take place. Supposing, however, that a sharp rise of pressure occurs, such as would happen if additional pressure were intentionally sent from the works, the level of the glycerine outside the float would rise at a much greater rate than the level within the float, and the latter would be rendered buoyant. At the centre of the interior of the float is a brass rod projecting upwards, so as to come in contact (after sufficient movement) with a vertical valve G, which consists of an arrangement of coned surfaces which, though being gas-tight, slides very freely, and provides sufficient opening to allow a full pressure of gas to be transmitted past its orifice. The action of this valve is to open up a passage for the gas-pressure between the point D through the valve D G to the pipe A H, which passes to a bell floating in mercury, which, on rising, operates an absolute lamp-cock by means of a ratchet-wheel turning in one direction only; the gas being transmitted to the bell at full pressure.

After the apparatus has performed its work in lighting the lamp, the glycerine mixture gradually percolating through the small hole in the float attains the same height inside the float as



A Modified "Rostin" Gas-Lighting Apparatus.

outside. Consequently, the float drops, and the valve G is closed, and the outlet is opened, allowing the bell operating the cock to fall, and cause the levers to engage in the next step of the ratchet-cock ready for the subsequent operation, when another moderately sharp rise will extinguish the light.

It has further been found necessary to make special provision for districts where the pressure falls rapidly previous to lighting-time, and then only rises to a height lower than was previously attained; and this is accomplished by introducing a special valve C, which allows the glycerine mixture to get out of the float as quickly as the level falls round the float—thus bringing the apparatus instantly into working condition.

The adjustment of the apparatus is exceedingly simple. A pointer is provided for the purpose, which, on being moved to the requisite figure, renders the float heavier or lighter, and making the apparatus answer to a small rise or to a large one as may be required. From long and exhaustive experiments conducted over an extensive period, it has been proved that the apparatus can be relied upon to work absolutely satisfactorily with a sharp rise of 4-roths, irrespective of what the initial pressure may be; and at the same time it remains unaffected by a slow rise of any height.

It will be seen that the apparatus marks an entirely new departure in automatic lighting, as the principle employed is quite a new one, and constitutes a very valuable adjunct to the already well-known Rostin apparatus, which has achieved such success in this and other countries.

BOLZ'S ARRANGEMENT OF VERTICAL RETORTS.

In last week's issue of the "JOURNAL" (p. 292), some particulars were given of results obtained at Trieste by the use of a new bench of twenty vertical retorts erected according to the designs of Herr Christian Bolz, the Manager of the Buda-Pesth Gas-Works. A section of the bench was reproduced from the pages of our Italian contemporary "Il Gaz;" and we are now enabled to give some further illustrations and particulars of the system through the issue by the British Patent Office of Herr Bolz's complete specification.

In view of the very general interest that is being taken in the construction of the various systems of vertical retorts, it will be of value to give some extended extracts from the specification, so as to show what were in the patentee's mind as desirable modifications of some of the well-known and previously described arrangements.

He says: In all gas-generating furnaces with vertical retorts, and with producers beneath the floor for the workmen engaged in emptying the retorts, the conduits for the air for combustion to be preheated, and the regenerative apparatus arranged beneath the floor near the producer, the supporting piers or

pillars bearing the retort or combustion chamber above simultaneously serve for the reception of the conduits or flues for the ascending preheated air for combustion and the descending "smoke gases." Moreover, the bracing of furnaces with producers arranged beneath the working floor is effected by holding together both the lower part of the furnace with the producer, and also the supporting piers or pillars for the retort-chamber, and also the retort-chamber itself at the top, by a common system of bracing. This bracing is normally effected as follows: On two opposite sides of the furnace, a number of vertical buckstaves extending up from the foundation surround the masonry of the furnace; and each two oppositely-arranged buckstaves are connected top and bottom by tie-rods. Further, in all gas-generating furnaces heretofore built with vertical retorts or chambers, whether the producer is positioned as above described or is arranged above the working floor, the heating of the retort-chamber either takes place from one side only of the furnace—for which purpose combustion-nozzles are mounted at one side of the furnace only and the fire is conducted along substantially only the broad sides of the retorts—or if it takes place from both sides of the furnace the "fire gases" impinge directly on to the walls of the retorts, thus injuring them by erosion. All the arrangements have, however, serious disadvantages, which he proceeds to describe.

1.—The conduits or flues, built into the supporting piers or pillars, for the preheated air for combustion and for the smoke

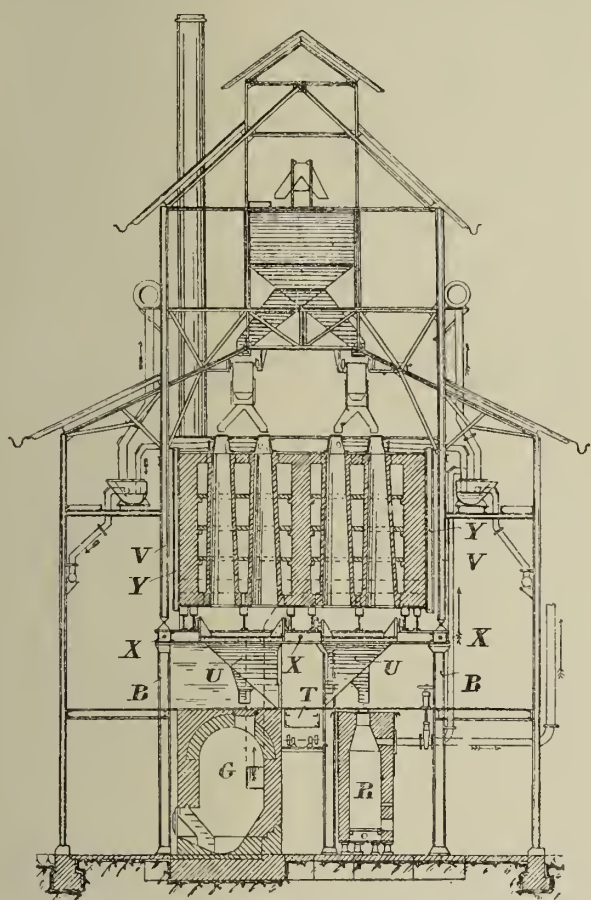


Fig. 1.

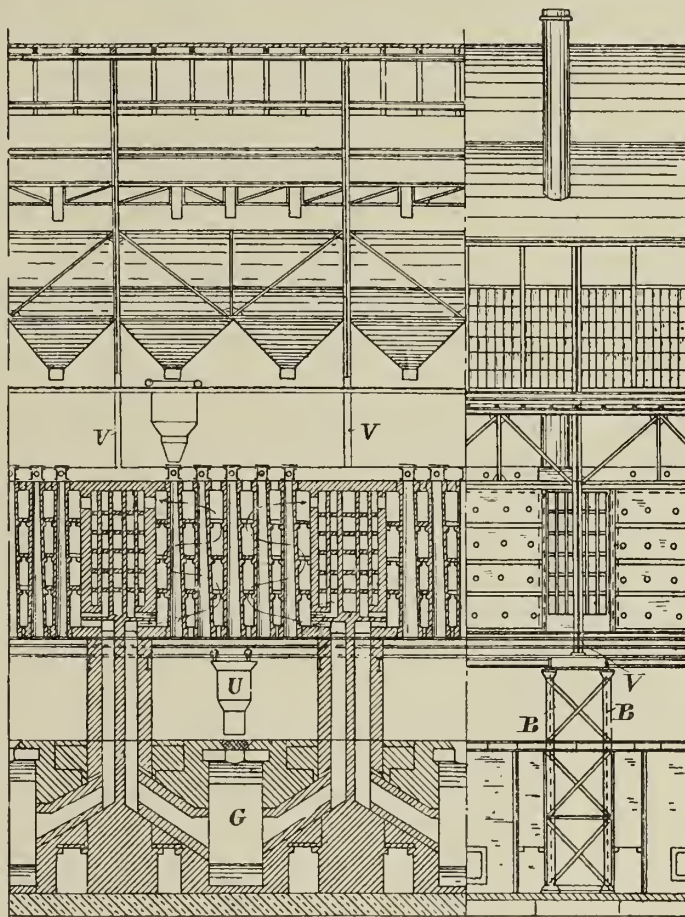


Fig. 2.

gases to be drawn away, form a continual source of leakage. They also considerably increase the cost of building the furnace by reason of the inaccessible and complicated construction, and involve losses by radiation of heat.

2.—The recuperator arranged below, by the side of the producer, obviously involves (quite independently of the fact that the space taken up, which would be useful for other purposes, is lost) the erection of a special chimney by the side of the furnace, the site of which chimney has to be deducted from the amount of land available. Since the whole of the smoke gases, for the purpose of escaping into the chimney from the top of the retort-chamber, which stands at a considerable height, must be conducted down again, the requirements of the furnace as to draught are very high. The loss of heat, however, also increases the draught; while the chimney, requiring a separate site at the side of the furnace, renders the plant more expensive.

3.—The heating of the retort-chamber of a furnace with vertical retorts from only one side of the furnace is, however, a specially weighty disadvantage of all known constructions, since with this method of heating the number of retorts to be united in one furnace is limited.

This is based on the following consideration: The vertical retorts are (as is known) made conical—that is to say, the retorts become wider from above downwards—in order to permit smooth sliding out of the coke. The coal capacity of the retorts is thus considerably greater at the lower than at the upper part.

In order to carbonize the coal uniformly throughout the whole

height of the retort, it is necessary to heat the lower part of the retorts (with the larger coal-capacity) more strongly than the upper—that is to say, the heating of the retorts must decrease uniformly from the bottom to the top. This is effected by dividing the retort-chamber by means of a number of horizontal partitions into superposed flues, through which the heating gases are drawn in a zig-zag path from the bottom to the top. The principle on which vertical retorts are heated consequently differs entirely from that which is adopted for heating horizontal or inclined retorts.

It is thus clear that, if heating gases be supplied to the retort-chamber from one side of the furnace only, in a large group of retorts standing one behind the other, the retorts at the side of the furnace remote from the heating nozzles will be heated less at the lower part than those lying next to the heating nozzles. The further result of this method of firing is that the fall of temperature is greater towards the upper ends of the retorts; so that the coal is only irregularly carbonized—that is to say, the complete removal of the gas from the whole charge of the retorts lasts a considerably longer time than it should do.

This obviously only appears when, as above mentioned, a large number of retorts standing one behind the other is combined into a group. In the furnaces, heretofore used in practice, each two retorts only are combined into a group; and this number may be taken as a practical limit in heating from one side of the furnace only. For economical reasons, however, attempts must be made to combine a larger number of retorts in a single retort-chamber

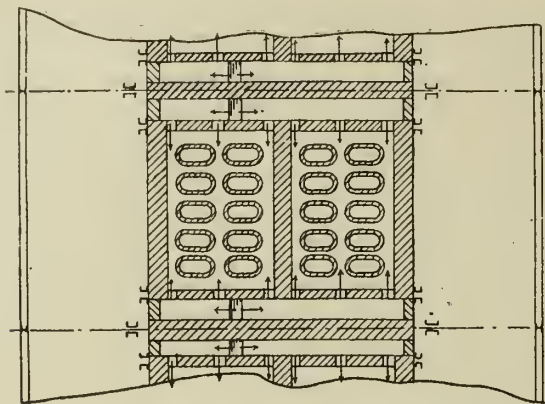


Fig. 3.

in a furnace supplied from only one producer. Both the capital cost and the cost of maintenance are, of course, relatively less with the larger number of retorts combined into one furnace.

The method of firing heretofore usual in the retort-chamber along the broad sides of the retorts has, too, the disadvantage that the fire is too much confined, whereby free development of the flames is interfered with. The prevention of the free development of the flames obviously gives a lower efficiency of the furnace. If the fire, however, passes along the narrow sides of the retorts, a larger free space is afforded thereto for development.

4.—A common system of bracing for the elevated retort-chamber, and the producer arranged beneath and the supporting piers or pillars, only imperfectly attains the object sought. Obviously the greatest expansion occurs at the parts of the furnace where there is the highest temperature. The highest temperatures occur in the retort-chamber at the top; while the temperatures in the producer built between the supporting piers or pillars of the retort-chamber, and also in the conduits or flues built into the supporting piers or pillars, remain very considerably below the temperature of the retort-chamber.

Thus, while there is only a relatively low temperature up to the base-plate of the retort-chamber resting on the supporting piers or pillars, the temperature reaches its highest value in the combustion chamber above this base-plate. The temperature thus increases quite suddenly in this zone.

If, now, the whole substructure of the furnace and of the retort-chamber is held together by common vertical buckstaves, the yielding of the bracing due to the great expansion of the retort-chamber causes an equally great yielding of the substructure of the furnace; while the expansion of the masonry in the substructure of the furnace, corresponding to the lower temperature there, is much less than in the upper part of the furnace. The unavoidable result of this is a loosening of the bonding of the masonry and consequent leakage.

The present invention has for its object the construction of a furnace with vertical retorts in which the faults indicated above are said to be entirely avoided. Figs. 1, 2, and 3 show one example of construction, consisting of several furnaces each having twenty retorts built together into one block. The upper part of the furnace receiving the retorts is mounted on a carrier-frame or grid supported on transverse girders carried by columns. The heating gases generated in the producer rise on both sides in masonry conduits to distribution passages arranged on the two opposite sides of the furnace near the retort-chamber. Above these passages is built, throughout the whole breadth of the retort-chamber, the regenerative apparatus with the passages for the air for combustion to be preheated.

From the distribution passages, the heating gases pass into the retort-chamber between adjacent lines of retorts and between the outer lines of retorts and the walls of the furnace, through nozzles or jets; and from the air-passages above preheated air for supporting combustion passes into the retort-chamber. The combustion gases thus heat the retort-chamber from two opposite

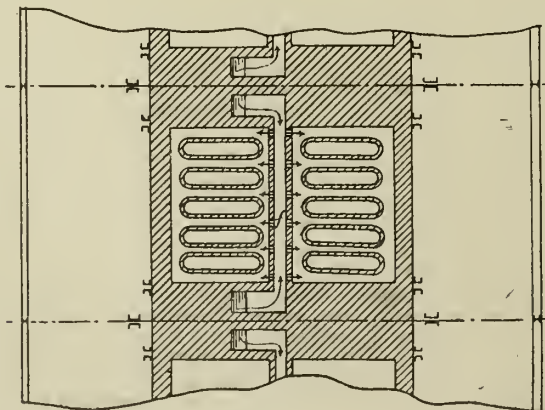


Fig. 6.

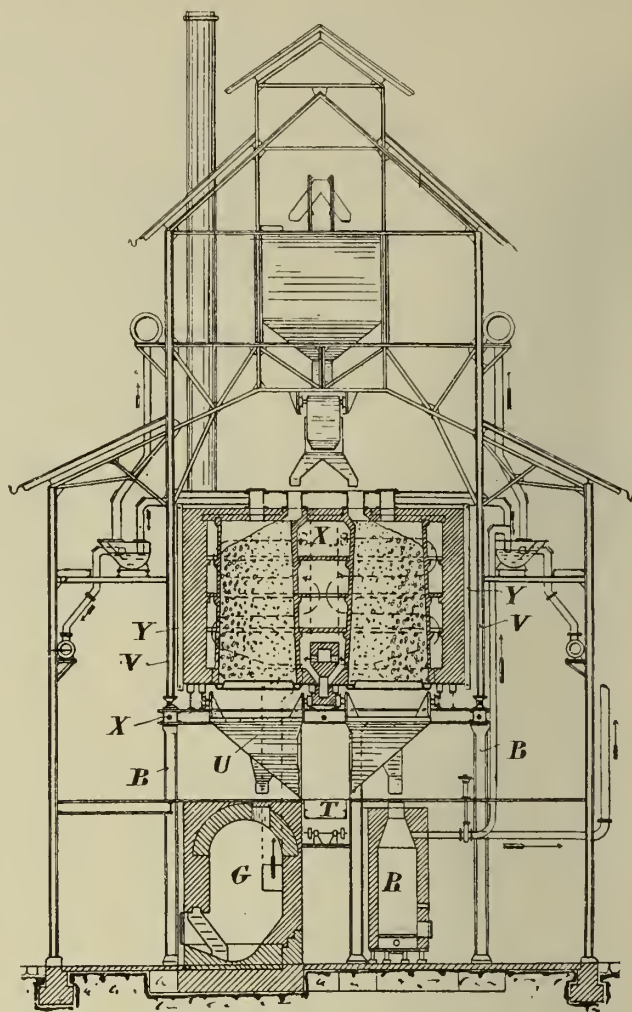


Fig. 4.

sides of the furnace simultaneously, in order to pass through the retort-chamber along a zig-zag path in the manner indicated by the arrows. In this arrangement, the retorts are made flat, and are built into the retort-chamber in such a manner that the heating gases flow past the narrow sides of the retorts.

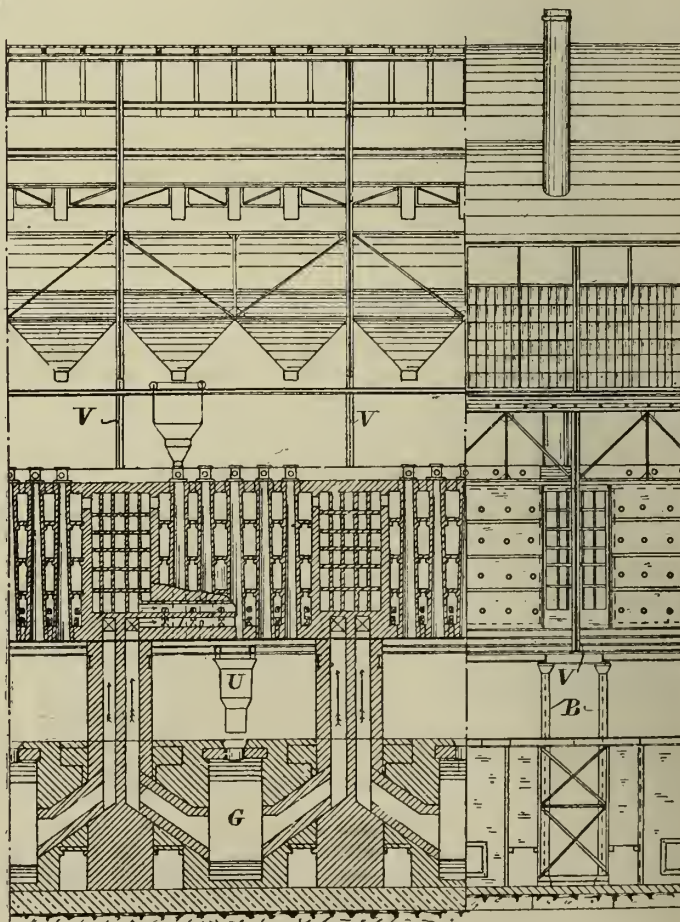


Fig. 5.

The simultaneous supply of heating gases from the producer to two opposite sides of the furnace accordingly permits in a perfect manner uniform heating of even a larger number of vertical retorts arranged one behind the other in a group than was possible with furnaces heretofore known. The number of retorts combined into one furnace and heated by one producer only can, it is said, be more than doubled in this construction; and the cost of erection of the furnace will obviously be less per unit output, as also "the cost of maintenance will obviously be less with the increased efficiency."

Special stress is laid by the patentee upon the fact that, for a given total output, the number of furnaces required, and with them the number of producers necessary for heating the retorts, can be reduced to about one-half with this form of construction as compared with those heretofore known. The area of the site of the furnace is less by about 60 per cent. Considerable economy is also claimed in labour by the smaller number of producers to be attended to.

The form shown in figs. 1, 2, and 3 comprises twenty-retort furnaces with a partition-wall cutting the whole retort-chamber into two halves. As can be seen from fig. 2, the length of the whole furnace beyond the total length of the retort-chambers is dependent upon the thickness of the masonry conduits. The latter, accordingly, determine the distance apart of two retort-chambers where a number of furnaces are built side by side. This latter space above the distribution passages is in every case sufficient for arranging the passages for the air for combustion to be preheated. Thus the whole space beneath the working floor, with the exception of the space required for the producer, can be utilized for other purposes. A further result of the arrangement is that the amount of space occupied and the cost of erection are said to be reduced, and also separate conduits for carrying up the preheated air for combustion (such as are necessary where a recuperator or regenerative apparatus is arranged below the working floor) are avoided.

After the heating gases have left the top of the retort-chamber on both sides, they pass through the passages, in which they give up their heat as far as possible to the air for combustion, in order finally to escape into a separate chimney built directly on the recuperator of the furnace. A separate chimney built beside the furnace—such as is necessary in connection with the recuperator arranged beneath the working floor as in the forms of construction heretofore known—is therefore dispensed with, and with it the separate conduits for the purpose of conducting the smoke gases down.

In the construction shown, any passages between the working floor and the retort-chamber, except those for carrying up the heating gases from the producer, are accordingly avoided; so that any danger of leakage which occurs when there are a number of passages or conduits is not present here. "The whole construction of the furnace gains in simplicity and lowness of cost by dispensing with the numerous conduit connections."

A further advantage of the arrangement of regenerative apparatus is that the requirements of the furnace as to draught are reduced to the lowest possible degree, since the smoke gases leave the furnace along the shortest path, in order to be carried up directly by the separate chimneys mounted on the recuperator. Special attention should also be drawn to the fact that the simultaneous supply of producer gas to two opposite sides of the furnace is here not bound up with the position of the producer relatively to the retort-chamber. Thus the producer could be arranged above the working floor near the retort-chamber.

As already mentioned, in the form shown, the space below the working floor (with the exception of that required for the producer) is available for other purposes; and should this space be employed for the erection of a water-gas producer, for the purpose of utilizing the heat of the glowing coke falling out of the vertical retorts, the coke can be delivered directly into the water-gas producer by conveyor-rakes, in order to produce water gas directly from the coke. Further, in order to obtain a mixed gas having a specially high value with respect to lighting and heating power, the decomposition of carburetting oils can take place at the end of the distillation period by means of the incandescent coke in any individual retort. In fig. 1, the arrangement is shown with the water-gas producer R. The arrangement is, moreover, such that the free space still available in the middle of the furnace, between the heating-gas producer G and the water-gas producer R, is utilized for erecting a mechanical coke-conveyor T. The erection of such a coke-conveyor in the middle of the furnace beneath the working floor is of considerable advantage, since the whole of the coke left over after feeding the two producers can be taken up, without trouble, in the simplest manner and conveyed away.

For receiving the glowing coke falling out of the retorts and conducting it away into the two producers or into the coke-conveyor, the two trucks U, formed as suspended railway trucks, are employed. These trucks are made in the form of four-wheeled suspended-railway trucks, the wheels of which move on the lower flanges of the girders above. The trucks are so arranged that, by throwing over a valve or flap arranged on the inclined bottom, or by adjusting a slide, the glowing coke can be drawn off either into one of the two producers or into the coke-conveyor channel. This method of transport would obviously be rendered considerably more difficult if, for example, the coke-conveyor were mounted on one side of the centre line of the furnace, or by the side of the furnace. Again, since with vertical retorts the

height of the lower door of the retort is limited in respect of convenient operation by hand, it would not, with any other position of the coke-conveyor, be possible to obtain the necessary inclined plane for the automatic delivery of the coke from all the retorts to the conveyor.

The bracing of the furnace shown is arranged so that the elevated retort-chamber, which has the highest temperature, is held together by a special system of bracing entirely separate from the bracing of the substructure of the furnace. Both on the longitudinal and also the transverse sides of the furnace, the body of masonry in the example given is held together by bracing bars or buckstaves Y, rigidly connected at the bottom to the iron base-plate which extends through, and rests on, the carrier-frame; while above the masonry of the furnace the two oppositely arranged buckstaves are connected together by tie-rods. The columns B, with transverse girders bearing the carrier-frame and the braces X, form a rigid trussed underframe, on which the whole superstructure of the furnace rests. The latter can therefore expand freely on all sides without in any way impairing the stability and gas-tightness of the substructure.

By this means, it is also rendered possible to use the columns B without any danger for carrying the roof of the furnace-house—for example, by means of the extensions V. This would obviously not be possible if the columns formed a rigid system of bracing with the superstructure of the furnace, in which case the columns would move to and fro in accordance with the expansion of the furnace. The advantage obtained by this improvement is twofold—in the first place, by the separate bracing, it is ensured that the masonry in the substructure shall remain gas-tight, and also by using the columns B great economy can be effected.

Figs. 4, 5, and 6 show a further example of construction, in which retorts of large coal capacity are employed. In this form, the simultaneous heating of all the retorts can be obtained if the combustion nozzles are mounted not on the two sides of the retort-chamber, but in the median line thereof between two rows of retorts; so that the heating of the retorts takes place simultaneously on two sides of the furnace. In principle and method of operation, this firing is exactly the same as in the other form of construction. The heating gases generated in the producer G ascend on two sides in passages to the distribution passage arranged in the median line of the retort-chamber between two rows of retorts, in order to pass from these passages through the nozzle-apertures on both sides into the combustion-chamber. Above the passage is built a distribution passage for the preheated air for combustion, which is fed at both ends from the recuperators or regenerative apparatus arranged on both sides of the retort-chamber. The heating gases thus pass simultaneously to two opposite sides of the furnace, in order to pass in a zig-zag path through the retort-chamber.

The coal is introduced by allowing it to fall at a definite velocity on to an inclined plane provided in the upper part of the retort or of the upper mouthpiece—in this manner separating the coarser pieces of coal from the fine coal.

Having thus described his invention, the patentee declares that he is aware it has already been suggested to mount vertical retorts in a retort-chamber into which flame-gases enter from separate combustion chambers and impinge directly on to the lower parts of the retorts from opposite sides of the retort-chamber; horizontal baffles being arranged in the retort-chamber to control the flow of the hot gases therein. Also that it has already been suggested to make furnaces for use in smelting iron, in which vertical round retorts are arranged in rows in a retort-chamber into which the fuel gases are introduced through openings arranged on both sides of the retort-chamber between the rows of retorts. He therefore does not claim such arrangements broadly or generally; but what he claims is:

(1) A gas-generating furnace with vertical flat retorts or chambers, characterized in that the burners conducting the heating gas and the air for combustion into the retort-chamber are arranged at the two opposite sides of the furnace (which sides are parallel to the broad sides of the retort) between adjacent lines of retorts and between the outer lines of retorts and the walls of the furnace, and that at the same time the flame-gases in the retort-chamber are conducted upwards in a zig-zag path from the bottom to the top.

(2) A gas-generating furnace with vertical flat retorts or chambers, characterized in that, in the centre line of the furnace at the bottom of the retort-chamber, a heating-gas collecting-passage fed from both ends is arranged between two rows of retorts, from the burner-nozzles of which collecting-passage the heating gas flows into the retort-chamber on both sides and is guided in the retort-chamber in a zig-zag path from the bottom to the top.

(3) A gas-generating furnace with vertical flat retorts or chambers, characterized in that the bracing of the retort-chamber at the top is effected independently of the bracing of the lower part of the furnace, and that the columns carrying the retort-chamber are simultaneously used for supporting the roof of the furnace-house.

(4) A gas-generating furnace with vertical flat retorts or chambers, characterized in that a water-gas producer is arranged directly beneath the vertical retorts or chambers beneath the working floor near the heating-gas producer for the retorts, and that a mechanical coke-conveyor is mounted in the middle of the furnace between the heating-gas producer and the water-gas producer, by means of which conveyor the coke that remains is quenched and carried away.

COMBINED VERTICAL RETORT AND WATER-GAS GENERATOR.

Among the specifications issued last week by the English Patent Office was one—No. 16,614; Aug. 6, 1908—communicated from the International Gas Development Company, of Manhattan, New York. It described a "process of manufacturing

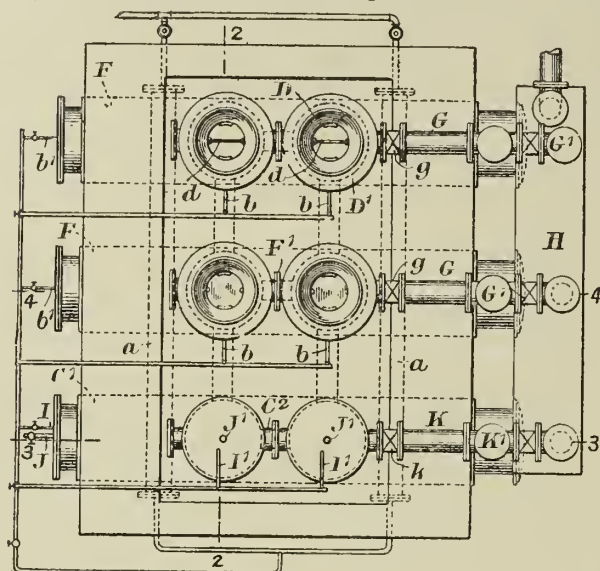


Fig. 1.

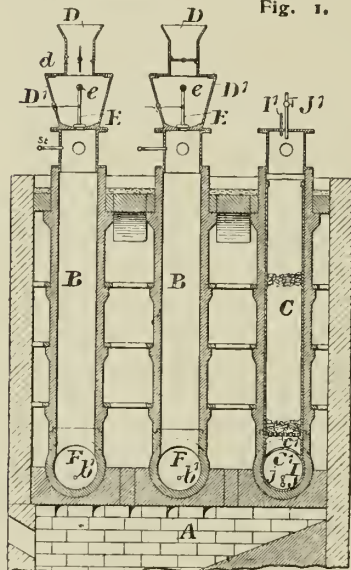


Fig. 2.

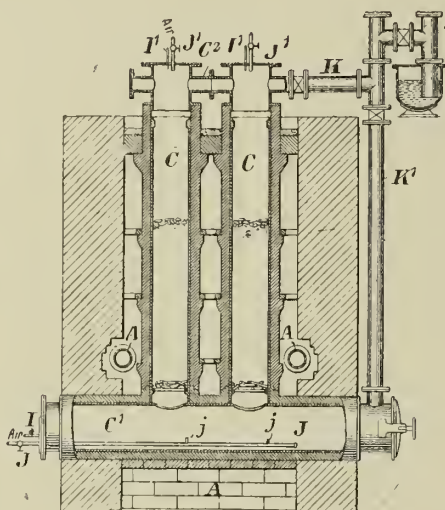


Fig. 3.

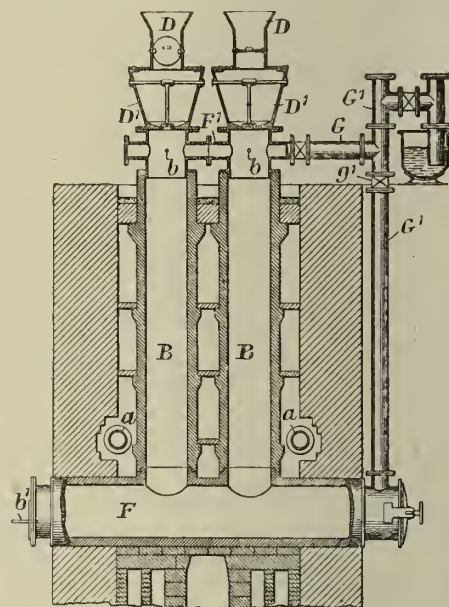


Fig. 4.

ferably superheated, is admitted through either of the pipes *b* or *b'*. As a convenient means of superheating the steam, it is passed through drums *a*, which run through the furnace and receive heat from it. With this arrangement, the steam that is used in the different retorts will enter at substantially the same temperature as the retort.

At the top of the retort is a compound coal-shoot composed of an upper hopper *D* and a lower one *D'* separated by a damper. The upper hopper is smaller than the lower one; so that, from time to time as required, it may be emptied into the lower by opening the damper. The flow of coal from the lower hopper into the retort is controlled by an adjustable gate *E*, movable about a pivot so as to uncover the opening into the retort, by means of a rod passing through the side of the hopper.

At the bottom, the retort communicates with a horizontal chamber *F*, which is common to the entire row of retorts in the battery (three rows of retorts are shown in the engravings). Access may be had to the interior of the chamber through a man-hole. The retorts in each row are also connected together at the top by a pipe *F'*; the pipe *G* from the last retort in the row connecting with the pipe *G'* from the chamber *F*. Pipes *G* *G'* are provided with valves, so that either may be used; and from their meeting point the pipes communicate directly with the hydraulic main which is common to all the retorts in the battery.

Referring, now, to the oil-enriched water-gas retorts, shown particularly in figs. 2 and 3, *C* is a chamber or retort preferably provided with an iron lining. It is shown as vertical merely for convenience in building the battery, as it may be horizontal or inclined. It is partially filled with pieces of iron held up by a perforated plate. The vertical chamber at its bottom opens into a horizontal chamber *C'* over the furnace; and leading into this chamber are the steam and oil inlets *I* and *J* respectively. Similar steam and oil inlets *I'* and *J'* are provided at the top of the

illuminating gas consisting in producing coal and water gas by forcing steam into contact with coal passing through a distilling chamber, drawing off the products from the distilling chamber, and enriching same by adding oil-enriched water gas produced by passing steam and oil vapour through a heated bed of material capable of acting as a carrying agent to combine the oxygen of the steam with the carbon of the oil vapour," or else through a heated bed of iron. The process is designed to manufacture the mixed coal and water gas and the oil-enriched water gas separately, but to combine them in a permanent gas without the use of a superheater, if they are brought together at the same temperature; and thereafter no fixing is required.

It is preferable, but not requisite, the patentees point out, that the process be carried out in one and the same general apparatus to ensure the gases meeting each other while at the same temperature—namely, that of the hydraulic main. Therefore, "the invention specifically considered contemplates the manufacture of the gas in a single piece of apparatus in which the entire product is continuously manufactured in a simple and highly economical way."

Fig. 1 is a plan of the plant used to carry out the process. Fig. 2 is a vertical section on the line 2. Fig. 3 is a vertical section on the line 3. Fig. 4 is a vertical section on the line 4.

A is a furnace common to, and heating, all the retorts. Above the furnace is a double battery of three retorts *B*, *B*, and *C*—the *B* retorts being for coal and water gas, and the *C* retorts for oil-enriched water gas. Any number of retorts may be in one furnace; and the ratio of coal and water gas retorts to oil-enriched water-gas retorts will vary according to conditions—quality of coal, candle power desired, &c.

Referring first to the coal and water gas retorts (figs. 2 and 4), *B* is a chamber or retort shown as vertical, "so that gravity may serve to pass finely-divided coal through it;" but it may be inclined or horizontal, and the coal blown through. Steam, pre-

chamber; and either set may be used. The steam may be drawn from the common source through the drums *a*, and be thus pre-heated. The inlet for oil passes into the horizontal chamber, and is provided with nozzles from which it issues as a vapour.

The retorts in each row are also connected together at the top by a pipe; the pipe *K* from the last retort in the row connecting with the pipe *K'* from the chamber *C'*. The pipes *K* *K'* are provided with valves, so that either may be used; and from their meeting point they communicate directly with the hydraulic main, which is common to all of the retorts in the battery.

The operation of the apparatus is as follows: The furnace *A* is heating the entire plant. The hoppers *D* on the *B* retorts are filled, and finely-divided coal is falling through the retorts. Superheated steam is being supplied to the *B* retorts through the steam-inlets *b'*, and, with one valve closed and the other open, the products are passing to the hydraulic main through the pipes *G*. The coal falling through the retorts is quickly heated and distilled, while at the same time the steam is disintegrated; the result being the formation of mixed coal and water gas, which passes out through the pipes *G* to the hydraulic main.

At the same time that this is going on in the *B* retorts, superheated steam is entering the chamber below the *C* retorts, through the steam-inlets *I*, where it meets, and mingles with, the oil vapour issuing from the nozzles. The mixed steam and oil vapour then passes up through the bed of hot iron, which serves as a carrying agent to combine the oxygen of the steam with the carbon in the oil, whereby oil-enriched water gas is formed without destroying the iron bed. This oil-enriched water gas passes out through the pipe *K* to the hydraulic main.

The coal falling through the *B* retorts is distilled and becomes coke, which is withdrawn from the bottom through the manholes at the ends of the horizontal chambers. The other bye-products are collected in the usual manner.

ANALYSIS OF AIR AND GAS.

At the Meeting of the Society of Public Analysts last Wednesday, Mr. W. J. A. BUTTERFIELD, M.A., F.I.C., read a paper on the above subject, of which the following is an abstract.

The methods of analysis described referred only to the estimation of moisture, carbon dioxide, methane (fire-damp), or small quantities of other combustible gases, oxygen, and, by difference, nitrogen. The methods had for the most part been devised or perfected, either independently or with the aid of collaborators, by Dr. J. S. Haldane, F.R.S.; but the original descriptions of them are scattered, and certain modifications have been introduced aiming at greater ease and certainty of operation. The estimation of moisture must necessarily be carried out on the spot; and in his paper the author referred in detail only to the gravimetric chemical method, which, with the precautions he indicated, admits of a far higher degree of accuracy being attained in the estimation of moisture than is afforded by any other chemical or any physical (psychrometric) method. The absorbent used is granulated pumice saturated with concentrated sulphuric acid. The estimation of moisture by this method is conveniently made in conjunction with the gravimetric determination of the carbon dioxide in air, for which the form of double absorption-tube which he exhibited is used; the absorbent in this case being freshly prepared granulated soda-lime. This is the most accurate known method of determining carbon dioxide in air; but it gives only the average content of the air for a period of not less than ten minutes. The mean error of the determinations is about 0.1 per cent. on the amount of moisture or carbon dioxide; or (say) ± 0.01 part of either constituent per 10,000 parts of air. The volumetric determination of carbon dioxide by the portable Haldane apparatus was referred to; and a modified form of the apparatus which possesses some advantages for laboratory use was described and shown. The mean error of determinations of carbon dioxide by this apparatus amounts to ± 0.2 part of carbon dioxide per 10,000 parts of air.

The use of a control-tube and a differential pressure-gauge containing a solution of caustic potash or other aqueous liquid, which was introduced in the last-named apparatus for the purpose of rendering the volumetric analysis of a gas independent of variations of temperature and barometric pressure, was referred to in connection with its general applicability to the analysis of air and gas. This control-tube and gauge are employed in the apparatus for the determination of methane (fire damp) and oxygen in air, which was next described. The methane is estimated by combustion over a heated spiral platinum wire, and absorption by caustic potash solution of the carbon dioxide produced by the combustion. The oxygen is determined by means of an alkaline solution of pyrogallol. The requisite conditions for the preparation of this solution in a maximum state of efficiency were described. The degree of accuracy attainable in the estimation of fire-damp and oxygen with the apparatus shown is such that the error in the results, stated in percentages of the original volume of air, need not exceed 0.01. A portable and a laboratory type of apparatus for the complete analysis of air to this degree of accuracy were on view.

PETROL GAS FOR LIGHTING AND HEATING.

At the Meeting of the Royal Scottish Society of Arts on Monday, April 26—Mr. W. R. Herring, the Vice-President, in the chair—reports were submitted by a Sub-Committee, consisting of Mr. Henry O'Connor, Mr. Mackenzie, and Mr. Herring (Convener), on a communication from Mr. W. Key, on his "Centenary" air-gas turbine generator, and another from Mr. W. Shearer, on an improved apparatus for producing petrol gas for lighting and heating purposes.

Referring to Mr. Key's apparatus, the Sub-Committee said: "This device has for its object the production of lighting and heating gas by the utilization of petrol vapour in air. It appears to be distinctive in character, and differs materially from any other type on the market. The making of the turbine generator with a number of chambers keeps the pressure of the gas even and its flow uniform. The covering of the surface of the liquid contained in the generator by a film of petrol ensures the carburation of the air in proportion to the amount of petrol admitted by the regulating-tap at the top of the apparatus, which must be adjusted to suit the varying quantities of gas produced from time to time. The apparatus is very compact and easily manipulated, and can be driven by any form of power, such as a suspended weight or a hot-air engine for small installations, and petrol, water, or other motive power that may be available."

With regard to the other communication, the Committee said: "There are many different types of apparatus for accomplishing the purpose in view; but Mr. Shearer's arrangements possess some points of novelty which have not hitherto been applied to this particular purpose. The arrangement for supplying the petrol in positively regulated quantities controlled by the air-meter is very ingenious, and seems likely to carry out what is desired. The carburettor has distinctive features, novel arrangements for preventing the cooling of the moisture in the gas to too great an extent, as it is surrounded by an anti-freezing liquid contained in a tank,

and the carburettor is studded with fins to rapidly dissipate the intense cold produced by the evaporation of the petrol. We have not been in a position to prove the figures as to candle power produced and the initial cost of production; but with regard to the latter, it is important to bear in mind that a very much larger quantity of petrol gas requires to be consumed in an incandescent burner to yield the equivalent of light obtained from ordinary town's gas."

The Sub-Committee expressed the opinion that both communications were worthy of consideration by the Prize Committee.

SOUTH-EAST OF IRELAND GAS ASSOCIATION.

Quarterly Meeting at Kilkenny.

The Quarterly Meeting of the South-East of Ireland Gas Association was held in Kilkenny last Tuesday—Mr. Jer. Grant (Kilkenny) presiding over a rather smaller gathering than usual. After viewing the works and the city show-rooms, the members were entertained at luncheon by Mr. Grant, and afterwards proceeded with the business of the meeting.

A financial statement in regard to a recent testimonial presented by the members to Mr. John Richmond, late of Kilkenny, and now in South America, was submitted by the Hon. Secretary (Mr. J. F. Tyndall, of Wicklow), as well as a reply from Mr. Richmond thanking them. The fixing of the time and place of next meeting was left to the Committee, it having been the practice to hold this particular meeting just preceding or following that of the Irish Association, and in the vicinity of, or *en route* to, the place, so as to suit the convenience of members. Owing to an alteration in the constitution of the meetings, the date of the annual general meeting was under consideration; but it was unanimously decided not to change the time or the place. This meeting is held in Waterford in the autumn, and all members are eligible to attend it; the three other meetings being open only to engineers and managers of gas-works who are members of the Association.

Two items were on the *agenda* for discussion: "First Impressions and Difficulties on Taking Charge of a Small Gas-Works," by Mr. Ellacott, of Mallow; and a "Question-Box" item, "How can Coke Sales be better Stimulated among Householders?" The latter item was, by consent, postponed; and Mr. Ellacott proceeded with his paper. It proved to be of an interesting nature, and mutually beneficial to himself and his audience. The chief points of his impressions were the possibilities of using peat in place of coke, or coke and coal mixed, as fuel in producers for heating retorts; the recovery of the sulphur in spent oxide; and the old carbonization question: Are we extracting all the combustibles out of a ton of coal? His difficulties included the getting rid of water from tar, and the counteracting of reduced receipts from slot-meters.

A hearty vote of thanks was accorded to the President for his kindly entertainment of the members; and the proceedings closed.

Purifying Tar Oils.—Herr W. Feld has taken out a German patent for a process for purifying tar oils; and an abstract of the specification appears in the current number of the "Journal of the Society of Chemical Industry." When hydrogen sulphide and sulphur dioxide interact in presence of tar oils, the recovered sulphur is discoloured. This can be avoided if the tar oils are treated, either simultaneously or separately, with sulphur dioxide and hydrogen sulphide, and then distilled. The resulting oils smell of hydrogen sulphide. This is no disadvantage if they are to be used for the solution of sulphur; if they are needed for other purposes, the odour can be removed by warming, or by passing air or sulphur dioxide through the oils, or by treating them with alkalis or alkaline earths in the presence of metallic salts, or with metallic oxides or hydroxides. Instead of the treatment with sulphur dioxide and hydrogen sulphide, the oils may be treated before distillation with polysulphides or salts of thio-acids in presence of acidic compounds, such as mineral acids, carbon dioxide, phenols, &c.

Wales and Monmouthshire District Institution.—As was announced in last Tuesday's issue, the meeting of the Institution will be held to-morrow week (the 19th inst.) in the Gas and Water Offices at Barry Dock, when the chair will be taken by the President, Mr. Thomas Acland, of Llanelly. After the election of officers for the ensuing year, the members will consider the question of subscribing to the Sir George Livesey Memorial Fund. A motion will then be submitted by Mr. Edward Jones—"That the Institution affiliate with the Institution of Gas Engineers;" and if this is agreed to, a representative on the Council will be appointed. No papers will be read at the meeting; but there will be two discussions. The first, on the "Proposed Calorific Power Standard," will be opened by the President; and the second, on "Some Points of Gas-Works Economy," by Mr. J. H. Canning. After the meeting, the members will be entertained at luncheon by the Chairman of the Barry Urban District Council and the Chairman and members of the Gas and Water Committee; and subsequently they will be conducted over the gas-works by Mr. T. E. Franklin, the Manager. Members so desiring may also visit the Barry Docks and Island.

SULPHUR IN COAL AND ILLUMINATING GAS.

An American Report on the Subject.

The issue of "Progressive Age" for the 15th ult. contains a report by Mr. Arthur D. Little, of Boston (Mass.), on the subject of sulphur in coal and illuminating gas. Though, as a whole, it is of more value to gas managers in the United States than to their colleagues on this side of the Atlantic, portions of the report are of sufficient general interest to justify reproduction; and these we give below.

The amount of sulphur contained in gas is naturally a function of the percentage of sulphur in the coal from which the gas is made. The quality of coal is therefore of the utmost importance to the gas manufacturer; and when he is compelled to furnish gas containing not more than 20 grains of sulphur per 100 cubic feet, he must either buy low-sulphur coal at a premium or else use expensive methods of gas purification. Even though he does choose to pay a high price for this coal, he is not assured that he will always get it. While comparatively low-sulphur coals have been available in the past, the conditions are rapidly changing; and it will be only a question of a very few years until coal containing 1 per cent. of sulphur will be practically out of the question for the gas manufacturer.

If the gas manufacturer were the only one who asked for a low-sulphur coal, his requirements might be met; but from the limited tonnage of this coal the iron and steel industries necessarily draw part of their supply, in addition to the coal derived from property which they already control and operate. There must necessarily exist, therefore, a competition for low-sulphur coal between the steel companies and the gas manufacturers, in

which the latter are at a disadvantage; for, on account of the larger scale of operation of the steel producers, and of the tremendous importance to them of low-sulphur coal, they unquestionably have the first call on the supply. In order to comply with restrictions designed to mitigate an evil that has never been proved to exist, the gas companies abet a real one; for it has been thoroughly proved that sulphur in steel rails, bridge members, &c., constitutes a great source of danger and is a real menace to safety and life.

The raising or removing of the sulphur restriction in gas would result in a more economical purchase of gas coal, and make it possible to buy coal more on its real merits for gas manufacture than on this one impurity, which, in itself, is of little consequence. But even if all restrictions were removed, it would still be to the interest of the gas manufacturer to buy a comparatively low-sulphur coal, because of the expense of taking out the hydrogen sulphide, and the trouble arising from a clinkering coke. The latter is not due to sulphur primarily, but to the higher percentage of iron which is usually present with the sulphur.

The suitability of any coal for the manufacture of gas depends upon a number of factors, the most important of which are the quantity of volatile matter and the percentage of sulphur contained in it. The amount of the former is for the most part about 35 per cent. The manner in which the sulphur in coal may affect that found in the unpurified gas can be seen from the following table, which also indicates the composition of coals that are sometimes used in New England gas-works.

It will be seen that, in general, the high-sulphur coals have produced gas containing large amounts of sulphur. However, in other cases gases derived from two coals containing nearly the same quantity of sulphur differ widely in both the amount of sulphuretted hydrogen and sulphur compounds. This illustrates very well the uncertainties incident to the regulation of the

Source of Coal.	Chemical Composition of the Coal.					Unpurified Gas.		Illuminating Power.	Make per Retort 24 Hours; 900-1000 lbs. of Coal used with Five-Hour Charges.
	Total Sulphur.	Volatile Matter.	Mixed Carbon.	Ash.	Moisture.	Sulphuretted Hydrogen. Grains per 100 Cub. Ft.	Sulphur as Sulphur Compounds. Grains per 100 Cub. Ft.		
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.			Candles.	Cubic Feet.
Half Pardee, half Westmoreland	3'65	36'68	54'38	7'94	1'00	600	38'0	16'2	21,850
One-third Pardee, two-thirds Westmoreland	3'37	35'70	53'80	9'50	1'00	400	33'0	15'5	22,117
One-third Pardee, two-thirds Westmoreland	2'43	34'49	56'08	7'46	0'97	450	33'0	15'6	22,891
One-fourth Pardee, three-fourths Westmoreland	2'10	35'14	56'61	7'29	1'26	500	34'0	16'4	22,612
Flemington, West Virginia	2'04	35'25	56'41	6'90	1'44	610	36'6	16'0	23,630
Stafford	1'87	35'50	56'56	7'84	1'10	600	38'5	16'0	23,630
Kingmont (W. Va.), near Fairmont	1'81	36'72	55'84	6'30	1'14	420	22'0	15'9	22,603
Homonic	1'66	35'87	55'79	7'22	1'12	305	19'4	15'9	..
Farmington (W. Va.), Fairmont	1'55	34'39	57'09	7'09	1'43	485	25'6	16'8	..
Westmoreland (Irwin, Pa.)	1'51	36'60	54'08	7'94	1'38	475	24'0	15'1	21,859
Kingmont	1'39	34'19	55'57	8'82	1'42	400	25'0	15'2	23,000
Farmington	1'20	36'14	57'27	5'40	1'19	400	24'0	16'5	23,629
Farmington	1'15	35'73	55'42	7'47	1'38	390	27'0	15'8	..

amount of sulphur that occurs in gas where a large part of the control has to be effected by a proper selection of low-sulphur coal.

In a general way, about 60 per cent. of the sulphur in coal remains behind in the coke. The amount of gas per long ton of ordinary Westmoreland gas coal is about 10,750 cubic feet; so that where this coal contains 1'5 per cent. of sulphur, we have 0'6 per cent., or 13'44 lbs. of sulphur leaving the retorts from a ton of coal. A portion of this (probably over 2 lbs. to each ton of coal) goes into the tar; leaving about 11 lbs. of sulphur to pass on with the gas. This would give 720 grains per 100 cubic feet.

An idea of the manner of the introduction of sulphur into water gas, and the forms in which it occurs, is given by the following data, which are the average results of a large number of tests. The sulphur in the coke used in the water-gas generator varied from 1'09 to 1'75 per cent. The average sulphur in the uncarburetted or blue gas is: Sulphuretted hydrogen, 240 grains per 100 cubic feet; sulphur compounds, 18'2 grains. In the crude carburetted gas, the quantities are: Sulphuretted hydrogen, 204 grains; sulphur compounds, 15'8 grains. It was found that 65 per cent. of the carburetted gas consisted of blue gas, and 35 per cent. was derived from the cracking of the oils used in the carburettor.

It is calculated that 100 cubic feet of pure oil gas would contain 1'4 grains of sulphur as sulphur compounds, and 137 grains of sulphuretted hydrogen. In the crude carburetted gas, therefore, 75 per cent. of the sulphur compounds are derived from sulphur in the coke, and 25 per cent. from sulphur in the oil employed. The relatively crude petroleum used for carburetting water gas contain considerable quantities of sulphur. The sulphur in the oil used in the tests described above was 0'11 per cent. The sulphur which is given off by the oil in the form of gaseous compounds in the carburetting of water gas is largely present as sulphuretted hydrogen. Statements are common to the effect that the sulphur compounds in oil gas are negligible. This may have been true a few years ago with the better grades of gas oil; but at present these compounds may be considerable.

The manner in which the quantity of sulphur in coke affects the sulphur content of the gas is shown in the following table:—

Sulphur in Coke. Per Cent.	Grains per 100 Cubic Feet.	
	Sulphur Compounds.	Sulphuretted Hydrogen.
1'09 ..	12'5	207
1'47 ..	16'4	207
1'75 ..	20'5	234

The total sulphur present in coke can be roughly accounted for in the following way: 40 per cent. passes into the gas, 50 per cent. goes off in the blows, and 10 per cent. goes into the ash. Of the sulphur in the oil used in the carburettor, approximately, the following distribution occurs: 65 per cent. goes into the gas, 12 per cent. into the tar, and 23 per cent. into the drips.

The removal of sulphuretted hydrogen by the condensers and scrubbers depends in a large measure upon the way in which these are handled. With the use of fresh water in the scrubbers, but little of the impurity named is taken out; but if a strong ammoniacal liquor is used, much carbon dioxide and sulphuretted hydrogen can be removed. The following results (in grains per 100 cubic feet) were obtained at Springfield, where fresh well water runs into the scrubber, and a 10-oz. liquor is obtained at the outlet.

Inlet.		Outlet.	
Sulphuretted Hydrogen.	Sulphur Compounds.	Sulphuretted Hydrogen.	Sulphur Compounds.
660 ..	32'7	620 ..	32'0
615 ..	34'7	580 ..	33'6
730 ..	33'2	690 ..	32'7
590 ..	37'7	560 ..	37'2

In the rest of the report, the author deals with the purification of gas and with the difficulties attending the removal of the sulphur compounds.

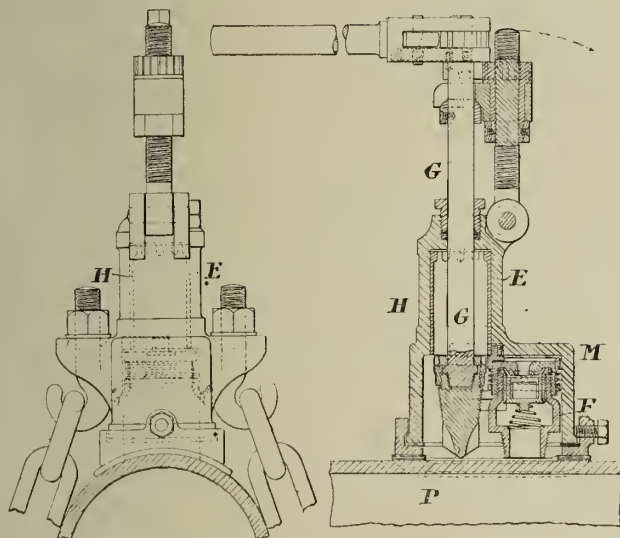
REGISTER OF PATENTS.

Connecting Service Pipes in Gas and Water Mains under Pressure.

DONNELLY, S. H., of Letchworth, Herts.

No. 10,335; May 12, 1908.

This apparatus, for drilling, tapping, and inserting connections for service-pipes in gas and water mains under pressure, is of the class in which the drilling and tapping operations are effected by a single combination tool mounted in a casing adapted to be attached in a gas or liquid tight manner to the mains; the casing also containing the union ferrule or branch connection for insertion in the tapped opening. The ferrule, supported in the casing out of the path of the drill during the drilling and tapping operations, requires to be subsequently moved over the drilled and tapped opening; and heretofore this operation has involved the use of a separate spindle and stuffing-box in the casing in addition to the drill spindle with its stuffing-box, thereby not only adding to the cost of construction, but increasing the points at which leakage might occur.



Donnelly's Main Driller and Tapper.

The apparatus, as shown, comprises an elliptical box entirely open on the base or side towards the main, to which it is clamped by bolts and chains; a saddle being interposed to suit the size of main. A cylindrical extension E is formed on the box opposite the open side, and is fitted with a stuffing-box through which the drill spindle G enters the casing. The cylindrical extension also contains a sleeve H for moving the ferrule F over the tapped opening. On the lower end of the sleeve a lug is formed, which moves in a segmental recess in the casing when the sleeve is rotated, and is pivoted to a clip arranged to fit over an adaptor cap M, which is screwed temporarily on the top of the ferrule. The adaptor caps are made of the same diameter externally, but vary internally to fit different drills and ferrules. To facilitate the movement of the ferrule, the clip is supported on straight guide-strips in the casing, arranged to engage under the lower edge of the clip.

In order to ensure the easy sliding of the clip, and to compensate for wear, the outside diameter of the clip is reduced as shown, and a gun-metal spring and loose collar are placed on the reduced part—the loose collar resting on the guide-strip. This arrangement, besides facilitating easy working, saves in fitting.

In the top of the adaptor cap, a slot or opening O is made to fit or engage the end of the drill, which is pushed into the opening. The combined drill and tap P, with its square socket to receive the end of the drill spindle, is connected to the drill spindle by a union nut engaging a collar on the spindle. The nut is provided with a left-hand thread to prevent the possibility of disengagement in working. Teeth on the union nut engage corresponding teeth in the sleeve H. When the spindle is drawn up after drilling and tapping the opening; marks on the spindle showing outside the stuffing-box when the teeth are engaged. By turning the spindle through a quarter-of-a-revolution, the sleeve, which turns with it, moves the ferrule F into position for screwing into the main.

The ferrule has a straight full-way, and is provided with a valve having a cylindrical extension or guide with openings cut in it for the passage of the gas or fluid when the valve is opened. A spring keeps the valve closed against a screwed-in seating while the joint is being made. It may either take the form shown, or be made of smaller diameter and supported by a bracket or projection inside the ferrule.

When the joint is completed, the valve is opened by the extension on the union tail-piece; a rubber ring being inserted between the tail-piece extension and the valve extension to prevent leakage while the connection is being made.

Freeing Gas from Tar or Dust and Cooling the Gas.

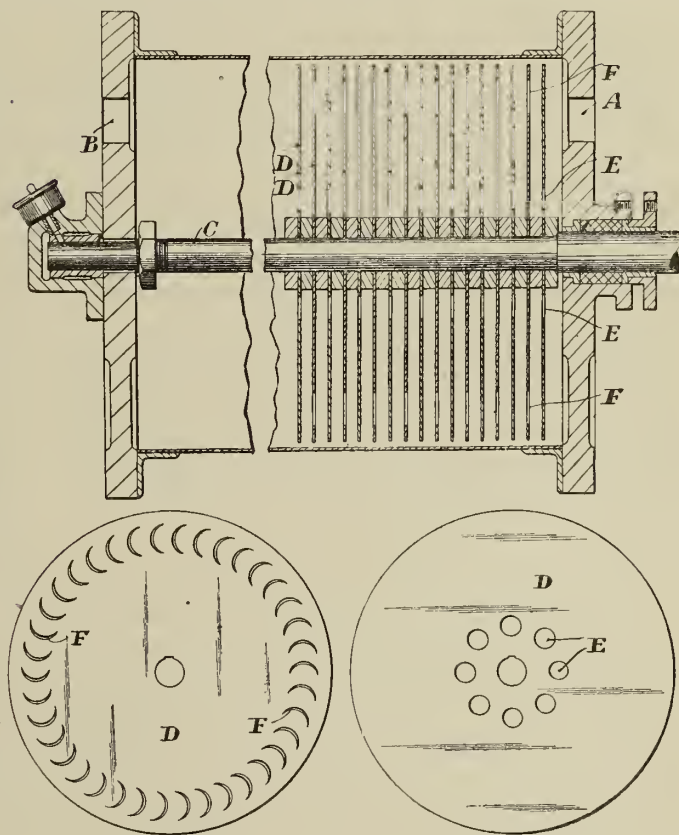
BURSTALL, F. W., of Edgbaston, Birmingham.

No. 10,901; May 20, 1908.

This invention relates to apparatus for washing and cooling gas of the kind in which a series of perforated revolvable plates or discs are arranged upon a shaft within a stationary drum or container through which the gas to be treated passes from end to end—the drum providing one large interior compartment only, and containing water which, by the centrifugal action of the plates or discs, always makes a water-

seal between the peripheries of the plates or discs and the bore of the container, demanding that the gas must in some way pass through them.

The patentee remarks that the arrangement he suggests is distinguished by the series of plates or discs being alternately pierced near the centre and near the circumference only, and not at any other parts. Thus the gas to be treated must, in passing through the plates or discs, take a circuitous course—first from near the circumference to the centre, and then from the centre to near the circumference again, and so on. This compels the gas to come into contact with a relatively large area of plate or disc surface which is between the piercings, and which is continually washed with constantly changing water. The arrangement of piercings sets up an action which compels the gas to be carried well down into the container and right through the body water, although the inlet and outlet are at the top of the container at opposite ends as ordinarily. He claims that his arrangement provides more efficient washing and cooling of the gas than any previously proposed arrangement of the kind—mainly for the reason that, without creating any back-pressure at the inlet, there is sufficient resistance of the too-free passage of the gas through the apparatus to compel it to remain in the apparatus until it is most effectually washed and cooled. He points out that an apparatus of a somewhat similar kind has been hitherto proposed in which a number of circular plates are made to rotate with the shaft, with a corresponding number of intervening plates fixed stationary with the cylinder or drum, in which case the stationary plates were pierced at the centre and the revolvable plates near the circumference—the gas having therefore to take a circuitous course in passing through the plates. But the action of the apparatus, according to the present invention, is distinctly different from the earlier apparatus, for the reason that there are no stationary plates whatever in the drum or upon the shaft, but all are revolvable plates or discs. Thus every piercing in the discs is “a movable piercing flying round at a high rate of speed, and through which the gas must make its way in passing through the apparatus to thereby give a distinctly different result in the washing and cooling operation.”



Burstall's Gas Washer and Cooler.

The illustration shows a longitudinal vertical section and two of the plates or discs separate.

The drum or water container is closed both longitudinally and transversely, except at the gas-inlet A and the gas-outlet B in the ends, and as high up as convenient. The container is cylindrical. An axial shaft C extends through the container, and has water-tight end bearings. It may be driven at any required speed, and forms a mounting for a series of flat plates or discs D, extending at distances apart side by side throughout the length of the container from inlet to outlet, and alternately pierced transversely of the plates and axially of the apparatus near the centre and near the circumference. The diameter of each plate is such as to just free it from contact with the longitudinal walls of the drum or container so that it may rotate freely. Its position is such that, when the apparatus is working, a film of water closes airtight the circumference of each plate with the walls of the casing—it being understood that the drum is, normally, a little over half-filled with water.

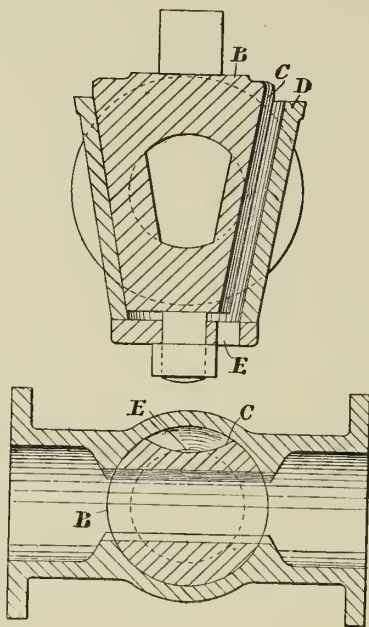
The gas on entering the apparatus flows to the centre, where the first disc is pierced, as at E, and then passes through the piercings and proceeds radially to the piercings of the next disc, which are near the circumference, as at F, and then again passes to the centre, and so on right through the whole series of discs and through the water until it reaches the outlet. During this time it becomes thoroughly washed and cooled, and leaves behind it any tar and dust in suspension, and which collects at the bottom of the drum.

Plug Cocks for Controlling the Flow of Gases.

HOLMES, P. F., and HOWELL, H., of Huddersfield.

No. 11,272; May 25, 1908.

This invention has for its object to provide access to any portion of the body of a cock or tap for cleaning or like purposes without allowing gas (or fluid) to escape.



Holmes and Howell's Plug-Cock.

The plug B is formed as shown, with openings in the sides leaving enclosed spaces open top or bottom, or both, but not communicating with the ordinary passage through the plug. Such opening or recess may be of a curved or concave form; and where only one of such openings is provided, the inside of the body of the cock on the opposite side of the plug may be rendered accessible by turning the plug to the extent of (say) half-a-revolution. The recess at C forms a passage from D to E, into or through which a brush or other cleaning device can be passed.

Gas-Generating Furnaces.

BOLZ, CHRISTIAN, of Budapest, Hungary.

No. 14,604; July 9, 1908.

A full illustrated abstract of this specification appears on p. 369.

Manufacturing Gas.

LAKE, W. E.; a communication from the INTERNATIONAL GAS DEVELOPMENT COMPANY, of Manhattan, New York.

No. 16,614; Aug. 6, 1908.

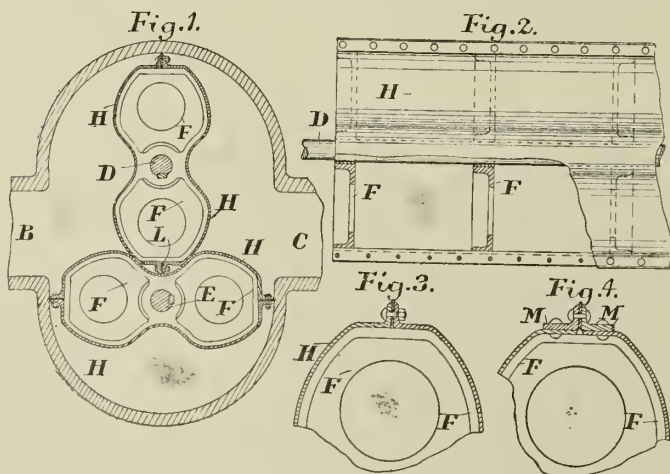
Some particulars of this invention appear elsewhere to-day, p. 372.

Rotary Exhausters.

DEMPSTER, J., and R. & J. DEMPSTER, LIMITED, of Manchester.

No. 3985; Feb. 18, 1909.

These improvements relate to rotary blowers or exhausters—such as Roots' blowers—which rotate in contact or juxtaposition with each other, within a cylinder or chamber having inlet and outlet passages for the gas to be forced through. Such apparatus has for the most part been "formed of masses of cast metal, or, where built-up revolvers have been proposed, no satisfactory provision for gas-tight jointing has been



Dempster's Rotary Exhauster.

made—sufficient space being usually left between the inner surface of the drum or chamber and the extremities of the revolvers, and between the revolvers themselves, to permit of free rotation." These spaces, the patentees point out, maintain a certain amount of communication between the inlet and outlet passages, and, as a consequence, the amount of

gas transferred during one revolution of the revolvers is less than if a tight joint were obtained, and the effect of any back-pressure further reduces the efficiency. In addition, with cast-metal revolvers, the weight of the apparatus is disproportionately great; and it is difficult to ensure a satisfactory balancing of the material on either side of the driving shaft, in each case, in order that the revolvers may rotate steadily. They therefore propose to provide means to overcome these defects.

Fig. 1 is a cross sectional view of a blower fitted with the improved revolvers. Fig. 2 is a longitudinal sectional elevation of part of one such revolver. Figs. 3 and 4 are details.

The chamber shown has an inlet passage B and an outlet passage C. The shafts D E, mounted in the sides of the casing, have secured to them revolvers constructed of a framework and outer covering, and operate in the following manner: Referring to the upper revolver, it will be seen that the shaft D has attached to it a number of diaphragms F for the reception of the outer casing H. This covering consists of rolled sheet or plate metal (by preference, pressed or otherwise formed to the contour of the diaphragms), over which the plates are mounted so as to complete the revolver. Parts of the diaphragms and covering are shown enlarged in figs. 3 and 4.

According to figs. 1 to 3, the plates H are turned up at two opposite edges, so as to present flanges; and when the halves of the covering are brought together over the diaphragms, they may be bolted or riveted together through these flanges. Between these abutting flanges are strips of leather, or other suitable packing material capable of effecting a tight joint between the revolver and the outer casing. As a modification, in lieu of turning up the edges of the plates H, the flanges may be provided by means of angle irons M (fig. 4) secured to the edges of the plates.

APPLICATIONS FOR LETTERS PATENT.

- 9819.—HELPS, G., "Gas-valves." April 26.
- 9824.—M'TAGGART, W., "Jointing of pipes and tubes." April 26.
- 9832.—POTTER, W. G., "Incandescent burners." April 26.
- 9866.—DEZENDORF, R. L., "Gas-meters." April 26.
- 9889.—COWAN, T. W., "Inverted lamps." April 26.
- 9901.—WILLIAMS, H. W., "Gas production." April 26.
- 9928.—HOWELL, W., "Coin-operated meters." April 27.
- 9933.—BRUCE, A., "Gas ironing-machines." April 27.
- 9954.—DORAN, R. L., "Gas generators and lamps." April 27.
- 9976.—KENT, W. G., and HODGSON, J. L., "Fluid meters." April 27.
- 10,000.—CHANDLER, S. & J., and HERSEY, S., "Burners and mantles." April 27.
- 10,040.—MITCHELSON, A. E., "Converting a lighting lamp into a heating apparatus without diminishing its lighting power." April 28.
- 10,062.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ, "Recording mechanism for meters." April 28.
- 10,141.—YOUNG, A., and R. LAIDLAW AND SON (EDINBURGH), LTD., "Money-boxes of prepayment meters." April 29.
- 10,177.—SUGG, W., and CO., LTD., and SUGG-WRIGHT, E., "Inverted burners." April 29.
- 10,215.—RAMASSOT, M., "Automatic temperature regulators for gas-heaters." April 29.
- 10,230.—BONE, W. A., and WHEELER, R. V., "Grates of gas-producer furnaces." April 30.
- 10,257.—MORGAN, R. T., and DISHER, R. E., "Production of gas." April 30.
- 10,262.—MARZ, J., and SMITH, A., "Gas-stoves and the like." April 30.
- 10,295.—ROBIN, J. I., "Packing of mantles." April 30.
- 10,309.—HEATON, C., "Incandescent burners." April 30.
- 10,314.—WARWICK MACHINERY COMPANY (1908), LTD., "Meters for measuring the flow of fluids." A communication from the General Electric Company, United States. April 30.
- 10,358.—RALLS, J. C., "Locking gas or other cocks." May 1.
- 10,364.—HUTCHINS, S., "Gas plants." May 1.
- 10,376.—HALL, F. H., "Mantles." May 1.
- 10,400.—BÖHM, C. R., "Incandescent bodies for gas." May 1.

RESTORATION OF LAPSED PATENT.

Notice is given that MARY PHELAN MALLOL has made application for the restoration of the patent granted to JAMES MALLOL for "Improvements in incandescent gas-burners." No. 19,776 of 1900, and hearing date Nov. 3, 1900, which expired on Nov. 3, 1908, owing to the non-payment of the prescribed renewal fee.

LEGAL INTELLIGENCE.

PROCEEDINGS IN RESPECT OF PATENTS.

We give below particulars of recent proceedings in respect of two patents for matters in which our readers are interested.

Tar for Road Spraying.

The Solicitor-General (Sir Samuel T. Evans, K.C.) has just given his decision in the matter of an opposition to the granting of a patent to Mr. William Blakeley, of the firm of Messrs. Firth Blakeley, Sons, and Co., Limited, Gas and General Engineers, of Thornhill, near Dewsbury, for an invention relating to tar-spraying machines, which are used for the purpose of preventing dust arising from the roads during the summer months, and also for their repair. The essential feature of the invention consists, as shown by the abstract of the specification given last week (p. 306), in the employment of a series of injectors for spraying the tar, by means of which it is drawn from the tank, and the intimate contact of the air with the tar as ejected forms a fine spray; the tar being expelled with sufficient force to make it penetrate into the material below the surface of the road—thus giving a lasting surface. The granting of the patent, which was taken out in

1907 (No. 4564), was opposed by Mr. Thomas Aitken, of Cupar-Fife, on the ground that Mr. Blakeley's invention had previously been covered by the opponent's prior patent (No. 26,148 of 1904). The hearing of the case before the Acting Comptroller of Patents took place last January, when the opposition was dismissed, and the patent was ordered to be sealed without any amendment of the original specification and claims. The opponent then appealed to the Law Officer; and the matter has lately been heard by the Solicitor-General. Mr. A. J. Walter, K.C., and Mr. Sinclair appeared for the appellant; Mr. H. Fletcher Moulton (instructed by Messrs. Tasker and Crossley, of Halifax) representing the respondent. The Solicitor-General dismissed the appeal with costs, and ordered the patent to be sealed, as previously directed by the Comptroller-General.

Gas-Retorts and Fire-Clay Goods.

The Comptroller-General of Patents has given his decision upon the application made by Messrs. William Hammond, Limited, manufacturers of fire-clay gas-retorts and general fire-clay goods, of Macclesfield, under section 27 of the Patents and Designs Act, 1907, for the revocation of the patent No. 4391 of 1904, on the ground that the patented process is carried on exclusively or mainly outside the United Kingdom. The patent was granted to Dr. Emil Weber, of Schwepnitz, Saxony, for "improvements in the preparation of clay for the casting of clay ware."

In the course of his decision, the Comptroller-General says: "It is admitted that what is called the 'patented process' is in use in 14 or 15 factories in Germany and Austria, two in Sweden, one in Belgium, and one in America; and that it is not in any way used or carried on in this country. It is clear therefore that the process is carried on exclusively abroad, and that there is no adequate manufacture here at all. The patentee is therefore confined to resisting the application on the ground that he can give satisfactory reasons why the process is not carried on to an adequate extent in the United Kingdom." The reasons given were that the patentee had made repeated and *bona fide* efforts to sell or license the patented process in this country; that he had treated this country fairly, and had not given any preference to Germany or other foreign countries; that the failure to work here was not due to want of effort on his part, but to the "conservatism of English manufacturers," and that he had, in fact, now entered into a *bona fide* contract giving an option to purchase the patent rights for England.

The Comptroller states that he is not wholly satisfied with the evidence adduced in support of these allegations; and that, in the circumstances, he has decided to revoke the patent—not forthwith, but on Dec. 31, 1909, unless in the meantime it is shown to his satisfaction that the patented process is carried on to an adequate extent in the United Kingdom. He adds that he thinks, from the evidence put before him, that there was a *bona fide* mistake in the way in which the patent rights were offered to purchasers in this country. In his opinion, however, the patentee is deserving of consideration, in view of the efforts he has made. Taking into account all the circumstances of the case, he did not give costs to either side.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Calorific Power of Tottenham Gas.

SIR,—I hereby enclose figures relative to the above, as promised in my letter in last Tuesday's "JOURNAL."

	Tes's at Works.			Mr. Brown's Tests (same day).	
	Illum. Power by No. 2 Metro. Burner.	Calorific Value by Junkers Calorimeter.		Illum. Power by No. 2 Metro. Burner.	Cal. Value by Junkers Calorimeter.
	Candles.	Gross.	Net.	Candles.	Net.
1st quarter, 1908 . .	15'45	550	496	15'53	488
2nd " " . .	15'80	557	504	15'28	490
3rd " " . .	16'38	541	489	15'42	487
4th " " . .	15'54	534	481	15'62	490
1st " 1909 . .	15'35	530	479	15'18	485

The tests taken at the works are average values during the whole day.

The comparative figures for the winter quarters are somewhat vitiated, as the constantly increasing output (amounting in some instances to as much as 25 per cent. in a single day) necessitates a large amount of stand-by plant, which, however carefully regulated, cannot be suddenly brought into operation without altering to some extent the quality of the gas supplied. The gross calorific values are included for the sake of comparison.

GODFREY WARBURTON, Chief Chemist.

The Laboratory, Gas-Works,
Tottenham, May 8, 1909.

The Dessau Vertical Retort Patent.

SIR,—The Dessau Vertical Retort Company have seen fit to strongly go into print again; and as you have afforded them room in your esteemed paper, I hope you will allow me to correct their misleading statements.

The Dessau patent (D.R.P., 167,367) has reference to "procedure of gas-making in vertical retorts, which are heated at a temperature above the usual in gas making—viz., 1300° to 1500°; and while evading the formation of tar separating in a downward direction, are in their free space completely filled with coal."

This is the patent claim against which I have gone, and tried to get it cancelled, because of "nothing new" in the invention.

As a matter of fact, I have been successful in proving that there is nothing new in the following three claims of the Dessau patent:—

- The filling of the entire space of the retorts.
- Evading a free space in the lowest part of same.
- Heating the retorts at 1300° to 1500°.

The Reichsgericht, however, have taken this standpoint, that the "combination" of the above three points make the patent, and that I failed to prove that the combination, as such, was known.

However, the Court proceedings have shown that the inventor in his description of the working of the patent has been entirely wrong. No weight has been attached to this fact by the Court, who took the standpoint that it was of no consequence whether the inventor had a correct imagination of proceedings, but that the only point of importance was whether his adopted ways and means showed, in the end, the desired and pretended end-effect.

Now it is clear that the value of a "combination patent" will always be doubtful. If, in a competitive design, only one of the elements of claim is not also shown to be in use, then there is no transgression of patent. I do not think, therefore, that the claimants will greatly enjoy their victory. To this may be added the fact that vertical retorts have, in the meantime, been far excelled by the chamber furnaces which are in every way more advantageous. Certain it is that my firm would, for this last reason, not now fight the Dessau patent.

In respect to the costs of this patent law suit, which are mentioned in the last "JOURNAL," there is a frivolous exaggeration apparent. Dessau, having been represented by a renowned lawyer and patent agent, must know that in patent law suits for obtaining cancellation, besides a charge of M 50 (say £2 10s.) there are no other Court charges. Both parties having arranged costs with their lawyers beforehand, the "value of object" is quite indifferent in this respect. All expenses of the suit will amount to M 4000 to M 5000 or (say) £200 to £250 all told—instead of the £5000 alleged by the Dessau Company in their communication to you.

Dortmund, May 8, 1909.

AUG. KLÖNNE,

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills presented, read the first time, and referred to the Examiners: Gas Orders Confirmation Bills (Nos. 1 and 2), relating to Bideford, Brough, Elloughton, and District, Bude, Comber, Compstall, Hayfield, Langley Mill and Heanor, Long Eaton, Settle, and Sutton and Hooton District; Gas and Water Orders Confirmation Bill, relating to Coatbridge, Llynvi Valley, Bradfield, Gravesend and Milton, and Hungerford.

Bills read a second time and committed: Mountain Ash Urban District Council Bill, Northallerton Water Bill, Swinton and Mexborough Gas Board Bill.

Bills reported, with amendments: Conway Gas Bill, Leyland and Farington Gas Bill, Littlehampton Gas Bill, Pontypool Gas and Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill presented, read the first time, and referred to the Examiners: Local Government Provisional Order (Gas) Bill, to confirm Orders relating to Ilkeston and Ynyscynhaiarn.

Bills reported with amendments: Ammanford Gas Bill; Llanelly Water Bill.

Bill read the third time and passed: Yorktown and Blackwater Gas (Electric Lighting, &c.) Bill.

The consideration of the Gaslight and Coke Company Bill, which had been deferred owing to the opposition of Mr. W. Thorne, was last Tuesday again put off till Thursday, when the objection was renewed. The Bill has now been ordered by the Chairman of Ways and Means to be considered next Thursday, at a quarter-past eight o'clock.

On Wednesday, Mr. B. S. Straus asked the Home Secretary whether his attention had been called to the remark made by the Coroner for Southwark, at the recent inquest on a child whose clothes had been set on fire by a gas-grill, that such a case was not contemplated by the framers of the Children Act; and whether he would consider the propriety of amending the law in order to secure that all fires are properly guarded. In reply, Mr. Gladstone said the Coroner had reported to him that in the case referred to the child had climbed upon a chair to reach a bag hanging on the wall over a gas-grill stove, with the result that her clothes caught fire. He added that it was impossible to provide by Act of Parliament against every source of danger. The provision in the Children Act was intended to meet the common cases of open fire-grates; but he was afraid that it would be impossible to prevent accidents in such exceptional circumstances as those in the case referred to.

New Purifiers for the Teignmouth Gas-Works.—At the meeting of the Teignmouth Urban District Council last Tuesday, the specification and general conditions for the erection of purifiers at the gas-works were approved, and the Manager (Mr. J. A. Gray) was instructed to invite tenders for carrying out the work, subject to the sanction of the Local Government Board being obtained for the necessary loan, amounting to £1200, for which it was decided to make application.

SALFORD GAS BILL.

House of Lords Committee—Monday, May 3.

(Before Lord DONOUGHMORE, Chairman, Lord MONK BRETTON, Viscount HILL, Earl MORLEY, and Lord HINDLIFF.)

The consideration of the above Bill—the opening proceedings in which were reported in the last issue of the "JOURNAL," p. 311—was resumed this morning.

Mr. BALFOUR BROWNE, K.C., the Hon. J. D. FITZGERALD, K.C., and Mr. ROE RYCROFT appeared for the promoters. The petitioners against the Bill included the Eccles Corporation, represented by Mr. RAM, K.C., and Mr. E. TYLDESLEY JONES; the Salford Board of Guardians, by Mr. MACMORRAN, K.C., and Mr. H. DAVEY; the Swinton and Pendlebury Urban District Council, by Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C.; the Barton Rural District Council, by Mr. R. S. CLEAVE; and the Worsley Urban District Council, by Mr. C. C. HUTCHINSON.

Mr. FITZGERALD intimated that he did not propose to call any further evidence on behalf of the promoters.

Mr. VESEY KNOX, on behalf of the Swinton and Pendlebury Urban District Council, called

Mr. William Cash (Messrs. Cash, Stone, and Co.), who said he had considered the Bill so far as it related to the gas undertaking, and had examined the published accounts of the Corporation for the five years ending March, 1908. He had also referred to the Board of Trade returns and "Field's Analysis." He laid before the Committee a statement showing the receipts and expenditure on the undertaking, the quantity of gas sold, and the price charged. The total number of customers in 1908 was 66,514. The outstanding loans amounted to £562,006, and the capital expenditure to £876,821. He deducted from the outstanding loans the capitalized value of the annuity fund (£63,250) because he contended that the loan had long since been paid off. If there had been no transfer from the old Corporation to the new, this amount would have been long since paid off, and there would have been a larger balance available for distribution. He estimated that, roughly speaking, the Corporation were making a profit of 12 per cent. on the gas undertaking. During the past twelve years, the amount paid in relief of the rates of Salford was £320,000. Asked if he could tell what the effect would be if the petitioners were given the powers they asked for in the Bill, witness said they were seeking to limit the profits to the amount required to pay interest on the sinking fund, with a margin of 1 per cent. His view was that the Corporation of Salford had not actually found any capital at all for the undertaking. What they had done was to pledge their credit to raise loans on the security of the gas undertaking with other contingent securities. They were not in the same position as a company. The Corporation had to manage the undertaking for the benefit of the consumers, and had to bear any loss that might accrue. They were therefore entitled to a profit over and above the capital charge in respect to the sinking fund; but inasmuch as the people outside were contributing to the sinking fund, they ought to share in the profits after the claims of Salford had been satisfied. The amount of the sinking fund was prescribed by Act of Parliament. It had to be met out of the profits of the gas undertaking. If consumers contributed to the sinking fund, they should be credited with the repayment of the loans paid off out of it. He considered that 1 per cent. of the profits was a reasonable amount to carry to the relief of the rates. The £30,000 which was last year carried to the relief of the rates ought to have gone to a reduction in the price of gas, both within and outside the borough. This would be an advantage to the consumers in Salford as well as those outside. They would share the advantage equally.

Mr. FITZGERALD: I understand you to suggest that the Corporation should make no profit at all over and above the amount required for the sinking fund. You know that this was the point raised by the outside districts in 1897?

Witness: I believe that was so.

In 1897 they said they were paying a higher rate for gas than the consumers in Salford. Swinton were paying 2d. per 1000 cubic feet more, and Worsley were paying 4d. or 5d. more—I take it from you that was so.

That raised the question whether there ought to be a limitation of profit just as you are raising it now?—I do not know that.

And thereupon a compromise was come to. It was agreed that, so far as Eccles and Swinton were concerned, they should in future be charged the same rate for gas as the consumers in Salford. As far as Worsley was concerned, they were only to be charged 2d. more than the consumers in Salford. In consideration of getting this advantage, they gave up their claim to any limitation of the profits. They have enjoyed the advantage of the abolition of the differential rate ever since?—Yes.

It represents something over £3000 a year?—It may do.

So that, while they have been getting this sum of money every year, they now propose to retain this advantage, and at the same time to deprive the Corporation of the right of making any profit at all?—No, what they are saying is that they are to-day within the area of supply of this authority, which has been set up for the benefit of the consumers in both districts.

So they were in 1897 and had been for twenty or thirty years before?—Very likely. I do not know what the Salford Corporation were doing in 1837.

Replying to further questions, witness said he was aware that differential rates for outside districts were frequently made both by companies and local authorities. In the case of the Croydon Gas Company, there was a differential rate of 4d. in Caterham. At Bournemouth, there was a differential rate for Poole. Both at Croydon and Bournemouth the differential rate was being reduced, and would gradually disappear. He had treated the annuity fund as an amount carried to the relief of the rates. It was applied in respect to a capital expenditure of £50,000, all of which has been paid off. He contended that Salford had carried to the depreciation fund more than

was required. In his opinion, £250,000 was an excessive sum for the extensions proposed under the Bill.

Re-examined by Mr. VESEY KNOX, witness said he had nothing to do with the Act of 1897. There was no discussion before any Committee, and there was no record of any agreement except what was shown on the face of the Act of Parliament.

Mr. E. H. Stevenson said he had made himself familiar with the district supplied by the Salford Corporation. So far as he was able to form an opinion, the existing works were ample; and there was no necessity for enlargement. He was not allowed to inspect the works; but so far as he could gather, no new works were wanted. Certainly he did not think it was advisable to spend £60,000 in the purchase of the proposed site. Asked what he thought about the claim of the petitioners to limit the profits of the Salford Corporation, witness said the arrangement in 1897 bore on the face of it an understanding that the people in Eccles and Swinton and those in Salford were to pay the same price for their gas. But while the letter of the law appeared to have been carried out, the spirit was not, because the amount paid to the relief of the rates of Salford equalled 6d. per 1000 feet on the gas sold in the town. Therefore, although the Salford people paid the same price, they were, in fact, getting it 6d. per 1000 feet cheaper than the people in the outside districts, because they did not have to pay so much in rates. Asked as to the extent to which, under the provisions of the Bill, the illuminating power as fixed in 1897 would be altered, witness said five candles. He thought there was a difference of two candles between the present Salford test-burner and the one proposed to be used for testing. It was admitted that this would save a good deal in the cost of manufacture. A saving would be effected by giving up the use of cannel, which cost 2s. a ton more than coal. About 40 per cent. of cannel was used at present. The coke, owing to the discontinuance of the use of cannel, would be increased in value by about 4d. a ton. It was admitted that 1500 cubic feet more gas would be made out of a ton of coal than at present. This alone meant, at the present average price, a saving of 3s. 4½d. This, with the saving on cannel and the improved price of coke, would mean a saving of 4s. 6d. per ton; and if there were 12,000 feet of gas made from a ton of coal, the saving would be 4½d. per 1000 feet. If the Committee were satisfied with the undertaking of the promoters, that the whole of the consumers should have the benefit of the reduced cost of manufacture, he thought the petitioners ought to have the right to inspect the books of the Corporation. In the event of any difference arising, the matter should be referred to an arbitrator appointed by the Local Government Board. Parliament should insert a provision to take the place of the sliding-scale—the amount to be applied to the relief of rates varying according to the price charged for gas. This would be an inducement to the Local Authority to reduce the price of gas. There were cases in which this result had been achieved by limiting, sometimes prohibiting, profit on the undertaking. When the Scotch Act of 1873 was passed, there were hardly any statutory companies in Scotland. The Act gave local authorities the right to buy up any non-statutory companies, but prohibited them using the profits in aid of the rates. In Edinburgh and Glasgow, where a reduction had been made in the illuminating power, the benefit had been given to the consumer, under similar legislation. There was also the case of Glastonbury, where the profits were limited to 1 per cent. on the capital for the time being of the gas undertaking. Under such a system as this, the consumer would be sure of getting gas at a fair price after a reasonable return was made on the undertaking. Salford could not make gas as cheaply as at present if they were confined to their own borough. As to the effect of the change in the illuminating power, he thought the consumers would be put to a good deal of expense. If they wanted the same light as they were now obtaining from a flat-flame burner, consuming 3½ feet of gas per hour, they would have to burn at least 5 feet per hour. He thought in making a change in the illuminating power, the consumers ought to be provided with new burners, as was done in the case of the London Gas Companies.

Mr. FITZGERALD: We have agreed to do so.

Witness: It is not in the Bill?

Mr. FITZGERALD: No.

Mr. VESEY KNOX: It is said that Swinton has had the advantage in recent years of having its price reduced to that of Salford?

Witness: As a matter of fact, the price at Salford is lower than at Swinton, because during the last five years, roughly speaking, £2000 a year has been taken out of Swinton for the reduction of the rates in Salford.

Mr. FITZGERALD: Is it a fact that when a reduction in candle power is given, it has been usually followed by a reduction in price?

Witness: Yes; generally speaking a reduction in price follows.

Plymouth reduced the candle power from 15 to 14, with no reduction in price?—There the price of gas is awfully low. The reduction of candle power would not really lead to a reduction in cost worth mentioning.

Replying to further questions, witness admitted that it was nearly always the ordinary practice in England, in large towns, where the corporation owned the gas undertaking, for the authority to be allowed to carry the profits to the relief of the rates. This did not, however, make it any better for the gas consumer. Parliament should do in this case what they had done in other instances where there had been a similar position—for instance, Glastonbury and Stalybridge. He considered that the Corporation of Salford were carrying too much to the relief of the rates. He did not think it was right to hide up the amount paid in rates by taking money out of gas and water undertakings. Consumers ought to get gas from the local authority at cost price.

Mr. HONORATUS LLOYD said that was all the evidence he proposed submitting on behalf of Swinton and Pendlebury. He was a little astonished to hear Mr. Balfour Browne, in opening his case, suggest that these local authorities were guilty of a breach of faith in opposing the Bill. There had been no attempt to substantiate the charge; and he hoped their Lordships would agree that it was entirely without foundation. The Corporation were in the position of a company coming to Parliament for additional capital; and this was the proper time to consider whether the conditions could not be revised for the benefit of the consumer. In 1891, the Salford Corporation came for a Provisional

Order to authorize the raising of further capital for the gas undertaking. They were at the end of their tether; and Swinton and Eccles succeeded in getting a purchase clause inserted. The following year, Swinton, in conjunction with Eccles, promoted a Bill to carry out the terms of the purchase clause. Unfortunately, the House of Commons struck out Eccles; and when the Bill came to the House of Lords, the Corporation said: "All we agreed to was not to oppose the Bill for the purchase of the whole; but as the other House cut out your partner you cannot purchase the whole, and we are entitled to oppose." Swinton lost their Bill because the first House struck out their partner, and the second House said "you cannot have your Bill because you have no partner." In 1897, the differential rate was abolished, and the standard illuminating power was fixed at 17 candles for the Swinton and Eccles district. This, Mr. Balfour Browne said, was a statutory obligation. "How dare you," he asked, "come here and complain! It is a gross breach of faith." Because in 1897 the representatives of these districts made a certain compromise with the Corporation, was it to be said that they were for ever in a position of servitude to the Salford Corporation who were to go on charging whatever price they chose up to their ridiculously inflated maximum of 5s.? The suggestion was so monstrous that he could hardly understand how it could be made. There had been no breach of faith. Every municipality which desired to carry on such a business as this must do so for the benefit of the consumer and not for the benefit of the ratepayers at the expense of their neighbours. The promoters of the Bill must elect whether they were to be treated as a company or as a municipal corporation—they could not be a corporation one moment and a company another. At the present time, the outside districts he represented were not only buying the gas-works by paying off the capital charges, but were contributing something like £2000 a year towards the rates of Salford. He asked the Committee to say that all they should be asked to pay was a fine which was sufficient to cover the cost of manufacture, to pay a fair share of the interest on the capital outstanding for the time being, and a fair share towards the sinking fund. Up to the present, they had been paying capital charges in respect of all the original capital. What he contended they were entitled to charge was $\frac{1}{2}$ per cent. interest on the sinking fund in respect of capital outstanding and 1 per cent. on the outstanding capital to cover "brains and risk." One per cent. was a perfectly fair sum to cover the risk. Where was the risk? These corporations did not step in until all the risk was over. It might be said if Swinton was not content with their position they could go out of the area. That was exactly what they could not do. When they attempted to get out, the Corporation opposed their Bill and kept them in. He did not know now whether his learned friend, Mr. Fitzgerald, would say "purchase."

Mr. FITZGERALD: Are you asking me a question?

Mr. HONORATUS LLOYD: I was wondering.

Mr. FITZGERALD: I do not know that any question arises.

Mr. HONORATUS LLOYD: If he had said "purchase," I should have known what course to take; but he does not suggest it.

Mr. FITZGERALD: It is not for me to suggest.

Mr. HONORATUS LLOYD: Then I take it my learned friend is not anxious that I should purchase that part of the undertaking?

Mr. FITZGERALD: I have no instructions at all on the point.

Mr. HONORATUS LLOYD: I think it is quite obvious that the Corporation do not desire us to purchase. With regard to the capital, I am going to ask that reasonable provision should be made that such capital as is necessary shall be raised, as and when required, with the consent of the Local Government Board.

Mr. C. C. HUTCHINSON, on behalf of Worsley District Council, then called

Mr. Isaac Carr, M Inst.C.E., the Engineer of the Widnes Corporation Gas-Works. He said the proposed reduction of the illuminating power of the Salford gas was undesirable in the interests of the consumers, more especially those who used flat-flame burners. The reduction of the power would diminish the cost of production. He agreed that the use of 40 per cent. of cannel was not the most prudent method of manufacture. There would be considerable saving by substituting ordinary coal for cannel. In his experience, there was not another gas-works in Lancashire which pursued this extravagant course in regard to the use of cannel in the same proportion. Asked as to the fairness of comparing Widnes with Salford, witness said he did not think Widnes had any special advantage over other towns in Lancashire and Yorkshire. The prices charged by Widnes, within the borough, were 1s. 2d. per 1000 cubic feet for lighting and domestic uses, and 10d. for power. The gas was obtained from Yorkshire and Lancashire coal. The quality of the gas would be 8 candles tested by the "Salford" burner. So that, in effect, it was the same gas, as regards illuminating power, as the Corporation of Salford were supplying now. He had never made any proposal to reduce the power. The Corporation of Widnes set aside a sum equal to 1½d. per 1000 cubic feet towards the relief of the rates. He had made a considerable number of experiments to test the effect of different burners; and he came to the conclusion that to substitute a No. 2 "Metropolitan" for the present "Salford" burner would operate against the consumers to the extent of 9½d. per 1000 cubic feet in regard to the flat-flame burner, 5½d. in regard to incandescent burners, and 7½d. in gas used for heating purposes.

Tuesday, May 4.

On the resumption of the proceedings to-day,

Mr. Isaac Carr continued his evidence in support of the Worsley petition.

Mr. HUTCHINSON: You told their Lordships yesterday that the proposed change in the candle power would involve a difference of 5½d. per 1000 cubic feet to consumers using incandescent mantles?

Witness: Yes; and I think that is proved by an examination of the burners sold on the market. I have here two burners almost identical in external appearance; but internally there is a very marked difference. One is the South London burner for low-grade gas. The orifice for the passage of the gas is much larger than that in the burner which is made for a higher quality of gas. This supports my contention that the high-grade burner allows the passage of a small

quantity of gas, and the low-grade burner a large quantity. I have made some careful experiments with these two burners; and I find that the one for low-power will pass 3·3 cubic feet of gas per hour, while the burner for high-grade gas will pass only about 2·3 feet.

In further examination, witness said he had examined the accounts of the Salford Corporation for the last five years, and had prepared tables which he placed before the Committee. These tables he contended showed that Worsley was paying about 5d. per 1000 cubic feet more for gas than Salford. Five years ago the total cost of gas at the burner of the consumer at Worsley was 1s. 11½d. In 1907, it was decreased to just over 1s. 10d. Accepting 5d. per 1000 feet as the difference between the cost of gas at Worsley and the cost at Salford, this did not justify a differential charge of 2d.

Mr. HUTCHINSON: Ought you not to deduct from the price of gas in Salford a sum per 1000 feet equivalent to the amount contributed to the rates?

Witness: Yes, certainly.

The total sum given in relief of rates in Salford was proved by Mr. Cash to be £29,830. Divide that by the total quantity of gas sold in Salford, it will show a diminution per 1000 cubic feet of gas sold amounting to 6·15d., which has gone to the relief of the rates. So that the actual difference between Worsley and Salford is not 2d., but a little over 8d. ?—That is so.

It is said by the promoters that Worsley has no liability in respect to loss on the works ?—I say that neither has Salford. Until the maximum price of 5s. is reached, Salford can always guard itself against loss by raising the price of gas to the locality. It is only when they are charging 5s. that there is any possibility of loss; and I should like to say that in my experience I do not know of any case in the kingdom where the ratepayers have been called upon to face any loss arising from the gas undertaking.

In reply to further questions, witness said he agreed with Mr. Stevenson as to the saving which would be made by a reduction in the candle power of the gas. Using the No. 2 "Metropolitan" burner at Salford would, he considered, reduce gas-testing to a farce.

Replying to Mr. RYECROFT, witness said that in Widnes the statutory standard was 14-candle power gas. The differential rate in Widnes did not vary from 10d. to 1s. 10d. per 1000 cubic feet. They charged 1s. 2d. in the borough. It was not a fact that they charged one district a differential rate of 1s. 11d. Their highest differential rate was 1s. 6d., the lowest 6d. The place where they charged 1s. 6d. was five miles from the works; and there the consumption was about $\frac{1}{4}$ per cent. of the total production. The entire consumption in the outside area only amounted to 6 per cent. of the total production. They laid the mains purely as a matter of speculation. They had no guarantee, as in the case of the districts around Salford. They made this differential charge because of the distance the gas had to be taken. Asked if he knew that Salford gas had to be taken as much as seven miles, witness said if they had to take it seventy miles it would not matter if they had a remunerative district.

Mr. RYECROFT: The differential price in Worsley is 2d., as against your lowest of 6d. May I take it the gas undertaking at Salford is about five times as large as Widnes?

Witness: Yes; I am not here to justify differential prices in Widnes. The last four reductions that have taken place within the borough have not been extended to the outside districts. It is a matter I personally have nothing to do with. The district where we are charging 6d. extra is very near our boundary and we are making a handsome profit.

Do you agree that Salford treats the gas consumers outside the borough better than Widnes does ?—No; there is no comparison between the two districts.

Do you set aside out of your gas profits £5255 a year for street lighting ?—We give 1d. in the pound in relief of rates; and that is given in the form of street lighting.

The Salford Corporation charge the ratepayers for street lighting whereas you make them a present of it to the extent of about £5255 per annum; so that if you were as big as Salford, it would amount to £26,000 a year ?—Yes.

Replying to further questions, witness said he regarded the reduction of the illuminating power as a great misfortune for the consumers, and he considered it was contrary to the best interests of industry. In his evidence on a parliamentary inquiry in 1900, to ascertain the fair price to be allowed to consumers for a reduction in the illuminating power in the Metropolitan area, he expressed the opinion that the value of two candles reduction to the consumer was 9d. The Company offered a reduction of 2d.; and the Committee thought 2d. was a proper amount to be allowed.

Mr. HUTCHINSON: That reduction of 2d. was imposed upon the Company by statute?

Witness: It was.

There is no such proposal here; it is to be left to the discretion of the Corporation ?—That is so.

Is there any justification for the continuance of the differential price at Worsley ?—No.

Mr. HUTCHINSON then proceeded to address the Committee on behalf of the Worsley District Council. He said they were in the same position as Swinton and Eccles, except that the consumers were charged a differential rate of 2d. He submitted there were no circumstances which justified the difference. The Corporation were in the position of a company coming for a fresh lease of life—for a further concession; and the burden fell upon them of justifying this departure from the principles of equity. The Corporation were not willing that these outside districts should go out of the area. Like the Israelites of old, they would not let the people go; they wished to keep them in bondage and servitude. It would be quite possible for these districts to obtain a supply of gas in bulk from four corporations; but Salford said "No, under no circumstances can we let you go." From an ordinary commercial point of view, he could not understand the position they had taken up. In one breath they declared they were philanthropists, supplying gas at a very small profit merely for the sake of letting them down easily, and then in the next breath they said: "Let you go! Let you supply yourselves! It would be monstrous; it would be absurd; it would be taking away our right; it would be forfeiting a valuable

privilege"—the privilege of supplying gas at cost price. (Laughter.) That was not the only question between Worsley and Salford. The differential rate for Worsley was fixed by statute at 2d.; but really the difference between Worsley and Salford was over 8d. per 1000 if they took into account the amount paid out by the gas undertaking for the relief of the Salford rates. So far as the outside districts were concerned, the Corporation were exactly in the same position as a company; and they should be brought into line with the companies. The outside districts claimed the right to be taken into partnership to some extent. The Corporation admitted that they would make a considerable saving by the change they were proposing to make, and they said to the outside districts "Oh, yes, we will give you something!" Was it right that they should be left in the position to make increased profits and allocate them between themselves and their consumers? Would this suggestion be seriously made if they came before a Parliamentary Committee as a company? Their Lordships knew it would not; and he asked for some guarantee that this pledge on the part of the Corporation would be carried out. He did not say for a moment that it would not be. But he said they were there in exactly the same position as a company; and the same sauce should be applied to the Corporation goose as would be applied to the company gander. He asked that the differential rate should be abolished, and that if these new concessions were granted to the Corporation, they should be accompanied by statutory provisions which would make the position of the outside people absolutely safe.

Mr. RAM, on behalf of the Eccles Corporation, said his case was precisely the same as that put forward by Mr. Honoratus Lloyd on behalf of Swinton and Pendlebury. They were not satisfied with the existing state of things; and they said now was the time and opportunity for revision. As to the question of a free supply of new burners, the only point he understood was as to how long the offer of the Corporation was to remain open. He submitted that two years was a proper time.

Mr. RYCROFT: We are willing to agree to two years.

Mr. CLEAVE addressed the Committee on behalf of Barton, and pointed out that although the population was only one per acre, more than 3000 persons were crowded on two sides of the main road. He asked the Committee to give Barton the same protection as they gave to Worsley and Swinton.

Mr. BALFOUR BROWNE said Mr. Hutchinson made some reference to the plagues of Egypt and likened the Corporation to the Israelites who would not let the people go. As a matter of fact, when in 1891 they secured the insertion of a purchase clause, they did not even attempt to exercise their legal powers. One local authority did bring in a Bill; but it was modified in the House of Commons and rejected in the House of Lords. Subsequently, they sought to obtain a share of the profits and do away with the differential rate. A bargain was made then that there was to be no sharing of profits; but the Corporation agreed to do away with the differential rate. The Corporation had given up to them what the Committee of the House of Commons in 1895 said they need not give up; and they went away without any share of the profits. These districts now asked their Lordships to say that this bargain was of no effect. He admitted anybody had a right to come to Parliament and ask them to break a bargain; but he thought it would be a bad day for the country if Parliament lent itself to any such nefarious practice as was attempted here. As regarded these outside districts, the Corporation stood exactly in the same position as a company. If they had been a company, they would have gone on charging profits on the whole of the capital employed. There would have been no sinking fund. The company would have taken all the risk. This was the position of the Corporation to-day. They took all the risk; they had to find the money, which had all been secured on the rates. The outside districts now wanted to be partners without sharing the risk. Even if there had been no bargain, he thought their Lordships would say this was not a fair claim. The Corporation were doing everything a consumer could reasonably expect, and he asked their Lordships not to accede to the prayers of the petitioners.

The room was then cleared; and when the parties were readmitted,

The CHAIRMAN said: The Committee desire, first of all, to say that, with reference to the word bargain which has been so much used, both in the speeches and the evidence, they are satisfied that the action taken by the opponents of the Bill is perfectly proper. They do not feel that any bargain made in 1895 or any other time has been broken by their action. The Committee are prepared to agree to the insertion of a clause providing that, in charging their consumers, the Corporation should be allowed to charge a sum which would only fall under the following heads:

Firstly, a fair price.

Secondly, interest on the sinking fund on capital for the time being outstanding.

Thirdly, a share of a proper reserve fund which we accept as $\frac{1}{2}$ per cent. per annum.

Fourthly, 1 per cent. on the capital outstanding.

The Committee agree that the same conditions should be placed upon the promoters as are placed upon public companies as to the limitation of the carry-over. And they think that the capital should be raised, as and when required, with the consent of the Local Government Board. The Committee think it would be fair to abolish differential rates in all the outside districts now before us, and that Barton should have a statutory right to the same rates as the other districts. The Committee think that a statutory obligation should be put on the Corporation to charge to the lighting fund the cost of public lighting; and, lastly, they think that a clause should be inserted stating that if at any time, through the discontinuance of the use of gas by the public, the gas undertaking of the Corporation becomes a total loss, and the outstanding capital of the undertaking should become chargeable on the rates of Salford, that charge should be shared by the ratepayers of the four outside districts now before the Committee, in proportion to their respective rateable value.

Mr. BALFOUR BROWNE said he would endeavour to draw up a clause to carry into effect their Lordships' decision.

Further consideration of the gas clauses was accordingly postponed.

Wednesday, May 5.

When the proceedings were resumed this morning,

Mr. BALFOUR BROWNE said: May I call to your Lordships' mind a matter which was decided yesterday with regard to the gas clauses of the Bill. We have considered your decision very carefully, and have come to the conclusion that if we were absolutely willing—of course, we should do it even if it were against our will—we have no power to do that which you have put upon us. First of all, the Corporation are only the creatures of the ratepayers. The ratepayers have never had any such proposal as this put before them, and we believe if it had been put before them they would have rejected the Bill. May I say for myself that, after the thorough investigation that has taken place before this Committee, I shall advise the Corporation most carefully to consider the scheme which your Lordship has suggested and put it before the ratepayers. I cannot go further than that. I cannot say that the ratepayers will allow us to come to Parliament with such a Bill; but I recommend that they should do so. If I put anything in the Bill beyond our notice, under the Standing Orders, the Bill would be rejected. There is another objection. Your Lordships have put an obligation, not only upon the ratepayers of Salford, but upon the ratepayers of Eccles and Swinton, and all the other places you say in your decision. Lastly, they think that a clause should be inserted stating that if at any time, through the discontinuance of the use of gas by the public, the gas undertaking of the Corporation becomes a total loss, and the outstanding capital of the undertaking should become chargeable on the rates of Salford, that charge should be shared by the ratepayers of the four outside districts now before the Committee in proportion to their respective rateable value. This was really in the nature of a protection to us; but I am not at all certain that it can be done, because the ratepayers of these districts have never been consulted about it.

The CHAIRMAN: But surely any action Parliament may think right to take may be taken without consulting the opinion of the ratepayers of the district.

Mr. BALFOUR BROWNE: It may be so; but I think it is impossible to put such a clause in.

The CHAIRMAN: Surely it cannot be argued that it is impossible for Parliament?

Mr. BALFOUR BROWNE: Perhaps not, if they accept it. We believe that if these proposals had been put before the ratepayers of Salford, the Bill would have been rejected; and I cannot be responsible for forcing the ratepayers of Salford to do what they would not have given power to do on their behalf. There are no means of consulting the ratepayers now; and I am sorry to say the only course open to us is to withdraw the gas part of the Bill altogether. At the same time, after this inquiry, I shall recommend the Corporation to consider the matter very carefully, and see if they cannot draw up a Bill on something like the lines your Lordship has suggested and submit it to the ratepayers of Salford.

Mr. RAM: I am not sure whether I quite apprehend what my learned friend is asking.

The CHAIRMAN: Surely; he wants to drop the whole of this part of the Bill.

Mr. RAM: Then I am going to submit it is not competent for him to do so. He cannot withdraw part of a Bill without your Lordships' permission. I may point out that this is the second time this has been done by the Corporation when they have been opposed by these districts. In 1895, when a clause was put in against their wishes, they withdrew the whole of the Bill. It may be open to them to take this course now; but I do not think it is respectful to your Lordships. It is not open to my learned friend, without your Lordships' permission, to withdraw the gas clauses of the Bill; and I ask your Lordships to say that it shall not be done.

Mr. HONORATUS LLOYD: This is not the first time this has been done. We have on several occasions had the advantage of the Corporation when they have come to Parliament. We have succeeded before, as we have succeeded now; but it seems to me the Corporation of Salford desire to take this position—they say: "We will have what we want, or we will have nothing." I ask your Lordships not to allow my learned friend to say: "I will take this or that from my Bill and I will leave the rest."

The room was cleared; and when the parties were re-admitted,

The CHAIRMAN said: The Committee are not prepared at this stage to consent to the striking of the gas clauses out of the Bill.

Mr. RAM asked whether a clause had been drawn embodying the decision of the Committee.

Mr. BALFOUR BROWNE said he would endeavour to draw a clause to carry out their Lordships' decision; but he would not say that the Bill would not be rejected under the Standing Orders in the other House.

The CHAIRMAN: That is no concern of ours. I may point out that if these clauses are to be struck out, it can be done at a later stage, when we come to consider the clauses.

Mr. BALFOUR BROWNE undertook to produce a clause embodying the decision of the Committee on Thursday morning.

Thursday, May 6.

When the Committee sat this morning,

Mr. BALFOUR BROWNE said he had endeavoured to draft a clause to carry out their Lordships' decision; but he understood Mr. Vesey Knox desired to propose some amendments, and it might save time if the Committee allowed the matter to stand over until the afternoon.

The Committee assented; and later in the day

Mr. VESEY KNOX submitted his amendments to the promoters' clause. He proposed that the new conditions should come into operation on Sept. 29, 1909, instead of March 31, 1910, as proposed by the promoters.

Mr. RYCROFT pointed out that March 31 was the end of the Corporation's financial year; and the Committee agreed that the change should take effect from that date.

The new clauses were accepted by the Committee in the following form:

REGULATION OF THE PRICE OF GAS.

Notwithstanding anything contained in former Acts of the Corporation,

as and from the 31st day of March, 1910, all moneys received by the Corporation by way of revenue from the gas undertaking in each year shall be applied in the following manner and for the following purposes:

Firstly: In payment of the working and establishment expenses and cost of maintenance, renewal, and repair of the gas undertaking of the Corporation.

Secondly: In payment of the interest on the moneys borrowed or reborrowed for the purposes of such undertaking.

Thirdly: In providing the requisite appropriations, instalments, or sinking fund payments in respect of any moneys borrowed or reborrowed for the purposes of such undertaking.

Fourthly: In repayment to the district fund of any deficiency in the revenue of the Corporation in respect of the gas undertaking at any time hereafter made good out of that fund.

Fifthly: In providing, if the Corporation think fit, a reserve fund, by setting apart a yearly sum, not exceeding 10s. per cent. upon so much as is outstanding for the time being of the moneys borrowed or reborrowed for the purposes of such undertaking, and investing the same, and the resulting income thereof, in statutory securities, and accumulating the same at compound interest until such fund amounts to a sum equal to 10 per cent. of the moneys so outstanding, and whenever the said fund amounts to that sum the income therefrom shall be applied in the same manner as moneys received by the Corporation by way of revenue in respect of the said undertaking. Provided that if and whenever the said reserve fund shall fall below the said last-mentioned sum, the Corporation may set apart such yearly sum as aforesaid until the said reserve fund shall again amount to such last-mentioned sum.

Sixthly: In setting apart a yearly sum equal to £1 per cent. upon the amount of moneys borrowed or reborrowed in respect of the undertaking and for the time being outstanding, after deducting all sums repaid and all sums standing to the credit of any sinking fund, which sum shall be carried to the credit of the district fund of the borough. The residue of any such moneys shall be carried forward to the revenue account of such undertaking for the next succeeding year and shall whenever, and so soon as, the amount so carried over exceeds the sum required to meet the purposes secondly, thirdly, and sixthly above mentioned for one year, be applied to the reduction of the price of gas supplied by the Corporation.

Any deficiency on such undertaking in any year shall be made good in the first instance out of the reserve fund (if any) set apart in connection with such undertaking; and if there be no such reserve fund, or if any such reserve fund shall be insufficient for the purpose, then out of the district fund of the borough. But in each such case any deficiency shall be a debt due from, and shall be repaid to, the district fund or the reserve fund, as the case may be, out of any future revenue of the said undertaking.

As from March 31, 1910, any then existing depreciation fund or reserve fund of the Corporation in connection with the said undertaking shall be deemed to form part of the reserve fund which the Corporation are by this section authorized to form.

Any disputes as to the amount of moneys borrowed or reborrowed in respect of the undertaking and for the time being outstanding, after deducting all sums repaid and all sums standing to the credit of any sinking fund, shall be settled by the Local Government Board.

ABOLITION OF DIFFERENTIAL RATE.

As from March 31, 1910, the Corporation shall charge a not greater price, rent, or rate for gas supplied by them to consumers of gas, as for the purposes of public lighting within the Urban District of Worsley and the Rural District of Barton-upon-Irwell than that which they charge in respect of gas supplied by them to consumers of gas in similar circumstances or credit for the supply of gas for the purpose of public lighting within the Borough.

SUPPLY OF GAS FOR PUBLIC LIGHTING.

The Corporation shall in each year credit the revenue account of the gas undertaking with an amount for the gas consumed for public purposes calculated at the rates charged to private consumers, which amount shall be a charge upon the rates leviable for public lighting.

REPAYMENT OF LOSS BY OUTSIDE AUTHORITIES.

If at any time hereafter through discontinuance of the use of gas by the public the gas undertaking becomes a total loss and the outstanding capital of the undertaking should thus become chargeable upon the rates of the Borough, the Corporation of Eccles, the Urban District Council of Swinton and Pendlebury, the Urban District Council of Worsley, and the Rural District Council of Barton-upon-Irwell shall respectively repay to the Corporation the proportion of the moneys so chargeable which the rateable value of the borough of Eccles, the urban district of Swinton and Pendlebury, the urban district of Worsley, and the townships of Clifton and Barton Moss and that portion of the township of Davyhulme in the rural district of Barton-upon-Irwell supplied with gas by the Corporation bears to the total rateable value of the borough and of the borough of Eccles and the said urban districts and portion of rural district. Provided that any payments to be made by the said Rural District Council of Barton-upon-Irwell shall be deemed to be special expenses, and for that purpose those portions of such rural district described in this section shall be deemed to be contributory places within the meaning of section 229 of the Public Health Act, 1875.

The other clauses were adjusted, and the Bill, as amended, was ordered to be reported to the House for third reading.

Personating a Gas Inspector.

At the Westminster Police Court, on Monday last week, charges of housebreaking and robberies from automatic gas-meters were brought against George Attwell, a young man, stated to have personated an inspector of the Gaslight and Coke Company. Mr. George Seavor, Solicitor for the prosecution, said the prisoner, wearing a cap with the Company's official badge on it, had perpetrated a number of audacious robberies. Evidence was given by residents in Lumley Buildings and Coleshill Buildings, Pimlico, that the prisoner called on them, stating that he came to examine and collect the money from prepayment gas-meters. Remarking that he had lost his keys, he in several instances forced the meters and took the contents. A number of the witnesses deposed that prisoner produced a book with the name of the Company upon it, and that receipts for the money taken were promised in due course. In the housebreaking cases, testimony was given that prisoner, having ascertained that people were away from their flats, called and posed as an official of the Company. In the absence of the occupiers, the flats were broken into and ransacked. When arrested, the prisoner was wearing clothing identified as stolen. Detective Steel said that accused was brought up in a reformatory, and had since been sentenced for bicycle theft. Prisoner pleaded guilty to the charges, and was committed for trial.

HARROGATE GAS BILL.

The Unopposed Bills Committee of the House of Commons, consisting of Mr. Alfred Emmott (Chairman), Mr. Cladwell, Mr. Phipson Beale, K.C., Mr. Hill, and Mr. Moon, K.C. (Speaker's Counsel), last Thursday, considered the Harrogate Gas Company's Bill.

The CHAIRMAN complained that the Committee had only then received the report of the Home Office on the Bill, which might lead to one of the clauses being omitted; but the matter would have to be further considered and the decision of the Committee would be given at their next sitting. For the time being, they would hear the evidence, which would obviate the witnesses having to be called again.

Mr. BROWN, on behalf of the Agents for the Bill, stated that it was proposed to supply suction gas plant; and, according to the Home Office report, they would have to come under the ordinary regulations. He, therefore, asked the Committee to qualify the clause relating to this matter by inserting provisions with respect to the quality of power gas similar to those contained in the Truro Gas Act of 1906. The main object of the Bill was to confirm the construction of a private railway siding to connect the Company's works with the North-Eastern Railway. The siding was about two miles in length, and had been constructed so as to avoid annoyance to the public in regard to the traffic on the roads. The other powers were of quite a minor character. The Company proposed to extend the area of supply by including certain parishes in the direction of Ripley, where there was at present no supply, and where gas was urgently needed.

The Chairman of the Company (called as a witness) told the Committee that they were not asking for any further capital. The present standard price was 5s. 6d.; but the price they were now charging was 2s. 8d. gross. The amount of the difference between the actual and the standard rate enabled them to pay 7 per cent. over the standard rates of dividend. They had paid 7 per cent. dividend on the capital; and this had given a high value to the Company's stock. The amount of premium capital was £51,380—very nearly a third of their whole capital was premium capital. If their sliding-scale were altered, it would interfere enormously with the capital value of the stock. They had done all they could to exploit their capital to the best advantage. Had the standard price been lower, they would not have got such a fine price on the issue of their stock, and there would have been less premium capital. From the point of view of the consumer, it did not really matter so long as he could get his gas as low as 2s. 8d. per 1000 cubic feet.

The preamble of the Bill having been formally proved, the Committee postponed their decision till their next meeting, when the matters raised on the Home Office report will be considered.

AMMANFORD GAS BILL.

Before the same Unopposed Bills Committee as dealt with the Harrogate Gas Bill, the above-named measure was considered.

Mr. BAKER, the Agent for the Bill, explained to the Committee that they proposed to incorporate a Company for the purpose of supplying with gas a district in South Wales which was growing very rapidly in population, and was likely to still further increase. Originally, two Bills were promoted—one by the Amman Valley Company, a Company who had constructed certain gas-works in the district, and the other the Ammanford Bill, which was promoted for the purpose of purchasing the undertaking of the Amman Valley Company. The Amman Company had been formed as a Limited Liability Company, without any statutory powers. It had a very inflated capital, and was promoted under somewhat discreditable circumstances. It fell foul of the Local Authority, with the result that when it endeavoured to break up the streets, the Local Authority intervened, and the undertaking thus became derelict. The Company then promoted a Bill to obtain statutory powers; but owing to circumstances at which he had hinted, the Company were not in a position to go on. Their Bill was withdrawn, and the Bill of the Ammanford Company proceeded, under which the undertaking of the Amman Valley Company was to be taken over upon arbitration terms. The works were now more or less complete; and very little money was required to put them into working order. Some of the houses were already actually fitted for taking a supply of gas. The proposal in the Bill originally was to take over the capital of the Amman Valley Company, or such of it as had been *bona fide* subscribed. But this was objected to by the officials of both Houses of Parliament. An arbitration price for the undertaking would now have to be determined; it would be paid to the Amman Valley Company; and they would have to satisfy their own creditors. The Ammanford Company had agreed with the Urban District Council on two points—one being that they should have nothing whatever to do with the Amman Valley Company, and the second that they were financially able to carry on their undertaking. The District Council had, therefore, withdrawn the petition which they had lodged against the Bill, and were now supporting it.

Mr. E. Herbert Stevenson said he had inspected the gas-works of the Amman Valley Company, and found them satisfactory. They had altered the price to be charged for gas from a standard price to a maximum price. When they found what they would be able to do, and came to Parliament again, a proper standard price would be fixed. They now proposed a maximum price of 4s. 3d. per 1000 cubic feet, with which the Local Authority was perfectly satisfied. He himself thought it was perfectly reasonable, having regard to the district to which it applied. The power to borrow asked for in the Bill was altered to one-third of the share capital. With regard to the Amman Valley Company, he said that most of the money had gone into the pockets of the promoters, and the subscribers for shares would only get a fraction back after the arbitration. There were a few debts which were, he believed, secured on debentures; but he did not think the shareholders would ever get a penny of their money.

The preamble of the Bill having been proved, it was ordered to be reported to the House.

ALLIANCE AND DUBLIN CONSUMERS' GAS BILL.

House of Lords Committee.—May 4.

(Before Lord LUDLOW, Chairman, Viscount DE VESCI, the Earl of LIVERPOOL, the Earl of HARDWICKE, and Lord SAYE AND SELE.)

This is a Bill to authorize the Alliance and Dublin Consumers' Gas Company to raise further capital.

The Hon. J. D. FITZGERALD, K.C., Mr. HONORATUS LLOYD, K.C., Mr. JAMES O'CONNOR, and Mr. PADDON appeared for the promoters. The petitioners in opposition were represented as follows: Corporation of Dublin, by Mr. BALFOUR BROWNE, K.C., Mr. MACINERNEY, K.C., and Mr. HUTCHINSON; the County Council of Dublin, by Mr. VESEY KNOX, K.C., and Mr. T. SULLIVAN; the Dublin Port and Docks Board (against alterations), by Mr. PEMROKE STEPHENS, K.C.

Mr. FITZGERALD, in opening, said the Bill was promoted by the Alliance and Dublin Consumers' Gas Company, who supplied Dublin and a very large adjoining district, with the object of obtaining further money powers (the existing capital being nearly all spent), and of consolidating and converting their capital into one uniform stock. In addition, the Company sought power to erect a coal-conveyor, to extend their district to Greystones (a rising watering place in Wicklow), to reduce the illuminating power of their gas, and to adopt the most improved modern method of testing. The Alliance Gas Company were incorporated in 1847; and in 1866, they were amalgamated, with the other Companies who supplied Dublin, under the title of the Alliance and Dublin Consumers' Gas Company. In the centre of the district of supply was the City of Dublin. The district was irregular in shape, being about 14 miles in length; while the area proposed to be served by the present Bill would add four or five miles more. In 1883, the Company applied to Parliament for further capital powers. Until then the Company was a maximum-price concern; the maximum price being 5s. The Corporation of Dublin opposed the Bill, and asked, among other things, that the sliding-scale arrangement should be imposed. An agreement was then arrived at, under which the sliding-scale was adopted—the standard price being 4s. 1d. The Company at that time were entitled to pay back-dividends to the extent of £187,000; and as part of the settlement they gave up this valuable right. They had from time to time reduced the price of gas, and had treated their consumers very well, because they had never paid the full dividend to which the sliding-scale entitled them. The original capital of the Company was £590,000, bearing 10 per cent. interest. Besides this, £50,000 was raised under the Act of 1874, and £286,000 under the Act of 1883—the two latter amounts bearing 7 per cent. interest. The Company had also borrowed, in three sums at 4 per cent., £310,000; making the total share and loan capital issued £1,236,000. They still had unexhausted borrowing powers amounting to £64,000. Dublin and the neighbourhood was a residential city. There were no great manufacturers, and very few big consumers of gas. The large outside area was not thickly populated. Thus the Company had a smaller number of consumers and a smaller consumption of gas per mile of main laid than in most big places. There were a very large number of working people in the area; and the Company had been eminently successful in their efforts to supply them with gas through automatic meters—over 33,000 consumers having already been supplied in that way. There were at least as many more persons in the area who might be supplied in the same manner; and the Company hoped to secure the greater number of them. This however would involve very considerable capital outlay. Another special object for which capital would be required was the coal conveyor. At present, the coal arrived by sea at Sir John Rogerson's wharf, whence it was conveyed to the works by a horse tramway. It was now proposed to provide a conveyor, to be worked by electricity, which would take the coal direct from the wharf to the works. The expenditure would not be very great, but substantial economy and great convenience would result. The coal would be transported at a suitable elevation so as not to interfere with the business of the quay; and the work, except that actually at the Company's premises, would be carried out at the Company's expense by the Dublin Port and Docks Board—the Port Authority. A certain portion of the works stood on leasehold land. It was desirable, however, that the works should stand on land the freehold of which was possessed by the Company. Power therefore was sought to purchase the reversions in every case. No objection had been raised to this proposal by the owner of any reversion except the Corporation of Dublin. The Corporation had a reversionary interest in a lease which had about 900 years to run; but they objected to anything being done with the reversion without their consent. The Company had no desire to raise any unnecessary controversy; and they were prepared therefore to provide that the reversion of the Corporation should not be purchased without their consent. More capital was also required for the ordinary business of the Company, and for the supply of the proposed new area. Power was therefore sought to raise £360,000 in ordinary share capital and £120,000 by means of loans. This capital, totalling £480,000, would carry the Company on for about 15 years. As in the case of all capital raised since 1883, these sums would be issued under the auction clauses. With regard to the proposed conversion of capital, it was desirable to have only one class of shares. It was intended, therefore, to convert the existing capital into such an amount of 5 per cent. stock as would yield exactly the same dividend as at present. No further liability would be placed on the consumer, because the amount which the Company could divide as profit would be exactly the same as if the conversion had not taken place. Experience proved that a better price was paid for new stock when issued at 5 per cent. instead of 7 or 10 per cent. Originally it was proposed to include in the district of supply a considerable area in the County of Dublin. This area was sparsely populated, and not likely to be profitable; and it embraced certain places where the Company thought a supply would be a convenience, and would assist in the development of the locality. The County Council of Dublin, however, objected. The Company had, therefore, withdrawn this proposal, and now wished to include only a very small portion of the county area. The illuminating power of the gas supplied was 16 candles; and authority was sought to reduce it to 14 candles, by

means of which, when consumed through an incandescent burner, all the light required could be obtained. All the London Gas Companies had, with the consent of Parliament, reduced their candle power to 14; and their example had been followed generally throughout the country. In the last four or five years a large number of companies and local authorities had applied to Parliament with the same purpose; and in no case, so far as Counsel knew, had the application been refused. It was obvious that if they could get by the supply of 14-candle gas as good an article for practical purposes as by the supply of 16-candle gas, the extra cost of making the higher quality was mere waste. At the same time the Company proposed to adopt the most approved modern form of testing; and for this purpose they had incorporated the Model Clause. Every diminution in the cost of manufacture inured eventually to the benefit of the consumer; but in many of the cases which had come before Parliament, it had been thought—especially where the company was working under a sliding-scale—that the consumer should get an immediate advantage by means of a reduction in the standard price. There were precedents both ways. In a number of cases Parliament had reduced the illuminating power and made no reduction in price, as for instance, in the case of Rotherham and Tottenham and Edmonton. In the case of the three London Companies, however, the adoption of the new method of testing was followed by a reduction in the standard price. This really was the point the Corporation of Dublin desired to raise in connection with the proposal. The new method of testing, as a matter of fact, meant a reduction in the candle power. The gas manufactured by the Dublin Company was tested at present in an antiquated way; and therefore they had to produce gas which, if tested in the best manner, would be shown to be really 20-candle power or thereabouts. In this way it might be said that the proposed reduction was a reduction of 6 candles. In London, the same state of things had prevailed. The nominal reduction in London was 2 candles; but so-called 16-candle gas, as tested in London, was equivalent to 18-candle gas tested by the new burner. The burner used in Dublin was more antiquated than that which used to be employed in London. After considerable controversy, the reduction in the standard price in London was fixed at about 3d. per candle. It was calculated in the present case that the reduction in the cost would be 2½d. per 1000 cubic feet; and for the sake of peace, and to effect a friendly settlement with the Corporation of Dublin (who had not always been friendly to the Company in these matters) the Company were willing to put the figure at 3d., and to say that the standard price in Dublin might be reduced by 3d. in consideration of the reduction in the illuminating power. If this offer were not accepted, the Committee would be asked to consider the matter on its merits. Turning to the petitions, Counsel said the Dublin Corporation had a large electrical undertaking on which they had spent a considerable sum of money. They were supplying electricity throughout the city in competition with the Gas Company, and were thus in the position of rival traders. He desired to eliminate from the case anything in the nature of acrimony; and though the Company's relations with the Corporation had not always been without friction, he had no desire to allude to past history at all. The Company had had a good deal of litigation with the Corporation, and had always been successful. The Corporation in their petition complained that the Company were charging more in the outside districts than in the city itself. The simple reason for this was that the further a place was from the works, the more expensive it was to give a supply. Moreover, when the Bill for the extension of the City of Dublin, so as to include these outside areas, was before Parliament, the Corporation got a clause inserted providing that nothing in the Bill should interfere with the existing rights of the Company; and by means of this clause they avoided the opposition of the Company. Subsequently, however, representatives of the three townships affected—viz., Clontarf, Drumcondra, and Kilmainham—appeared before the Committee who considered the Bill and urged that, if incorporated in the City of Dublin, they should be charged the same price for gas as the City. The Committee, however, decided that the position of the Company was not altered by the extension of boundaries, and that the prices of gas also should not be altered. The matter having been settled in this way, it should not be re-opened now, and certainly not by the Corporation, who had inserted the clause preserving the rights of the Company. The Corporation also asked for a reduction in the standard price. It was to be remembered, however, that the whole of the capital under one Act had been issued on the basis of the standard price being maintained, and the figure at which it stood was part of an arrangement arrived at when it was fixed. The Corporation also objected to a number of other provisions which the Company desired to put in the Bill. Almost all of these provisions, however, were in model form, and Counsel therefore did not think the objection of the Corporation to them was serious. The County Council of Dublin, in their petition, asked for more stringent powers in regard to the laying of mains. The Company worked under the Gas-Works Clauses Act, which provided that if they desired to break open a street, they must give notice to the road authority, and that the road authority's representative was entitled to attend and see that the work was done properly. If the representative objected to the mode of work proposed, and he and the Company could not come to an agreement, the matter, the Act provided, must be settled by a Court of Summary Jurisdiction. Till 1899, the road authority in Dublin was the Grand Jury; and with that body the Company had the most amicable relations. In 1899, however, the Grand Jury was superseded by the County Council, whose Surveyor thought he had a right to prescribe the depths at which mains should be laid, and every particular connected with the work. The matter was taken before the Court of Summary Jurisdiction—in this case, a Stipendiary Magistrate—with the result that the County Surveyor was defeated. Apparently, the position of the County Council was that, having been defeated before every tribunal to which they had gone in case of dispute, they wished the present Committee to over-ride the general law of the country and say that the Alliance Company should be put under a special law. The County Council also objected to the Company supplying gas which was mixed with water gas. The County Council gave no reason for their objection; and he did not know on what ground they could take exception to it.

Mr. Francis T. Cotton, the Secretary and Manager of the Alliance and Consumers' Gas Company, examined by Mr. HONORATUS LLOYD,

said they had gas-works in Dublin, Kingstown, and Bray. He gave evidence in support of Counsel's opening statement. All their capital powers except as to £64,000 had been exercised. Between May, 1899, and June, 1908, £170,000 was spent on automatic installations; the Company now having 33,600 slot consumers. The average monthly slot installations numbered about 350; and the demand was still continuing. The Company's ordinary consumers numbered nearly 19,000. The actual selling price in the City was 3s. 7d. The number of consumers per mile of main was 78, compared with 258 in the case of the London Companies, 206 in Leicester, 211 in Edinburgh, and 590 in Glasgow. Thus the consumption per mile of main was very low. As regarded cost of working and production, Dublin was badly situated; all the materials being sea borne. Still the Company had always endeavoured to keep the price of gas low—in fact they had not given the shareholders the dividend to which, under the sliding-scale, they were entitled. Had they exercised their rights, they could have paid the shareholders £200,000 more. Additional capital was required, especially to meet the demand for automatic installations. Power was therefore sought to raise £360,000 in shares and £120,000 by loans. For slot installations, £150,000 was needed. These installations meant a considerable increase in the demand for gas; and it was estimated therefore that £180,000 would be required for additional works. For lands, £46,000 was allocated. As the consumption was increasing the mains became too small, with the result that consumers in outlying districts did not get sufficient pressure. It was necessary, therefore, not only to provide additional mains, but to enlarge some of those now existing. The figure for this purpose was £60,000. Thus there would be £44,000 for contingencies.

Cross-examined by Mr. MACINERNEY: In Dublin the number of persons using incandescent burners was high. He was not aware that half the public lamps were not using, and could not use, such burners. The consumption of gas did not increase last year, and the dividend of the Company had lately been reduced. There was an increase in the slot consumption last year. In 1908, the Company took £16,000 from the reserve fund to make up the dividends of 10 and 7 per cent. There was a deficit in the earnings that year. The reason was that the price of coal went up considerably in 1907 and during a portion of 1908; and in the latter year, there was a decrease in consumption, due partly to bad trade, partly to competition, and partly to the introduction of incandescent burners. The last contract price for coal was 15s. 6d.; and the residuals were worth 5s. The reduction in the price of gas suggested in connection with the alteration in quality would affect not the price now charged (3s. 7d.), but the standard price of 4s. 1d. The consumers would gain nothing directly on a reduction of the standard price at the present time. If the cost of the gas was reduced, the price to the consumer would be reduced. The 3s. 7d. would be reduced when they were able to do it. A reduction in the standard price must have a good influence for the consumer, because it prohibited the Company from paying as high a dividend as they might do on the present standard price. The price of gas was 2s. 6d. in Belfast; but the conditions of Dublin and Belfast could hardly be more different. Belfast was a densely populated small district with a very low mileage of main; Dublin was sparsely populated. It was one of the largest gas districts in the world, with an enormous mileage of main. Belfast was a commercial town; Dublin was not. Belfast, moreover, could buy coal, and he thought all materials, at a lower rate than Dublin could. The Company refused to allow the Corporation's engineers to inspect their gas-works for the purpose of giving evidence before the Committee. The Company sent a letter to the Corporation stating that as the engineers were to be sent purely for the purpose of opposition to the Bill, and having regard to the relations which had existed between the Corporation and the Company for a great many years, they (the Company) could not consent to any engineer examining the works; but they would give them any information to which they thought they were entitled.

In cross-examination by Mr. SULLIVAN, witness said the consumption of the Company's gas in the portion of their district which was controlled by the Dublin County Council was 22 million cubic feet per annum.

Mr. H. E. Jones, in reply to Mr. FITZGERALD, said he had advised the Dublin Company for a number of years. When the three Companies supplying in Dublin were amalgamated in 1866, there were three separate works, and a great ramification of mains; the result being that the mains of the United Company were more than double those of any gas company with which he was acquainted. The capital in the concern was therefore necessarily large. Belfast, with 457 miles of mains, sold 1820 million cubic feet; whereas Dublin, with 639 miles of mains, sold 1450 millions. The capital of the Belfast undertaking was only £500,000; that of the Dublin Company, £1,163,000. Belfast had nearly 63,000 consumers and 11,000 public lamps; Dublin had 46,600 consumers and 6300 lamps. There was similar disparity between the Dublin figures and those of the leading English towns. The leakage in Dublin was 9½ per cent., against 6½ per cent. in the average of gas companies. This was due to the extra mileage of mains. The distribution charges—supervision, inspection, repairs, and so forth—were also larger in Dublin. Owing to special legislation, there were left now only about two gas companies in Great Britain and Ireland whose gas was tested by the kind of flat-flame burner in use in Dublin. The result of the enactment that the Dublin gas should be of 16-candle power when used in this burner was that the expenses of the Company had been unduly raised. The Company had been making a kind of fancy article which was not only expensive to them by very nearly 3d. per 1000 cubic feet of gas sold more than it might be, but was unsuitable for the burner now in use, for the incandescent burner and especially for heating apparatus. The Company were supplying a quality of gas which the consumer did not want, and which was unduly expensive to manufacture. Both the Company and the consumer would be much better off with the 14-candle standard. This was generally recognized now throughout the country. Fourteen candle gas was especially desirable when a supply through slot meters was being given. The Company had already obtained 33,000 slot consumers; and he expected they would get quite as many more. This would involve very considerable capital expenditure. An installation of this kind, including a cooking-stove, cost about £5, to cover which

the consumer paid about 10d. per 1000 cubic feet extra. Nearly half the population of Dublin was at present unsupplied. If they came in, as they certainly would, about £150,000 would have to be spent in the houses of the people. They would consume about 450 million cubic feet of gas per annum, which, at the low rate of £500 per million, would involve £225,000. The purchase of the reversion was estimated to cost £46,000, which, with (say) £50,000 for contingencies, costs of the Act of Parliament, arterial mains, and other expenses, would make the total £471,000, or only £9000 short of the sum asked for. The burner which was proposed, the Model Bill burner, had been approved by the Board of Trade, and was generally adopted by companies coming to Parliament. It was one result of the Committee of which Lord Rayleigh was Chairman. The Company had not paid within 2 per cent. of the dividend which they might have paid under the sliding-scale. If the change proposed were made, he would advise a reduction of 3d. in the standard price. It was not the fact that reduction of the illuminating power caused increased consumption by the householder. The Commercial Gas Company reduced their gas from 16 to 14 candle power in 1902; and in 1903 the increase in the sale of gas as compared with the previous year was only 4 per cent.—the average annual increase of the previous eight years having been about 4½ per cent. Similar, and in some cases even more marked, results of this kind followed when reductions in illuminating power were carried out by the South Metropolitan Gas Company, the Gaslight and Coke Company, and the Glasgow Corporation.

In cross-examination by Mr. MACINERNEY, witness said the main difference in the conditions of Belfast and Dublin related to the mileage, the leakage, and the capital. This was sufficient to account for the difference in price. The average price in Belfast was 2s. 3d., and in Dublin 3s. 7d. The Belfast Corporation had had the gas undertaking in their hands for many years; and they had written-down compulsorily under an Act of Parliament a great deal of their capital. In addition, they carried some £40,000 a year to the reduction of rates. As soon as the reduction from 16 to 14 candle power was made, the Dublin Company would save 3d. per 1000 cubic feet; and this would go to the consumer. He thought the Dublin people would expect to pay 3s. 4d. for gas of reduced candle power.

Re-examined by Mr. FITZGERALD: In Belfast, the consumption was 4 million cubic feet per mile of main; in Dublin, 2,309,000 feet. In Belfast, the consumers per mile were 137; in Dublin, 78. In these circumstances he would expect the price of gas in Belfast to be much lower than in Dublin. Moreover, the Belfast Corporation had been gradually paying off the capital of the gas concern—only £300,000 now outstanding; whereas the Dublin Company had to pay dividend on the whole of their capital. The Dublin Company had been very carefully managed. A more capable gas administrator than Mr. Cotton did not exist in the United Kingdom. When the amalgamation of the Dublin Companies took place, no dividend was being paid. Mr. Cotton had carved the present success out of that position of affairs.

Mr. W. R. Herring, the Chief Engineer of the Edinburgh and Leith Corporations' gas undertakings, stated, in reply to Mr. O'CONNOR, that the conveyer would result in the cost of cartage being reduced from, he believed, 1s. to about 1d. per ton. He knew of no town which was so disadvantageously situated as Dublin was as regarded supplying gas; and it followed that the price of gas there was higher than in cities of the same size. The consumer was bound to benefit largely by any economy which the Company could effect. It was the established practice at the present day to reduce gas from 16 to 14 candle power. The testing methods proposed in the Bill, the bar photometer and the "Metropolitan" argand No. 2, were the standards which were now in ordinary use.

Mr. FITZGERALD, in reply to Mr. Hutchinson, said that there was a clause giving the Company power to borrow £207,000, in addition to raising the £480,000. It was usual where a large concern was converting its capital to give borrowing powers in respect of the converted capital in addition to the existing borrowing powers; and the clause was inserted for this reason. On consideration of the whole case, however, he did not think it necessary to ask for the additional borrowing powers. The clause therefore had been struck out.

In cross-examination by Mr. HUTCHINSON, witness said the capital now sought, £480,000, would last the Company for from twelve to fifteen years. It would not last them thirty years unless they went to sleep in the meantime.

Mr. HUTCHINSON: Do you know that for the last seven years, if the amount of capital per million cubic feet of gas sold be an index of the efficiency and ability with which a concern is managed, your concern has varied in this way: In 1894, you were £839 per million; in 1900, £796; in 1905, £804; and now you are £863?

Witness: During this period the Company have installed 30,000 slot meters, which are admittedly more expensive consumers in so far as the capital outlay is concerned; and yet the Company, apparently, from the figures you have given, have been able to more than double the number of consumers without increasing their capital ratio.

The consumers by slot meters are the most profitable?—Not necessarily. At any rate, they are the only ones left to the Company. The electric light has taken all their large consumers.

In further cross-examination, witness said the Company were going to cater largely for the poor consumer. Flat-flame burners would not, however, be used by this class. Experience at Edinburgh and Leith showed that the working classes there had adopted incandescent burners to a much larger extent than the classes who were better able to provide them. When Parliament were granting a company a new concession, the standard price was sometimes dealt with. Asked to name a company selling gas to the same extent as the Dublin Company—namely (in 1908), 1,408,430 cubic feet daily—who had a standard price inside their original limits of supply, of 4s. 1d., and 5s. outside, witness referred to Croydon, where the standard price was 4s. 7d. He did not, however, know their outside price. The Croydon Company sold at 2s. 8d. The leakage in Dublin was small. The price charged in Dublin (3s. 7d.) was abnormal; and so were the conditions there. Gas which was 16-candle power when used in a flat-flame burner would indicate when put through a No. 2 "Metropolitan" argand 19-candle power. The value of a candle had been taken, erroneously, at 1d.; it depended entirely on the geographical position of the company. It was

absurd to assess the value anywhere in the United Kingdom at 1d. It being suggested that the Dublin gas consumer, if the Bill were passed, would be worse off by 9 candles in the power of his gas, witness asserted that the consumer would be better off. He had made a number of experiments by removing burners from various premises and testing with them; and he found that in no instance did they get more than 32 to 35 per cent. of what was possible with a clean, ordinary common burner. The Company were going not only to remedy the evil, but to supply a burner which was best suited for 14-candle gas, the direct result of which would be that the consumer would get a better light for the same consumption, though still using a flat-flame burner.

By the CHAIRMAN: If the present Dublin gas were tested through the proposed new burner, it would equal 19 candles. If the Bill passed, the gas supplied through the same burner would equal only 14 candles. On this basis, therefore, there would be a loss of 5 candles.

Further cross-examined: With the type of burner in common use, the public did not get more than 30 per cent. of the possible from the gas burnt. By introducing a more suitable burner, probably only at the cost of 1d., they would get from 75 to 80 per cent. of the possible. His experience in testing gas of all grades was that a burner should be constructed to suit the gas of each locality. The London burner would not necessarily be the best for Dublin. Less heat for the purposes of a gas-engine would be obtained from a cubic foot of gas of 14-candle power than from a cubic foot of gas of 16-candle power. On this basis, therefore, to get the same amount of power a greater volume of 14-candle gas must be used than would be required with 16-candle gas. No provision was made in the Bill for an allowance to customers who took gas for calorific purposes. More gas of 14-candle power was obtained from a given weight of coal than gas of 16-candle power.

In cross-examination by Mr. VESEY KNOX, witness said the Dublin conditions were exceptionally unfavourable. The sale, however, per consumer in Dublin was 27,696 cubic feet; whereas in Edinburgh it was only 18,522 cubic feet. The price in Edinburgh was 3s., which was less than it was in Dublin. The receipts per consumer in Edinburgh were very much less than in Dublin. The 3s. in Edinburgh, however, practically represented the cost price; the Edinburgh Gas Commissioners not being allowed to make a profit. The average price of the English gas companies was 22d.; in Dublin the average price was 40d. In Dublin, the receipts in money per consumer were very much higher than the average of the English companies. He did not know of a company in which they were so high as in Dublin.

Mr. VESEY KNOX: If you have a high price, or big receipts per consumer, and a small number of consumers per mile of main, is it not a fair inference that it is because you have charged so much that you have got so few consumers?

Witness: No doubt the price at which the product is sold affects the consumption; but the price at which it is sold is controlled by the cost of manufacture. Continuing, witness said the Company hoped to obtain 33,000 more slot meter consumers in a few years and further ordinary consumers; and it was possible these extra consumers might be secured without any great increase in the mileage of mains, though some mains would doubtless have to be laid to supply the new consumers. The general tendency would be to increase the number of consumers per mile of main. Sheffield had a great length of mains in comparison with the number of its consumers; and yet the Company were able to supply gas at 1s. 3d. But Sheffield was so exceptionally situated with regard to the sale of coke for manufacturing purposes that more was obtained for the coke from a ton of coal than they paid for the coal in the first instance. Practically, coal cost Sheffield nothing. Within Edinburgh and Leith the charge was 3s.; outside, the charge was 3s. 6d. uniformly. The nearest point to the works at which the increased price was charged was a mile distant. Part of the outside area was eight miles distant. Mains in Edinburgh were not laid at a greater depth under any circumstances than 2 feet. Really the only factor governing the depth of a pipe was frost. Gas lost from 3 to 3½ candles in its power in passing from the works at Edinburgh to the centre of the city—that was, with high-grade gas. With 14-candle gas they expected there would be no loss.

Re-examined by Mr. FITZGERALD: The illuminating power of the gas which they had been supplying quite recently in Edinburgh was 20 candles. When the illuminating power was the same as that proposed in the Bill, there was substantially no loss in the mains. The experience of the London Companies proved this. It was therefore quite unnecessary to make provision for testing beyond the works; it could only put an additional and uncalled-for expense on the Company.

Wednesday, May 5.

On the resumption of the proceedings to-day,

Mr. Herring was further re-examined by Mr. FITZGERALD. He said no proper comparison could be made between the price of gas in Sheffield and in Dublin. In Sheffield the sale of the residuals covered the cost of the coal; whereas in Dublin the cost of the coal was 1s. per 1000 cubic feet. A fair comparison also could not be made between Edinburgh and Dublin. The ordinary gas-burners and appliances now made were for the purpose of suiting 14-candle power gas. When used with a higher-grade gas, even a 16-candle gas, they did not give such good results. In 1871 the capital of the Company per million feet was £1530. This figure was gradually reduced until in 1900 it stood at £721, which reflected very great credit upon the Company and upon the management. About that time the Company began to feel very strongly the effect of the competition of electric light, which took away from them a number of their large consumers; the result being that the average consumption per consumer fell from 60,000 to 27,000 cubic feet, which was the average at the present time. To meet this competition the Company began pushing the supply of gas through slot meters, which involved much heavier capital expenditure. In this way the capital per million was raised. If they altered the standard price of the gas they took away from the existing shareholders part of the security on the faith of which their money was subscribed, and they made it more difficult to raise money cheaply in future.

By the EARL OF LIVERPOOL: The heating properties of lower grade gas were slightly (from 3 to 5 per cent.) less. The heating property

varied somewhat according to the coal used. In Dublin, they used some Scotch coal. Most of it, however, was North of England coal.

By the CHAIRMAN: The amount of gas lost for each mile of main was small in Dublin, although the total leakage was large, owing to the great length of the mains.

Professor Vivian B. Lewes, examined by Mr. FITZGERALD, said he considered it would be to the advantage of everyone if the candle power of the gas in all the chief towns of the kingdom were reduced to 14, and the method of testing suggested by the Dublin Company were adopted. At present, in Dublin they tested the gas in a flat-flame burner. They used a burner which, under normal conditions, would pass from 8 to 10 cubic feet of gas; and they burned the gas through it at the 5-feet rate. This gave an excessively low pressure; but by being very careful to avoid draught, they got the gas to burn satisfactorily, and obtained the best result from it. This method of burning the gas was absolutely inexact, and it was excessively illogical, because it did not develop the maximum light which could be obtained. The principle adopted by Parliament since gas testing came in was that the burner should be one which would develop the full lighting power of the gas without any adventitious causes. The burner now in use in Dublin was absolutely unfit for the purpose of testing 14-candle gas. The use of the incandescent burner was rapidly increasing, and would undoubtedly supersede other methods of employing gas. In Germany, the use of the incandescent mantle was universal. The tendency in England was in the same direction. Five years ago only 30 per cent. of the lighting was done with the incandescent mantle. Now the percentage was between 70 and 80. Experiments he had made showed that flat-flame burners very rarely gave more than 56 per cent. of the statutory lighting power of the gas, and that in many cases it was only 25 or 30 per cent. He did not approve of the method of testing now in operation in Dublin. It was extremely difficult to get any concordant results with it from different observers; and this had led to constant friction between the Corporation and the Company. The method gave a purely fallacious result. Dublin gas, if tested by the No. 1 argand, would be returned as of 18-candle power, and if tested by the No. 2 argand proposed in the present Bill, would be returned as of 19 candles. The saving to the Company if they had to supply 14-candle gas tested by the No. 2 argand would be about 2½d.—the price of a gallon of oil—per 1000 cubic feet. London gas used to be returned as of 16 candles in the No. 1 argand, and was then reduced to 14 candles in the No. 2 argand—a reduction practically of 4 candles. This was met by a reduction of 2d. on the standard price, though the Companies protested that it was a great deal more than the saving they made. On the same basis here, taking the reduction as being 5 candles, it would be represented by 2½d. or so. A reduction of 3d. on the standard price would therefore be very generous to the consumer. For the purpose of a settlement, however, he would advise the reduction of 3d. being accepted. It was said that there was a great difference between a high candle power gas like 18-candle gas and 14-candle gas. Theoretically that was absolutely correct. But in practice the full heat in the gas was not developed, and the difficulty in developing it from a high candle power gas was greater than the difficulty of developing it from a low candle power gas; the difficulty being to get the proper amount of air for complete combustion. The result was that in very many cases the poorer gas would give among general consumers more satisfaction than gas of higher candle power. Where high quality gases had been reduced to low quality, the consumer had practically been unaware that any change had been made.

In cross-examination by Mr. HUTCHINSON, witness said the general principle on which he proposed the change was to bring the whole practice of gas testing into line, both as regarded quality and procedure, because only then would they reach anything like finality in the methods employed. For a given quantity of coal there would be a greater yield of 14-candle gas than there would be of 16-candle gas. The type of photometer should always be prescribed. It would not be unreasonable that it should be distinctly specified in the Bill, subject to the Board of Trade.

Mr. Corbet Woodall, examined by Mr. PADDON, said he agreed that the capital asked for in the Bill was justifiable. The capital required for the extension of the prepayment meter business was considerable. Such extension was altogether dependent on the capital available. He thought that within ten or twelve years they might reasonably expect an increase of some 450 million cubic feet in the consumption. The area supplied by the Company had a population of 400,000 people, and, assuming the average number of people in a tenement to be five, there would be 80,000 tenements. Of these, 52,000 were now supplied; so that there was a balance of 28,000. He assumed that 75 per cent. of these would be supplied within a reasonable time. He understood that there were many hundreds of applications on the books of the Company which they were not able to meet. If the Bill were passed, there could be no question that the price of gas would be reduced materially. Every reduction of this kind would tend not only to increase the number of consumers, but the quantity of gas burned by the individual consumer.

Cross-examined by Mr. VESEY KNOX: The net cost of coal in the case of the Dublin Company was very heavy. In the case of the Gaslight and Coke Company, it was 5½d. per 1000 cubic feet, whereas in Dublin it was 12d. The freight for coal to Dublin was much higher than it was to London. The return for residuals per ton of coal to the Gaslight and Coke Company was 10s.; in Dublin, it was 8s. 11d. There was greater room for saving in the case of the Dublin Company than there was in the case of the Gaslight and Coke Company. A large proportion of the benefit of saving resulting from a change in the statutory conditions under which an undertaking was carried on ought to go to the consumer, and, under the operation of the sliding scale, a large proportion did go to him. He suggested that a reduction of 3d. should be made in the standard price. He agreed that the balance available for saving on coal was greater in the case of Dublin than in London. But there were many other circumstances connected with the question. The actual cost to the Company of enriching the gas was about ½d. per candle. If, therefore, they agreed as to the number of candles that would be saved, the number should be multi-

plied by 3d., and to this extent the standard price reduced. By carbonizing coal at a greater temperature, a slightly increased yield of gas was obtained. This increased yield was 100, however, 1,500 cubic feet per ton. The outside quantity would be 500 or 600 feet. As a town grew and the population increased in the immediate suburbs, the extra cost of supplying gas, relatively, in the immediate suburbs gradually disappeared. It would be quite fair to take this fact into account when the standard price was being revised.

Mr. VESEY KNOX: As these suburbs—Rathmines and Pembroke—have grown up, the cost of supplying these relatively to the cost of the supply within Dublin has increased?

Mr. FITZGERALD: My learned friend does not represent those places.

The CHAIRMAN (to Mr. Vesey Knox): Do you represent these parties?

Mr. VESEY KNOX: Yes. The County of Dublin includes the whole of this area, and representatives of it are members of the County Dublin County Council, and sit on the County Council to represent it. In that sense, I technically represent the whole district. The cost of the appearance before this Committee is shared by the whole area. In addition, in certain cases they did not petition separately, only because they thought that, as they were represented by the County Council, it was unnecessary.

Mr. FITZGERALD said there was no allegation whatever in the petition of the County Dublin County Council that they were authorized to appear for these Urban Councils. The County Council itself was not a lighting authority. The Urban Councils were interested as lighting authorities—everyone of them being a lighting authority and having a right, if they thought fit, to appear before the Committee on the Bill. At the previous sitting, Mr. Vesey Knox had stated that he was instructed that there was an arrangement between the County Council and these Urban Councils that the County Council should represent them. After the rising of the Committee the previous day, the Chairman of the Pembroke Council, in response to a telegraphic inquiry, wired that no such arrangement existed between his township and the County Council. A member of the Kingstown Urban Council, who was in the room, also stated that there was no such arrangement between Kingstown and the County Council. These facts showed that Mr. Vesey Knox had been incorrectly instructed.

Mr. VESEY KNOX said he had been instructed in general terms that the arrangement had been made. In the case of Rathmines, the following resolution had been passed: "That this Committee sees no necessity to lodge a petition against the Gas Companies' Bill, as their interests are common with the County Council who are opposing it." A representative of Pembroke on the County Council took part in the preparation of the County Council's petition, representing, as he thought, Pembroke, and undertaking to advise Pembroke as to what the County Council were doing. Counsel could not, however, say there was a definite arrangement that the County Council should represent Pembroke. In regard to Killiney the Solicitor to the County Council, who was also a member of the Killiney Council, arranged with the Killiney Council that they would not petition because the County Council represented them. He understood that similar communications had passed in other cases. As regarded the Rural Councils, the County Council was entitled to represent them without any arrangement; for while the County Council were not a lighting authority, they raised a rate to defray the cost of lighting, though the actual disbursement was in the hands of the Rural Councils.

Mr. FITZGERALD said that if the Urban Councils had desired to be represented with the County Council by one petition, all they had to do was to sign the petition. The County Council did not, in law, represent these authorities.

The CHAIRMAN, after further discussion, ruled against Mr. Vesey Knox.

Witness, in cross-examination by Mr. HUTCHINSON, said he did not agree with the following statement in the report of the Select Committee of the House of Commons on the working of the Metropolitan Gas Companies: "Your Committee have therefore come to the conclusion that the time has come when a reduction might fairly be recommended on the grounds that the cost of the production of gas is now much less than it was when the present standards were fixed, and also because capital can now be obtained at a much less rate of interest than formerly." That conclusion was a mistake. To make any alteration in the standard price fixed by Parliament after capital had been raised on the strength of the standard would be, he thought, a blunder. As a rule, the profit from any such reduced cost went as to about six or seven parts to the consumer and as to only one part to the shareholder. The inducement of that one part to increased economy on the part of the Company was very great, and it would be a pity to interfere with it. He agreed with the Select Committee that the conditions of the gas industry were liable to great fluctuations; but he disagreed with them in their conclusion that it would be wise to limit the period for which capital powers were granted to five years, and that "at such periods if any company came to Parliament for fresh power it would, of course, be within the power of Parliament to revise the sliding-scale if it was thought just and necessary to do so." To bring companies to Parliament at intervals of five years would be most detrimental to the interests not simply of the companies, but of the consumers also. Parliament had not adopted this recommendation, and had in no case fixed so short a period. One of the circumstances justifying the proposed reduction of the standard price in Dublin was economy. The use of water gas for a material proportion of the gas meant a lower capital expenditure, and the use of a material proportion of water gas meant lower labour charges. Labour, however, was only one portion of the cost of making water gas. On the whole, the cost of making 16-candle water gas was about the same as the cost of making 16-candle coal gas. One reason why water gas was used considerably was that it reduced the quantity of coke put on the market. It was nonsense to suppose that the reduction in candle power here proposed would mean the production of 1500 cubic feet more gas per ton of coal, making a difference of 2.8d. per 1000 cubic feet of gas sold. The use of water gas related to the question of cheapness. Sometimes when the price of coal was high and the price of oil low, it was economical to make water gas. As an ethical question, he did not discourage its use. In the circumstances, he did not consider £883 per million cubic feet, the capital of the

Dublin Company, extravagant. It might well be that the capital expenditure of the Company since 1893 had been £1000 per million. During this time they had been introducing the prepayment system, which involved expenditure almost, if not quite, equal to the total expenditure on building the works and laying the mains. Consequently, compared with (say) 15 years ago, the capital expenditure now was twice what it had been. In addition, the Company had been extending their works, and possibly a considerable amount of surplus works had to be allowed for.

Re-examined by Mr. FITZGERALD: If it was ever laid down that whenever a company came to Parliament for increased capital powers, as it had to do every 15 or 20 years, the price of gas was to be revised, the security would be enormously affected. Under such circumstances, the better a company behaved, the more carefully it conducted its business, and the more economically it made gas, the worse it would be for the company.

Mr. FITZGERALD: If by economy you had got the selling price down to a low figure, then according to the contention suggested here, you ought to have your standard price reduced accordingly?

Witness: It is a total subversion of the whole spirit of the sliding-scale, the idea of which is that the more economically you work, the better you shall be rewarded.

Sir Thomas Robinson (of Messrs. Hayes, Cunningham, and Robinson, chemists, who have establishments in Kingstown, Dublin, Rathmines, Clontarf, and all urban districts, except Drumcondra, affected by the Bill) cross-examined by Mr. O'CONNOR, said in all the firm's establishments gas was largely used. He saw no objection to the proposed reduction in the candle power. If the Company had facilities for extending the slot system, he believed it would be largely adopted by the poorer classes, who could not afford to be ordinary consumers.

Mr. A. S. Findlater (the Managing Director of Messrs. Alexander Findlater and Co., a firm having establishments in a number of the areas served by the Company) said these establishments consumed gas, and he was satisfied with the treatment he had received from the Company. Having regard to the circumstances of the Company, he thought they supplied at a fair price. The Company were most certainly well managed. In one of his firm's establishments, they had used electricity for a while, but discontinued it in favour of gas with incandescent burners. The change was made more because of the quality of the light than of the economy involved.

This closed the case for the promoters.

Mr. VESEY KNOX then addressed the Committee on behalf of the County of Dublin County Council. He said the position of the County Council, after the ruling of the Committee that morning, was that they were only entitled to appear as consumers of gas in the area. Regarding the position from the point of view of consumers, he asserted that something should be done to reduce the price of gas. The County Council, as the Road Authority, raised other points with regard to the breaking up of roads; but these were merely clause points. It was common ground that the price charged was very high. In 1907, the price in Dublin was 40.49d.; whereas the average of the large companies in England, mentioned in "Field's Analysis," was 22.77d., and of the great corporations of England 26d. The charging of such a high price must seriously lessen the amenities of life and diminish trade. All consumers were affected by high prices; and it was urgently necessary therefore that relief should be afforded. When any undertaker, whether a company or local authority, came for further powers in relation to the supply of gas, it had been the practice of Parliament entirely to review the conditions of the concession and see whether they did not need revision in the public interest. There were cases in which the standard price had been revised, as, for example, in the Lea Bridge instance, in which it was reduced by 6d. It was almost an axiom that a cheap supply of gas was better for both company and consumer. The Dublin Company argued in a circle—complained of the small number of consumers per mile of main, and said that was the cause of the high price. But he suggested that it was the high price which was the cause; and that the way to get a larger return on their expenditure in mains was so to reduce the price as to increase the number of consumers. The explanations of the high price of gas which had been given by the Company's witnesses were not satisfactory; the real reason being want of enterprise by the Company. Parliament should endeavour, as far as it could without injustice, to lower the price, or pass such legislation as would cause the Company to reduce it. An occasion when the Company were seeking not only fresh capital but a reduction in the illuminating power of the gas was a very suitable one for such action. He would not object to the reduction or to the alteration in the method of testing, if a considerable reduction in the standard price was also made. He submitted that there should be a reduction in price, not only on account of the reduction in candle power, but because, as in the case of the Commercial Gas Company, the price was too high in comparison with the price in other large towns. As to what was fair compensation for the proper reduction of illuminating power, he called in aid the evidence he knew would be given to the Committee on behalf of the Dublin Corporation. Of course, the suggested 3d. would not be sufficient. The Company would be able to introduce great and beneficial changes in the method of manufacture if they were to supply gas of only 16-candle power. In these circumstances, the reduction in the standard price should be about 6d. The fact that the Company had not been earning their full dividend at the present standard, showed that the standard must have been fixed too high; otherwise at the price recently charged they would have been able to pay their full dividends. This really showed how fatal to a company was the policy of dear gas; and it showed that the real way to obtain large dividends was to give cheap gas. Proceeding to refer to the differential prices charged, Counsel remarked that it was curious that in an Act of 1874 the Corporation or large consumers could, by giving notice within a prescribed period, require 14-candle power gas to be supplied at a price of 8d. below the price charged for 16-candle gas. This provision was spent. But it was interesting that Parliament on that occasion recognized the principle that if the illuminating power was to be considerably less, the consumer should get the full advantage of it—8d. then being taken to equal the proposed reduction. It was fair that, in sparsely populated and outlying places, the rate should be somewhat

higher than was charged in Dublin; but the outer charges should not be greater than the inner ones to such an extent as they were in this case.

Evidence in support of the petition of the Dublin Corporation was then called.

Mr. Andrew Robinson, Assistant Surveyor to the Commissioner of Public Works in Ireland, examined by Mr. BALFOUR BROWNE, said he was well acquainted with the conditions under which the Company sought to carry out their statutory obligations. It would not be to the advantage of gas consumers generally that the Bill should pass in its present form. The provisions of clause 39, which related to the specification of internal fittings and the placing of pipes between mains and consumers' premises, should not be applicable to Crown properties. In regard to clause 44, which dealt with the period of error in defective meters, it was scarcely fair to assume that the error could only have arisen within the previous three months. If a limit was fixed, it should be much longer than three months. Having regard to the nature of the supply demanded in Dublin, 16-candle power gas was more suitable than 14-candle gas. If the candle power were reduced, there should be a corresponding reduction in the price. In many cases the incandescent burner had not been introduced. Where it had not been introduced, and the flat-flame burner was used, it would be unfair to reduce the candle power as suggested. There should be more than one testing-station in Dublin.

In cross-examination by Mr. HONORATUS LLOYD, witness said he attended before the Committee partly as the representative of the Crown. He did not know that some of the clauses to which he objected were Model Clauses.

Mr. J. J. Healy, Assistant-Accountant of the Board of Works in Dublin, stated, in reply to Mr. MACINERNEY, that he represented the views of the Board (who were responsible for the lighting arrangements of various public buildings in Dublin) on the Bill. The Crown paid over £13,000 a year for gas in Dublin, of which the Board paid £5500. He considered the price excessive in comparison with that charged elsewhere. The Board objected to the proposed reduction in candle power. They could not use the incandescent burner in all their buildings. One reason was that sufficient pressure could not be obtained to get the proper value out of the burner, especially during certain hours when the demand was exceptionally great. The Board also thought the differential rate should be reduced in some cases.

Mr. Spencer Hartly, Surveyor to the City of Dublin, gave evidence on some points of minor importance, in regard to practically all of which the promoters accepted his suggestions.

Thursday, May 6.

Mr. John J. Farrell, a member of the Dublin Corporation, and a tobacco merchant, said he now largely used electricity because the gas was too dear and too bad. The electricity was about half the price, or less than half the price, of gas. At a meeting of the constituents of the Mountjoy Ward, a resolution was passed calling upon all the Irish Members of Parliament to oppose the Bill. There were constant complaints from all parts of the city. With regard to the difference in the charge for the added area and for the old city, there was a great deal of discontent. In some cases, a portion of the added area was as close to the gas-works as $1\frac{1}{2}$ miles, and portions of the old city were $2\frac{1}{2}$ or 3 miles distant from the gas-works. There they paid 3s. 7d. per 1000 cubic feet; and in the added portion of the city within $1\frac{1}{2}$ miles of the gas-works, they paid 4s. 6d. In some cases, the one main supplied both sides of a street; and while on one side the price was 3s. 7d., on the other it was 4s. 6d. The price and quality of the gas, he believed, had led to great depression in trade. If the price of gas was not lowered, the Company would not do much business, because the Electric Lighting Department would cut them out. There were more complaints about the slot business than any other; and people alleged that the meters could be manipulated to the advantage of the Company.

Cross-examined by Mr. FITZGERALD, witness said the Company put in the slot-meter fittings free, and then charged a big additional price to recoup themselves. When Mr. Fitzgerald produced a report of the City Treasurer which showed that the electrical undertaking was worked at a loss, witness said the undertaking was only in its infancy. In witness's opinion, if the Bill became law, practically every vestige of authority now exercised by the Corporation over the Company would be swept away. The Company would have power to supply gas of any quality and quantity; and their working staff would be reduced by one half.

Mr. T. J. Cotton, the Gas Examiner and Superintendent of Dublin, said the Corporation's consumption of gas amounted to some £9000 or £10,000 per annum. The Bill was ill-considered.

Mr. FITZGERALD, in reply to the Chairman, said the Bill of 1883 was introduced by the Company and the Corporation petitioned against it; but an agreement was come to, and all the provisions of the Bill that had been referred to now were carried into the Bill of 1883, which passed through Parliament as a Bill agreed on between the Corporation and the Company.

Witness said that the motive for agreeing with the Company then was that a high standard price was admitted, on the understanding that the gas would remain of high quality (18 candles), and that the sliding-scale would be adopted. With the present standard price, which was fixed by the Act of 1883, there was great dissatisfaction. Steps should be taken to make a uniform price throughout the whole of the city. With regard to the change of burner, the gas was at present tested through the flat-flame burner. The illuminating power was nominally 16 candles; but it was really about 18. He looked upon this test burner as the fairest that could be employed, between the seller of gas and the consumer. For $2\frac{1}{2}$ years, the gas supplied in Dublin was 20-candle power. Under the Act of 1874, it was provided that, if the illuminating power then indicated in a flat-flame burner at 16 was reduced to 14 candles, the difference in price that should be made for the 2 candles should be 8d. He did not think that the low-grade gas proposed—14 candles, as indicated by the No. 2 "Metropolitan" burner, and not by the flat-flame burner—was at all suitable for Dublin. In the burner the Company proposed to use and the present flat-flame burner there was practically a difference of 5 candles. He

maintained that any burner which gave a different quality of gas in the public testing-room from what was supplied to the consumer, was an unjust measure. Fivepence would not compensate the consumer for the loss of 7 candles.

The CHAIRMAN said he did not understand before that there was any dispute about the burner.

Mr. FITZGERALD explained that the report of the Departmental Committee was that the best possible burner should be used, and they mentioned the No. 1 argand; but the matter was referred to the Gas Referees of London, and the burner they had fixed upon was the "Metropolitan" No. 2—the one adopted in the Model Clauses.

Mr. HUTCHINSON remarked that the improved burner meant that with the same gas it showed a higher illuminating power.

Witness said it would give an apparent value of 14 candles at the testing-station; but in reality in the consumer's house it was only 9 candles, as tested with the existing standard. He believed the Gas Referees of London had prescribed the burner entirely under a mistake. In the Bill of 1868, under which they were appointed and their duties defined, it was stated that the test burner adopted by them should be such as to be practical for use in the consumer's house. But this burner never could be of any practical use. There was only one testing station in Dublin; and the gas going to the north of the city was not tested.

Dr. Frank L. Teed, F.I.C., said that, when comparing two burners, it was impossible to say the exact differences they would give in normal candle power, unless the nature of the gas to be tested was known. The richer the gas, the better value it would give in the flat-flame burner, and approaching more nearly to that obtainable with an argand burner. The proposed reduction in conjunction with the change of burner would reduce the illuminating power. Using a No. 8 Bray, it would be reduced from 16 to about 7 candles. The tests he had made showed that, with the flat-flame burner, the result was 14.77 candles, and with the "Metropolitan" No. 2 19.64. The difference between the two burners was greater with poor gas than with rich gas. The proposed alteration in the illuminating power also involved a great reduction in heating power. As a result of investigations he had made with the Dublin gas and its calorific value, he said that when the gas was nearly up to its statutory power he found 144.8 calories per cubic foot; and if it were increased up to the 16-candle standard, it would amount to 146, or thereabouts. The gas of the Commercial Gas Company, at Wellclose Square, giving 14-candle power by the No. 2 argand, only came out at 126.8 calories, and in other official tests it averaged 125. By the different illuminating power suggested, they would lose 50 per cent., or more, on the flat flame, and 15 per cent. of the heating power, if used in stoves either for cooking or for heating rooms. It was an extremely vague offer which was made by the Company to provide the consumers with flat-flame burners. The burner ought to be prescribed. The "Metropolitan" No. 2 argand was anything but an ideal burner for testing. The incandescent burner went wrong much more frequently, and to a much more serious extent, than the flat-flame burner; and there was a far greater proportional loss of illuminating power from an incandescent burner under these circumstances than from a flat-flame. Sulphur in gas had a deleterious effect on many things about a room; and in Dublin the Company were restricted to 20 grains per 100 cubic feet. In the interests of the consumer the test for sulphur compounds should certainly not be done away with. With regard to the London Gas Companies, the sulphur clauses were done away with; and the result was that, instead of being in the neighbourhood of 20 grains, the sulphur went up to 80 or 90 grains per 100 cubic feet.

Mr. Isaac Carr, Gas Engineer to the Widnes Corporation, said it was undesirable to reduce the illuminating power of the gas, because the alteration in quality adversely affected every type of burner for illuminating purposes, as well as the consumers who used gas for cooking, heating, and motive power. It would more especially affect users of flat-flame burners. For a number of years past, the Widnes Corporation had sold gas within the borough at a lower price than any other town. The highest price was 1s. 2d. per 1000 cubic feet to small consumers, 1s. to consumers of over 3,000,000 feet per annum, and 10d. to all users of gas for motive power. Though they supplied at these very low rates, they had not sought to reduce the illuminating power. This policy should also be adopted in Dublin, because the consumer with the lower-grade gas had to pay more. The reduction in illuminating power was equivalent to an increase in price; and it was not to the advantage of the consumer that these low standards of quality should be granted. In Widnes, the present 14-candle power gas, by the existing statutory burner, was 20 candles when tested by the burner proposed in the Bill. The proposal in the Bill was to reduce the illuminating power to 14 candles, which would mean a reduction of 7 candles, or 43 per cent. The 43 per cent. that the consumer would have to use extra in the flat-flame burner would amount to 1s. 6.4d. per 1000 feet. He had always found great difficulty in making gas of so low a quality as 14 candles from Lancashire or Yorkshire coal. It had recently been publicly acknowledged by producers of coal gas only that it was impossible to make so low a candle-power gas as 14; and he submitted that Parliament had never understood the question in granting so low a standard as 14 candles in the No. 2 "Metropolitan" burner. The people who induced Parliament to grant this concession now publicly acknowledged that they were unable to make gas of this quality. Of course, the idea was that the lighting did not depend upon the burning of the gas, but upon the heating of the mantle. On the question of calorific value, the reduction from 16 to 14 candles was also a loss to the consumer in heating power. He had made tests with gas of both qualities, and found that there was a distinct falling off in the calorific value of the gas which would cause the consumer to use more. He placed the value of this fall at 11.9d. per 1000 feet. The 14-candle power gas in the No. 2 "Metropolitan" argand gave an illuminating power of 9.1 candles per cubic foot, when consumed at the rate of 5 feet per hour. Dublin gas of the statutory quality gave an efficiency of 16 candles; so that there could be no contention on the point of illuminating power. In Dublin, the present standard was 16 candles in the flat-flame burner. The London County Council's last published figure as to the Commercial gas averaged, in the flat-flame burner, 8.9 candles. If the consumer was to be treated

fairly, the price of 3s. 7d. per 1000 feet in Dublin should be reduced to 1s. 6½d. The use of gas in incandescent mantles suffered a loss also. He agreed with the promoters that there was very little difference, with careful manipulation, between a high-grade and a low-grade gas; but the ordinary consumer who used the two kinds was incapable of the necessary careful manipulation, and in applying the two qualities of gas in practice he suffered as serious a loss with the incandescent mantle as he did with the flat-flame burner. Witness produced and explained to the Committee two burners that were just alike, externally, for consuming gas in incandescent mantles. One burner was for low-grade and the other for high-grade gas. Internally, he said, the orifice in the nipple in the burner for low-grade gas would pass 43 per cent. more than that for the high-grade gas; and this was the practice of the makers. Though the promoters in all these Bills had argued that there was no difference in the incandescent burner, and that low-grade was as good as high-grade gas, yet when a person went to the manufacturers—the Welsbach Company—and asked for a burner for one quality of gas and a burner for another quality of gas, he was given two different burners, the one capable of passing practically 50 per cent. more gas than the other. When he went to Dublin to inspect the works of the Company, he was refused admission; but he saw them casually two years ago, and they were the worst arranged works he had ever come across. The capital that had been spent was abnormal, and worked out at £883 per million cubic feet. This was double the necessary amount. It was the highest capitalized undertaking that had ever come to his notice. He considered the capital necessary for this gas was 25 per cent. less than for ordinary coal gas.

Witness, replying to the CHAIRMAN, said the Cork Gas Company were similarly situated to the Dublin Company. In fact, there was nothing to discriminate Dublin as an abnormal situation for the manufacture of gas, as between Cork and Belfast. For a works of the size of Dublin, a capital of £650 per million cubic feet of gas sold was ample. Having examined the amount of gas sold, the increase would be at the rate of 3½ per cent. per annum in the last eight years. From this he concluded that the increase of the Company's business in the future would be less than in the past. Therefore it was reasonable to suppose that the capital they would want in the next 15 years would be less than they had spent in the last fifteen years—he would say for both share and borrowed capital, £225,000. There was no justification for charging a differential rate in different parts of the city.

Mr. J. G. Newbigging, Gas Engineer to the Manchester Corporation, stated that he went to Dublin, and was refused admission to the works. He, however, examined them from the exterior. From the way in which they manufactured gas, as evidenced by their constitution and capital, he did not find any attempt to reconstruct the plant in proper and systematic order. He thought their conditions were unparalleled in the United Kingdom. The price of gas was abnormal, having regard to the scale of manufacture; and that was due to bad management. The site of the works was eminently suited for planning out works for the economical production of gas. The amount of capital expended per million cubic feet for the year ending 1908 was £883. Between the years 1899 and 1908, the increased quantity of gas sold was 67 million feet; and in order to provide for this, £224,000 had been expended—at the rate of £3348 per million. In 1908, the quantity of gas sold was 60 million feet less than was sold in 1904; but notwithstanding this diminution, there had been an expenditure of £91,208, which was evidence of extravagance. The capital for which the Company were asking would last them for 38 years. At Manchester they turned out in the year about four times the quantity of Dublin—6000 million cubic feet; and the price was 2s. 3d. per 1000 feet for ordinary consumers. The capital per million cubic feet was £496. Witness put before the Committee an estimated saving in the cost of manufacture by reducing the illuminating power of the gas by 7 candles—from 16 to 9 candles in the flat-flame burner, or from 21 to 14 in the No. 2 "Metropolitan" argand. The estimate was: Total gas made, 1908, 1,555,461,000 cubic feet. Carburetted water gas, 48 per cent. = 746,621,280 feet; coal gas, 52 per cent. = 808,839,720 feet. Increased make per ton on coal gas, 1500 cubic feet at 3s. 7d. = 5s. 4½d. ÷ 12,000 cubic feet = on total make 2½d. Saving in enriching: 746,621,280 feet at 2½d. = on total make, 1½d. Saving in enriching: 808,839,720, 13 to 16 candles in flat flame, at 1½d. = on total make, 0½d. Giving a total saving per 1000 cubic feet of gas made of 4½d., or £28,000 per annum. Taking into account, he said, the conditions at Dublin, £700 per million cubic feet would not be extravagant. With the experience of the last fifteen years, showing an increase at the rate of 277 millions, if this were the experience of the next fifteen years, the capital they asked for would be equal to £1800 per million, which was £1100 more than they ought to have. From his experience in reducing the quality of gas, he estimated that the Company would save 4½d.—in round figures, 4½d.—per 1000 cubic feet of gas made. With the modern method of the consumption of gas, he estimated that the consumer of gas, with the incandescent burner, would lose to the extent of 4½d.; so that the two figures taken together equalled 9½d., which was what they would save in manufacturing cost and what the consumer lost by using the incandescent burner—leaving the flat-flame burner out of the question. Making a comparison, he said that in Dublin gas cost 21½d. per 1000 cubic feet, including coal, cannel, and oil used in the manufacture of carburetted water gas; and in Belfast the cost was 15½d. The gross cost of the gas sold was 42½d. in the case of Dublin, as against 25½d. in Belfast. The ordinary selling price in Dublin was 3s. 7d.; and in Belfast 1s. 10½d.; the capital was £883 per million feet sold in Dublin, as against £583 in Belfast.

Witness, in cross-examination, said in Manchester they would not for a moment supply a customer with 14-candle power gas. He agreed that it had been the custom in recent Acts to reduce the candle power from 16 to 14, but it had never been supplied. A diluted gas must be given. Parliament had been misled. So far as he knew, there had been no case, except the one at Falmouth, where, when the candle power had been reduced from 16 to 14, there had ever been more than 4d. allowed. Nevertheless, in this case, 9d. was a fair figure. Falmouth, where 4d. was allowed, was merely a reduction of illuminating power, without a change of the test burner. If there were a change in the burner, it would double the amount—8d.

Friday, May 7.

Mr. BALFOUR BROWNE, in addressing the Committee, remarked that this was a very important issue between two great public bodies. It was, of course, the duty of the Corporation to watch very closely the proceedings of the Company, which was a far more satisfactory arrangement than the one which had found favour at some time of placing the gas undertaking in the hands of the local authority itself. When a gas undertaking was owned by the local authority there was really no one to watch the interests of the consumers. This Company had a large capital; and, in consequence, they had been away from Parliament for 26 years. They were now seeking to add to the capital an enormous amount, which would enable them to again be away from Parliament for a great number of years. The Bill had been so carelessly prepared that he asked the Committee to order the promoters to take it back and prepare another, after the investigation that had taken place, and see if they could not come to fair terms with the Corporation. The capital requirements had made the Corporation and the consumers suspicious of the Company. They had been refused admission to the works, which was a mistake for a Company to make. What were they concealing? If the works were good, why should not they allow them to be seen? The Corporation were suspicious of the capital of the future, just as they had been suspicious of the capital in the past. Then they were seeking to reduce the illuminating power from 16 to 14 candles. It was not very useful for them to make comparisons in this matter; but there would be a large saving, and ought to be a commensurate reduction. When the Bill was introduced, there was no reduction at all; and then Mr. Fitzgerald said they must take something off. But it was quite obvious that 3d. was not a proper reduction. Then they were altering the burner. What with the new burner and the new test, the consumer would only get 43 per cent. of the illuminating power for the price he was now paying. In certain cases Parliament had allowed a reduction of the illuminating power; and it would be the right thing to do where all the gas was made from coal, but not where some of it was water gas. It might be that 16-candle power gas was the right gas for Dublin; but if it was not, then the reduction ought to be at least 1s. 6d., because they were losing 43 per cent. of the lighting power and 15 per cent. of the heating power. In Dublin they found that people on one side of the street were paying a differential rate from people on the other side. This was most undesirable; and it could easily be adjusted without really injuring the Company. The promoters ought to take back their Bill, and bring in another showing a fair, uniform rate over the district, and dealing with the anomalies which he had mentioned.

The Hon. J. D. FITZGERALD, in reply, said no one had disputed that further capital powers were required. The provisions with regard to the reduction of the illuminating power and for the testing of the gas were such as had been sanctioned by Parliament over and over again. Every other provision in the Bill was an ordinary one which gas companies all over the country obtained from Parliament—generally without dispute—and almost in every case the Model Clauses had been adopted. The fact that they were Model Clauses showed that it was in accordance with the practice of Parliament, because such clauses were not drawn up by the officials of the House unless, by the repeated decisions of Parliament, a matter had become an ordinary provision which ought to be inserted in Gas Bills. The high capital of the Company was due to the fact that Parliament had originally allowed three competing Companies to exist in Dublin. In 1866, the Companies were amalgamated by the Dublin Gas Act; and this Act created a Company with a large amount of capital. The new capital was £480,000. In 1898, they reduced their capital to £760 per million feet of gas sold—they cut it down by more than one-half. The increase up to £880 had not been challenged by any witness of the Corporation. In 1898 and 1899, the Company were subjected to severe competition with the electric light undertaking of the Corporation, who were selling electricity cheaper than gas. They were carrying on the electricity undertaking at a loss, owing to the low price which they charged. Being subjected to such competition with an undertaking not conducted on commercial principles, but with the rates of Dublin behind it, the only course open to the Company was to preserve their position by pushing their slot-meter consumption, for which purpose they had to spend £170,000. The evidence of the expert witnesses was that, for the purpose of slot-meter consumption business, they had got to spend more capital per million cubic feet than in the other branches. The figure of £880 had simply been produced by the additional expense of supplying 33,000 slot consumers. Whereas they had now got 33,000 slot consumers, there was an equal number of persons who might have a supply if the Company were given the capital to undertake it.

The CHAIRMAN: The original capital of the Company was £500,000, which lasted for 26 years; and you are now asking for £480,000.

Mr. FITZGERALD said that in 1866 the capital was £590,000. But in 1883, and for long afterwards, the slot meter was not known. He believed the capital they were now asking would carry the Company on for about fifteen years. With regard to the point of the opponents not being allowed to view the works, he said they had to keep the opposite party at arm's length; but he did not see what the state of the works had to do with the matter of capital. The question was brought in as a point of prejudice. As to the illuminating power, the South Metropolitan Company asked to have their standard reduced from 16 to 14 candles; and after the fullest investigation, they were allowed to do so.

The CHAIRMAN: I do not think you need trouble yourself with regard to that matter.

Mr. FITZGERALD (continuing) said Lord Rayleigh's Committee adopted the principle that the gas should be tested in the burner to show the best results. They came to the conclusion that the "Metropolitan" argand No. 2 burner ought to be used; and the Company were now only seeking to put themselves in line with the London and Provincial Companies. Generally the question of the amount of the reduction in the standard price, unless agreed on beforehand, had been settled by the Committee before whom the Bill came; but he thought it desirable that they should make a fair offer, and he considered the saving would be about 2½d. For the sake of peace, they had made it 3d. The whole reason for the reduction of the illuminating power was that, where 14-candle power gas was properly burned, it was absolutely

as good for all purposes as 16-candle gas. The clause dealing with sulphur compounds was a Model Clause affirmed by Parliament over and over again.

The CHAIRMAN said there was no necessity to address the Committee on that point.

After the Committee had considered privately for a little while, the Chairman announced that their unanimous opinion was that the Bill should proceed.

OLDHAM CORPORATION BILL.

Local Legislation Committee—Tuesday, May 4.

(Before Sir FRANCIS LAYLAND-BARRATT, Chairman, Dr. COOPER, Mr. J. S. FLETCHER, Mr. E. GARDNER, Mr. HALL, and Mr. MANFIELD.)

This Bill, which has been under consideration for several weeks, has for its objects to authorize the Corporation of Oldham, among other things, to confer further powers in respect to the supply of gas. The gas part of the measure was reached to-day.

Mr. BALFOUR BROWNE, K.C., Mr. WEDDERBURN, K.C., and Mr. JEEVES appeared for the promoters (Messrs. Lewin, Gregory, and Anderson, being the Parliamentary Agents). There were a large number of petitions against the Bill from various authorities and companies in the district.

Mr. JEEVES said the reason why he now proposed to deal with this part of the Bill was that many of the petitioners who were petitioners against the water portion, were also petitioners against the gas, and expense would be saved if the Committee would not mind taking the parts out of order.

The CHAIRMAN having assented,

Mr. JEEVES, continuing, said that on the gas, only two or three questions arose. There were three principal points of contention, as he understood it. One was that they wished to take certain powers with regard to residuals. The second was that they proposed to take the standard burner according to the Model Clauses for the testing of gas. These two points were objected to by some of his learned friends. Then, also, certain questions, somewhat akin to those they had been dealing with in the matter of water, arose on the question of gas. He would propose, subject to anything that might be urged, to take first of all the matter of the burner; after that, to take the question of residuals; and, subsequently, the question of the charges, which did not really arise on the Bill at all, but which was a matter brought in as a condition of the grant to them.

After discussion between the Committee and Counsel,

Mr. JEEVES said the gas part of the Bill dealt with a variety of matters. He did not propose to open any question other than that which was the subject of the particular clause 63. The clause was as follows:

(1) For testing the illuminating power of the gas supplied by the Corporation, the burner to be used shall be that known as the "Metropolitan" argand No. 2, the photometer shall be the bar photometer, the standard light shall be that supplied by Harcourt's ten-candle pentane lamp, and in making the test the burner shall be so used as to obtain from the gas when burned at the rate of 5 cubic feet per hour the greatest amount of light. Provided that the Board of Trade may, on the application of the Corporation or any twenty consumers of the gas supplied by the Corporation, approve the use of any other burner photometer or standard light which may appear to the Board to be equally or more suitable for the testing.

(2) The Corporation shall, within three months after the passing of this Act, provide all the necessary apparatus for testing gas under this section, and shall at all times keep the same in proper order and repair.

(3) As from the passing of this Act, section 149 (experimental meter) of the Act of 1865 shall be, and is hereby, repealed.

What they were trying to do by this clause was to adapt to the gas which the Corporation supplied the test which was provided by the Model Clauses of to-day, instead of the old test provided by section 149 of the Act of 1865. This section of the Act of 1865 read as follows: "The Corporation shall, within six months next after the announcement of this Act, cause to be erected in some convenient part of their works, and in such a situation as to test the whole of the gas supplied by them, an experimental meter furnished with an argand 15-hole burner and a 7-inch chimney, or other approved burner and chimney capable of consuming 5 cubic feet of gas per hour, with other necessary apparatus for testing the illuminating power of the gas." This test of gas was of necessity alike to the consumers in the borough of Oldham and to those in the gas limits outside the borough. Gas consumers in the borough were perfectly satisfied to let the Corporation have this modern test. So far as he knew, the consumers in some of the outside areas were also content; but there were one or two local authorities who desired them to remain where they were, and to continue to test the gas by the test provided in the 1865 Act. With regard to this, he would point out that it could not affect the consumers in the outside areas in any way different from those in the borough, because there was no differential charge, and, further than this, there was a limitation of the profits which the Corporation might make. If, as a result of this absence of differential price and limitation of profit, it followed that there was any economy resulting from the use of this burner, or if there was any increase of revenue from the use of the burner, both of these things must inure to the benefit of the consumer in the outside area equally as to the benefit of the consumer in the inside area. Why, therefore, the consumers in some of these outside areas should think it worth while to come here and object to a proposal of this kind, was difficult to understand. The urban district of Chadderton raised the point.

Mr. J. W. GREIG (who appeared, with Mr. TALBOT, K.C., for the Springhead Urban District Council, and the Chadderton, Crompton, Lees, and Royton Urban District Councils, and the Limehurst Rural District Council) said that all the outside districts raised it.

Mr. JEEVES understood that, although it was raised in the joint petition, only Chadderton really objected to the proposal made.

Mr. GREIG thought that all the outside districts objected. He understood that another one, which he did not represent (Failsworth) did

not object. All the others whose names were on the three petitions now before the Committee—Springhead, Chadderton, Crompton, Lees, Royton, and the rural district of Limehurst—objected. They were all within the gas limits.

Mr. JEEVES: Does Failsworth object?

Mr. FLEETWOOD PRITCHARD (who appeared with Mr. HONORATUS LLOYD, K.C., in support of the petition of the Failsworth Urban District Council) said they would not object, provided they were satisfied that the benefits would really go to the consumer.

Mr. JEEVES, having thanked Mr. Pritchard for stating his position, proceeded to deal with the joint petition of the Urban District Councils of Chadderton, Crompton, Lees, and Royton, and the Rural District Council of Limehurst. The petitioners objected to the provisions of clause 63 of the Bill "whereby the Corporation would be enabled to supply an inferior quality of gas." If this particular allegation were true, all he could say was that the modern clauses were encouraging the supply of gas of an inferior quality. They would be told that, as a matter of fact—as no doubt they had been told in many other cases—with the modern burner the lower candle power gas within certain limits was a much more useful gas for the purpose of lighting, and that the effect of the proposed change in the test would probably be to reduce to the Corporation the cost of the gas supplied. If that were so, the benefit must inevitably accrue to everybody within the limits of the gas supply, which included all the outside areas with whom they had been dealing in the matter of water.

Mr. William Newbigging gave evidence from his experience as to the conditions of gas supply in Oldham. He and his father before him had for many years been the Consulting Engineers of the Corporation with regard to gas supply. As to clause 63—change of burner—it was, generally speaking, taken from the Model Bill. This provision in the Model Bill had undergone a good many changes. Since it was adopted by the Gas Referees in 1906, it had been practically put into every Bill that had come before Parliament. The difference between the burner that was specified in the 1865 Act of the Corporation, and the one which it was now proposed to insert in the present Bill would be from 2 to 2½ candles. The return which the Corporation Gas Department made to the Board of Trade was based on the burner which they were using at present. The Corporation had no intention, so far as he understood it, to alter or reduce the quality of the gas which they were at present supplying. They simply asked for powers to adopt this burner. So that the only alteration that would take place would be this, that instead of returning something like 18 candles in the Board of Trade returns, they would return something like 20½ candles. They had no intention of reducing the quality of the gas at present.

Mr. Arthur Andrew, Business Manager of the Gas and Water Department, testified that it was certainly more in the interests of consumers that the proposed change should be made than in the interest of the Corporation.

Mr. GREIG then contended that if the Committee permitted the Corporation to alter the method of testing their gas, the inevitable result would be that in the outside districts (where they used the gas largely in flat-flame burners) they would have to use more gas; and therefore the commodity supplied would be of greater cost to them. They were already labouring under difficulties with regard to the supply of gas as they were under with regard to water. They no doubt paid the same price in the outside districts; but the Corporation were entitled to supply within their own district, and they did so gratuitously. They also applied the whole profits of the undertaking within their own limits. Therefore, any increase in the supply of gas to them was an additional hardship in the competition which naturally went on between manufacturer and manufacturer in the district. Of course, the price of gas that was going to be supplied was not to be increased; but their contention was that lowering the illuminating power of the gas would inevitably necessitate either the employment of incandescent mantles or a larger number of flat-flame burners in places where the latter were used. He would be able to produce evidence to show that in the outside districts the flat-flame burner was employed not because of any want of progress in the outside areas, but because in the card-room and other parts of a cotton mill the flat-flame burner was preferable, as it was less dangerous.

Mr. J. B. Tattersall, President of the Oldham Master Cotton Spinners' Association, and Vice-President of the Federation of Master Cotton Spinners' Associations, gave evidence against the proposals of the Bill. He was followed by Mr. Isaac Carr, whose evidence was to a large extent similar to that given by him in the Salford and Dublin cases—reported elsewhere, pp. 379, 386.

Wednesday, May 5.

Mr. E. GARDNER presided over the Committee to-day.

Mr. S. Smethurst, Chairman of the Royton Urban District Council, said it had been explained to them that it was a necessity of card-room operations that they should have the flat-flame burner for safety, and if the quality was reduced, the illumination would also be reduced, and they would either need to have more burners or larger ones, with the result that the atmosphere would be vitiated, and the operatives would suffer. But he wanted to say that he thought it had been made apparent that protection could be obtained for the incandescent burner in the card-room. He did not personally object as much to this question as he did at the beginning. If they had the incandescent burner, it had to be of a special form. It was suggested that it might cost from 5s. to 16s.; but he did not know anything about that. There had been many complaints from the ordinary cottages as to the poor quality of the gas.

Mr. JEEVES submitted, on behalf of the Corporation of Oldham, that in this matter of the best burner they would be wrong if they did not progress, as they would be wrong if they did not progress in other things. Whatever they did, they would be guided in the future by the same business spirit that had distinguished them in the past.

The CHAIRMAN said the Committee were advised that they had better not give a decision on this matter, being short of a quorum. They had heard the evidence, and would give a decision when all the members of the Committee were present.

Mr. JEEVES said that there were two other matters. One was the

question of manufacturing any residual products. He was afraid this would still have to be fought at length. The other was the question of the financial position of the consumers as a whole to the Corporation, as the owners of the gas undertaking. In the case of gas, they had no differential charge; whereas in the case of water they had a differential charge. The question of gas charges was very fully considered by Parliament in 1886. When they did away with their power to make differential charges, they also limited the amount of profit that they were entitled to make. But the case of the opponents then was that there ought to be a limit. The whole question before Parliament was what the limit should be. Several of the opponents desired to raise all these questions again, and put themselves in the position to do it by their petitions. But he was happy to say that an arrangement had been come to between the Corporation and the petitioners who were petitioning in this direction, the terms of which they would bring up later. As the result of these arrangements, it would not be necessary for the Committee to consider this question at any length.

After discussion, it was agreed that the following Tuesday [to-day] should be fixed for the consideration of the water and gas clauses.

The question of the manufacture of residuals was next proceeded with, and the petition of the Royton Urban District Council heard.

Mr. JEEVES said what they asked for in clause 56 of the Bill was this:

The Corporation may, upon the lands described in the second part of the third schedule to this Act, erect and maintain works, machinery, apparatus, and conveniences for the manufacture, conversion, utilization, storage, and distribution of materials used in, or residual products resulting from, the manufacture of gas, and may do all such acts as they may think proper for manufacturing, distilling, selling, providing, supplying, and dealing in lime, coke, chemicals, tar, pitch, asphaltum, ammoniacal liquor, oil, and all other products or residuals of any materials employed in, or resulting from, the manufacture of gas.

Mr. GREIG gathered that one of the reasons Counsel submitted to the Committee for the granting of this clause was that in other places the manufacture of residuals was carried on without the slightest objection or nuisance being caused. It would meet their case if they were willing to put into this clause a provision that if any nuisance was caused by the manufacture or conversion, or exercise generally, of the powers of the clause to them, or inhabitants in the neighbourhood, they should have the usual legal remedies.

Mr. JEEVES said it would be ridiculous for them to come here and ask for this power under these circumstances.

Mr. Jason Thompson, the Chairman of the Gas-Works Committee of the Corporation, Mr. T. Duxbury, the Gas Engineer to the Corporation, and Mr. W. Newbigging were called in support of the clause.

Subsequently Mr. Isaac Carr and Mr. S. Smethurst were called in support of the petition.

Mr. GREIG urged that the Oldham Corporation were now seeking an extra power beyond that which they had at present—a power which Parliament had carefully indicated should be notified to everybody who would be at all likely to be affected by it. The Standing Orders were directed to the very point that all these people who were within certain limits should have notice of the power when it was sought. Obviously, the principle underlying that was this—that in the process of making these residuals there might be objectionable nuisances created. In this case, the Royton Urban District Council, who were practically representing the interests of their ratepayers, and the inhabitants of the district, had come to the conclusion that without some protection there was a possibility of this sort of thing. The Corporation no doubt made out a strong case, on the ground that they might be able to reduce the cost of their work, and they might be able to make their manufacture of gas yield more revenue if they had these powers of turning their residual products into a marketable commodity. If they were going to do it in their own neighbourhood, and for their own purposes entirely, of course, Parliament might concede it; but the result of the concession of these powers would be that the Royton people would be exposed to what would be a very serious matter in the future. It might be true that such works could be carried on in other places, and had been carried on in other places, without a nuisance; and the evidence that had been given on behalf of the Corporation, taking their construction of such powers, was that it could be so carried on, and that there was no likelihood at all of a nuisance arising. Why not, then, give the protection asked for? There could be no harm in putting on the face of the Act of Parliament what Parliament had put on the face of every Special Act passed with regard to the ordinary production of lighting gas. The Gas-Works Clauses Act included this very clause. Something to this effect they wanted. They would have been glad to have seen the clause disappear altogether, because they were apprehensive. Their position was imperilled by the clause as it stood. They did not wish the production of residuals to go on in their district. But they were not taking up an absolutely hostile attitude if a strong case was made out for such a thing on the ground of more profit to the Corporation and a reduction of price. But they did say that a parliamentary concession to them of the extraordinary power ought to be accompanied by a proper protection to them as the inhabitants and ratepayers of the district.

Mr. JEEVES having replied for the promoters,

The CHAIRMAN said a decision would be given the following day.

Thursday, May 6.

The CHAIRMAN to-day (Sir F. Layland-Barratt) said the Committee were prepared to grant clauses 56 and 63 (burner to be used in testing gas).

Other parts of the Bill were next considered; and the Committee adjourned until to-day.

Lord Onslow, Lord Chairman of Committees, had before him last Tuesday the following Gas Bills: The Leyland and Farington Gas Bill, which has for its object the granting of further powers to the Company and authority to change the name of the undertaking to the Leyland Gas Company; the Littlehampton Gas Bill, for the dissolution and re-incorporation of the Company; and the Conway Bill, which empowers the Borough of Conway to supply gas outside the limits of their district, to borrow further moneys, and for other purpose. The Bills were ordered to be reported with amendments.

PONTYPOOL GAS AND WATER BILL.

House of Lords Committee.—Monday, May 3.

(Before Lord RIBBLESDALE, Chairman, Marquis of BATH, Lord ZOUCHE, Lord SALTOUN, and Lord BIDDULPH.)

This is a Bill to enable the Pontypool Gas and Water Company to construct water-works, raise more capital, and for other purposes.

The promoters were represented by Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. G. J. TALBOT, K.C.; Mr. VESEY KNOX, K.C., and Mr. R. S. CLEASE appeared for the Monmouthshire County Council.

Mr. HONORATUS LLOYD, in opening, said that originally there were a number of petitions against the Bill; but these had now been reduced to two. In 1873, the Company were incorporated for gas and water purposes. They took over an undertaking which had been formerly carried on by a limited Company. The Company's limits of supply for water were extended in 1890. The district had for some years increased at a very abnormal rate, and they had had to take precautions and provide further works. In 1906, an epidemic of typhoid broke out. The Company's water was being continually analyzed and found to be good. There were wells which were found to be polluted, among them being one at the gas-works. A medical inspector of the Local Government Board thought the epidemic had been to some extent accelerated by this well; and actions were brought against the Company, by the Pontypool Council and others, to recover damages. There were in all fifteen actions brought. But Mr. McKenna and a member of the County Council intervened; and as a result of negotiations, the Company, while denying liability for the epidemic, and without prejudice, agreed to pay a sum of £4500, which the Council were to disburse. The Bill was placed before the Town Council of Pontypool, who offered no opposition. But there were two petitions—from the Monmouthshire County Council and certain consumers of water. The County Council pointed out that, having regard to the past history of the Company, no further powers should be granted to them without full investigation. The Company should be compelled to give a satisfactory supply of water. Counsel pointed out that it would not be fair to compel the Company to supply these places, which could not be reached by gravitation from their works. It would be unreasonable to ask them to do more by constructing special works. This was a question which had constantly arisen, and was last year fought out on the Liverpool Corporation Bill, where the powers given were similar to those for which the promoters were now asking. The Company were now constructing further filtration works. There was a report by the Local Government Board upon which one or two matters remained outstanding; the chief point being that the Board suggested that the powers asked with regard to bye-laws were unusual. There was also a report from the Board of Agriculture and Fisheries as to compensation water being given to a certain river; and by the Bill compensation water was being given.

Mr. Davey, civil engineer, of Westminster, gave evidence in support of the Bill.

In reply to Mr. VESEY KNOX, witness said that they had filtration works at every source of supply. He agreed that when the epidemic broke out, they were supplying from the gas-works spring, and that the water was not filtered. With regard to the supply of water to places at a considerable height, he said they would give a supply if it could be done at a reasonable cost. Under the Bill, the Company would be the judges as to what was "a reasonable cost."

Tuesday, May 4.

When the Committee resumed their sitting this morning,

Mr. VESEY KNOX, in reply to the Chairman, said there were three points which the County Council raised in petitioning against the Bill. With regard to filtration, they brought forward a clause asking that there should be the right to have the question of the quality of the water determined by arbitration. The second point was with reference to pressure; and the County Council asked that, in addition to the obligation undertaken by the Company, there should be a proviso that the water should be supplied from the sources that would give the best available pressure, where it could be done at a reasonable cost. This matter also should be determined by arbitration. Their third point was with regard to the authorized charge for baths.

Replying to the Chairman, Mr. BALFOUR BROWNE said that the remarks in the report of the Local Government Board, as to bye-laws, were not of great value. The proposed clauses with regard to this matter were in the Bristol Water Bill last year, and were now working there quite satisfactorily.

Mr. Charles Hawksley, speaking with regard to the point of pressure, said he did not know of any precedent placing an obligation upon a water company to give a supply "at a reasonable cost" as might be determined by arbitration. Parliament had thought fit to trust water companies to carry out the duties that were placed upon them.

Mr. VESEY KNOX, addressing the Committee on behalf of the Monmouthshire County Council, said that there had been some question raised as to whether the County Council had any right to interfere in this matter; but he contended that the Standing Orders determined the question. One of the general duties of a county council was to see to the sanitary condition of the water supply. With regard to the question of filtration, he said there was no doubt that the Company had supplied water without filtration. Where outbreaks of typhoid fever had occurred, it had been frequently found that the analysis of the water did not show it to be defective. The County Council were not asking the Company to give a supply to the top storey of every house within their limits of supply, but that, when the proposed reservoir was built, the water there should be made available for all parts of the district which could be reached at a reasonable cost.

Mr. BALFOUR BROWNE, replying on behalf of the promoters, denied that this was any concern of the County Council's, having regard to the fact that there were three local authorities affected, and who were quite satisfied with the proposals contained in the Bill. The filtration had been agreed to with these local authorities.

The Committee approved of the preamble of the Bill.

MISCELLANEOUS NEWS.

GAS-WORKS SIDINGS AND RAILWAY RATES.

RAILWAY AND CANAL COMMISSION.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE-HARDY, and Sir JAMES WOODHOUSE.)

Corporation of Birmingham v. Midland Railway Company,
London and North-Western Railway Company, and
Great Western Railway Company.

Seventh Day.—Tuesday, March 30.

This was a case in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, asked for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies on inward and outward traffic to the various works. They also asked for a declaration that the London and North-Western Company had exceeded their maximum charge for use of trucks. Further, they claimed damages in respect of the past six years' overcharges. The earlier proceedings were reported on pp. 105, 167, 240, 316.

The following were the Counsel engaged: For the Corporation: Mr. BALFOUR BROWNE, K.C., Mr. J. A. FOOTE, K.C., Mr. A. H. M'CARDIE, and Mr. J. B. WORTHINGTON (instructed by Messrs. Sharpe, Pritchard, and Co., Agents for Mr. E. V. Hiley, Town Clerk of Birmingham). For the Midland Railway Company: Sir ALFRED CRIPPS, K.C., and Mr. L. MACASSEY (instructed by Messrs. Beale and Co.). For the London and North-Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. J. B. ASFINALL (instructed by Mr. C. de J. Andrewes). For the Great Western Railway Company: Sir ALFRED CRIPPS, K.C., Mr. J. A. SIMON, K.C., M.P., and Mr. HAROLD RUSSELL (instructed by Mr. R. R. Nelson).

Mr. Balfour Browne's Reply for the Corporation.

On the sitting of the Court to-day,

Mr. BALFOUR BROWNE at once proceeded, on behalf of the Corporation, to reply on the whole case. He said that, to clear up any difficulties, and to get rid of some of the propositions that had been put forward by Sir Alfred Cripps and Mr. Simon, he would refer to the powers of the Provisional Order of 1891, which gave a railway company the authority to charge for conveyance. Section 2 of the Order said: "The maximum rate for conveyance is the maximum rate which a company may charge for the conveyance of merchandize by merchandize train, and, subject to the exceptions and provisions specified in this schedule, includes the provision of locomotive power and trucks by the company and every other expense incidental to such conveyance not hereinafter provided for." Then his learned friend skipped from section 2 to section 5; but he left out two very important sub-sections to which attention should be directed. Section 3 was: "The maximum station terminal is the maximum charge which the company may make to a trader for the use of the accommodation (exclusive of coal-drops) provided, and for the duties undertaken by the company for which no other provision is made in this schedule, at the terminal station for or in dealing with merchandize, as carriers thereof, before or after conveyance." All that was provided for there was accommodation or services undertaken at the terminal station after or before conveyance. Section 4 was with regard to the service terminal: "The maximum service terminals are the maximum charges which the company may make to a trader for the following services when rendered to or for a trader—that is to say, loading, unloading, covering, and uncovering merchandize, which charges shall in respect of each service be deemed to include all charges for the provision by the company of labour, machinery, plant, stores, and sheets." These were the only things that a railway could charge for to a trader where the merchandize was conveyed from a station to a station; and if at the station of arrival the trader wanted to do the unloading himself, there would be found in the remainder of section 4 provision for his doing so. When traffic was conveyed from a station to a station, how was a rate made up? As a fact, they knew that railway companies did not go into it elaborately and make it up in this way. Unfortunately, they generally looked at what the traffic would bear—the three maxima. That was to say, the maximum for conveyance, the maximum for station accommodation, and the maximum for service terminal. They charged all three; and it was admitted on the other side that, in that case, if they were charging an accommodation terminal and a service terminal, the trader had a right to have this taken off as a rebate. That was, the trader who did not have the services, or who did not use the accommodation, had a right to the rebate. Supposing the three maxima together came to £1, he had, according to the other side, a right to a rebate. Now suppose, instead of finding that the traffic would bear £1, they put it at 10s., but did exactly the same services, could anybody believe that this rate did not cover the services and the accommodation? Yet this was the Companies' case here. It did not matter in the least whether the rate was under the maximum or not. This contention of the other side was founded on the New Union Mills case, which seemed to him an extraordinary decision at the time. But even if it was binding, it had no bearing on the present case. This case (Vol. 9, "Railway and Canal Traffic Cases," p. 152) was not under section 4 at all; and the Birmingham Corporation were before the Court under section 4 of the Act of 1894. The case referred to was under section 33, sub-section 3, of the Act of 1888; and, just to show how dangerous it was to argue from one section to another which was totally different, he would point out that the case in question was decided simply upon section 33, and the question whether section 4 of the Act of 1894 made any difference was expressly reserved. Mr. Justice Collins said: "He may claim some other form of rebate in

respect of something which he has not received, and which other people receive for the same rate. It may or may not be that section 4 does entitle a person under these circumstances to a rebate, notwithstanding the railway company assert that no charge is made in respect of the particular matter in regard to which he asks for the rebate. I do not decide that point. I only say there does not appear to me any inconsistency between section 4 of the Act of 1894, and section 33, sub-section 3, of the Act of 1888." The Act of 1894 was a punitive measure; and section 4 read: "Whenever merchandize is received or delivered by a railway company at any siding or branch railway not belonging to the company, and a dispute arises between the railway company and the consignor or consignee of such merchandize as to any allowance or rebate to be made from the rates charged to such consignor or consignee in respect that the railway company do not provide station accommodation or perform terminal services, the Railway and Canal Commissioners shall have jurisdiction to hear and determine such dispute, and to determine what, if any, is a reasonable and just allowance or rebate." There was not one word there as to whether they were charging the maximum or not. It was about the rate they charged that the dispute arose; and he was to have a rebate in respect that they did not provide accommodation or do any service for him.

Justice LAWRENCE: But does not the section begin by pre-supposing that the rate includes a terminal or station accommodation?

Mr. BALFOUR BROWNE: No; distinctly not. It says: "Whenever merchandize is received or delivered by a railway company at any siding or branch railway." There is no terminal there possible. That is why I read sections 2, 3, and 4 of the Provisional Order. Their only power is to charge for accommodation at a station, for services at a station. This section does not deal with that at all.

Justice LAWRENCE: It does not arise from that. It says the dispute arises "as to any allowance or rebate to be made from the rates charged to such consignor or consignee in respect that the railway company do not provide station accommodation."

Mr. BALFOUR BROWNE: Quite so. It cannot be assumed for an instant that there is a terminal in that. It is a rate without a terminal.

Justice LAWRENCE: Suppose the case of a trader who has sidings, and who is simply charged a conveyance rate upon his traffic, and a low conveyance rate, if you like, so as to make the thing perfectly plain. Can he, notwithstanding that that is all he is charged, get a rebate or allowance?

Mr. BALFOUR BROWNE: Suppose the station rate is 10s., and the railway company said: "We are not going to charge you a station rate at all. We are going to charge you 8s.; and that is only conveyance to your door, and putting the train over it." Certainly I cannot claim the 10s. They have given me a rebate. And that is the dispute.

Justice LAWRENCE: There are two classes of cases to which the mind must be applied. In order to get this section applicable so as to entitle the claimant to a rebate, you must be sure the case is one in which there is some charge being made that is not justified.

Mr. BALFOUR BROWNE: All that this section says is, when there is a dispute, if the trader is entitled to a rebate, he is to have it. But remember what we are doing here is this: We are charged exactly the same rate that is charged to an ordinary trader to the station; and I have also tried to say that I will assume—even if the House of Lords decides it—that the 10s. rate to the trader at the station does include something for accommodation. If there is any portion of that 10s. rate paid for station accommodation, then, on showing that the same rate is charged to me, I am entitled to a rebate. This was decided in the first Birmingham case. Mr. Simon has said: "Once you find that you are within your maximum powers, there is really no inference to be drawn from the circumstance that the rate happens to be the same from or to a siding as it is from or to a station." This proposition I deny. Whether it is within the maximum or not, I ask the Court to draw the inference that the Company are charging something for the accommodation. I am going to argue: First, that there is a terminal in rates to Lawley Street; secondly, that I do not care whether there is a terminal in the rates so-called to Lawley Street or not, because I will ask you to infer that there is something charged for station accommodation; and, thirdly, that they do not perform any services to me which can be placed against the terminal. Proceeding to deal with the last point, the learned Counsel said that section 5 of the Provisional Order read: "The Company may charge for the services hereunder mentioned, or any of them, when rendered to a trader at his request or for his convenience, a reasonable sum, by way of addition to the tonnage rate." Was there anything which the Companies did in this case that was either at the request or for the convenience of the Corporation? Absolutely nothing. It was obvious from the words of the section which came after that the service must be one special to the trader; but was there anything special which the Companies did for the Corporation? Take Swan Village as an instance. Everything they did for the Corporation was done for traders at the station. This was admitted. If the Great Western Company had a set of sidings close to Swan Village, where the traffic could be marshalled, they would not need to carry it to West Bromwich. Therefore what they did was for their own convenience—just as the London and North-Western Company, not having a set of sidings at Nechells, for their own convenience carried the traffic from Nechells to Windsor Street, and said quite properly that they did not charge anything. It might suit the Railway Companies to have the marshalling done at Windsor Street, or ten miles away; but it would not make a bit of difference to the Corporation. How could it be said to be at their request or for their convenience? Therefore he said there was no service here that they did not do for the trader. Look at Saltley. Mr. Thompson had stated that when the coal came in a train mixed with other people's goods, exactly the same service was performed for the Corporation trucks as for those of an ordinary trader. But he said it was different when it came in a full train-load. Did the Companies want full train-loads or single trucks? Then what about sorting, if the traffic consisted of a single truck, or of two trucks going in different directions? The thing was nonsense.

Justice LAWRENCE: Are we to take your argument as going to the length of denying that there is such a thing as sorting?

Mr. BALFOUR BROWNE: I deny absolutely that there is such a thing

as sorting by a private trader. It does not exist. Sorting is marshalling, and marshalling is sorting. There is no such word as "sorting" anywhere used except by Mr. Simon. It is not recognized by Statute. It is marshalling traffic; and marshalling traffic is putting it in station order. How can a trader put it in station order?

Justice LAWRENCE: Suppose the Postmaster-General, instead of paying the Railway Company for providing a sorting carriage and sending sorters to do the sorting, gave the railway company a bag of letters, and said: "There they are. They are all addressed. Deliver them to where they are going." Would not that be casting upon the railway company a service that they would have to perform?

Mr. BALFOUR BROWNE: I think the railway company would very likely refuse to undertake the obligation of sorting them out for the Post Office.

Justice LAWRENCE: So do I; and that is exactly what the Railway Company could do with the trucks. Of course, I am only putting this as a mere illustration.

Mr. BALFOUR BROWNE: No traders' trucks are sorted by traders. Take them on the Lawley Street sidings, who sorts them there?

Justice LAWRENCE: But they sort them there and charge for it. That is the difference. It is all part of the services for which they are entitled to charge, and for which they do charge; and in making analogies, you jump from a case in which there is a charge made, to another in which you want to say no charge should be made. They cannot make the whole terminal charge, no doubt; but they can make a charge.

Mr. BALFOUR BROWNE: With great respect, that is not so. Take traffic coming in through Washwood Heath sidings. There the services for the trader are exactly the same as for us. Who pays for that—the trader? It is in the conveyance rate, not in the terminal, because they could not charge a terminal at Washwood Heath.

Justice LAWRENCE: That, of course, depends really upon whether the Washwood Heath sidings are sidings ancillary to delivery or ancillary to conveyance.

Mr. BALFOUR BROWNE: No, my Lord, it depends upon whether they are at a terminal station.

Justice LAWRENCE: Do you mean you could not have your sidings performing some service?

Mr. BALFOUR BROWNE: These are very large exchange sidings; and there is no charge for exchange with other companies. That is part of conveyance.

Justice LAWRENCE: Of course, it is part of conveyance.

Mr. BALFOUR BROWNE, continuing his argument, said the Corporation could not make up the trains for the Companies. They must do it themselves; and therefore this charge for sorting was entirely outside their powers. It was marshalling and shunting, which was clearly the duty of the Companies. His Lordship had suggested that Washwood Heath might be a terminal station; but the definition of "terminal" by clause 26 of their own Provisional Order was: "The term 'terminal station' means a station or place upon the railway at which a consignment of merchandise is loaded or unloaded before or after conveyance on the railway, but does not include any station or junction at which the merchandise in respect of which any terminal is charged has been exchanged with, handed over to, or received from any other railway company, or a junction between the railway and a siding let by or not belonging to the company, or in respect of merchandise passing to or from such siding, any station with which such siding may be connected, or any dock or shipping place the charges for the use of which are regulated by Act of Parliament." In support of his contention that the marshalling and shunting operations were not a special service to the Corporation, he quoted the case of the *Chatterley Iron Company v. North Staffordshire Railway Company* (Vol. 3, "Railway and Canal Traffic Cases," p. 238), which, however, was before the passing of the Provisional Order. Sir Frederick Peel, in his judgment in the case, said a railway company could not carry on the business of a carrier if they had no place to shunt or to stand or deposit their trucks in; and they could not therefore be said to perform a special service (which were the words of section 86 of the North Staffordshire Company's Act of 1847) by having and using or granting the use of such places. In that case they had to decide the question of whether it was a special service; and the same point had to be settled now. But the words were even stronger in the Provisional Order at present concerned. It must be for the convenience or at the request of the Corporation. If the providing of these sidings was not a special service, then the Washwood Heath sidings, the Duddleston Mill sidings, the sidings at Windsor Street Station, the sidings at West Bromwich, and the haulage to West Bromwich, all had to come out; and the Companies had not provided any service at all in the Corporation works. They admitted that they were bound to bring the traffic to the gas-works sidings; and, further than this, the Court would see what their obligation was under the Railways Private Sidings Act of 1904, section 2: "The reasonable facilities which every railway company are required to afford under section 2 of the Railway and Canal Traffic Act, 1854, as amended or explained by any other Act, shall include reasonable facilities for the junction or private sidings or private branch railways with any railway belonging to or worked by any such company, and reasonable facilities for receiving, forwarding, and delivering traffic upon and from those sidings or private branch railways." "Upon and from"—that was their duty. The Companies did not do this. Really, the Corporation might claim that they themselves were doing a great deal of the services. With regard to the Saltley works, the Company were doing the work. They brought the traffic to the Corporation points and pushed it in. That was upon the gas-works siding. But with reference to the Midland traffic at Neshells, this was not the case; and the same remark held good with regard to the North-Western Railway and the coke at Windsor Street. In these respects the Companies stopped short of their duty. He was not claiming anything for this; but he wished to emphasize the fact that the Companies were doing no more than their duty when they brought the traffic to the Corporation siding, and whatever happened until they brought it to the siding (unless it was at the request or for the convenience of the Corporation) could not be counted as against the Corporation in the price the Companies were to charge. It was conveyance, pure and simple. He did not want to go at greater length into the ser-

vices rendered; but he wished to show now that there was a terminal in the charge made to Lawley Street.

Justice LAWRENCE: The difficulty of all these questions is that in the terminal services at a station things are done for the trader which are almost, if not quite, identical with the services which are done here for you; and while it is true to say that the services done for you are not worth as much as those done for the trader, your argument seems to me to go to show that they cannot charge you anything.

Mr. BALFOUR BROWNE: I am going to try to say that. At the station it is not the same service at all that is performed.

Justice LAWRENCE: I am not saying it is; but surely some of the things are.

Mr. BALFOUR BROWNE: None of them, I think.

Justice LAWRENCE: Well, you think none.

Mr. BALFOUR BROWNE: No, my Lord. What is done is this: First of all, they provide the station. They do not do this for us. Secondly, they allow the truck to stand three days for the consignee of the goods to take delivery. They do not do this for us. The trucks are returned almost immediately. What do they do at Lawley Street for the trader similar to what they do for us? Nothing. They deliver our coal, and nothing more. I have the letter here of Feb. 20, 1906: "Subject to these remarks, the Midland would assess 1d. per ton as the terminal charge at all the collieries named, and another 1d. as the terminal charge at Saltley gas sidings, Neshells gas sidings, and Lawley Street Station, attributing the remainder of the rates charged to conveyance." You will see that this was a terminal charge at Saltley gas sidings, Neshells gas sidings, and Lawley Street Station—not a special service at all. In their own disintegration, they put down: Terminal at Lawley Street upon coal, 1d. I am trying to show that in all the local rates for coal they charge a terminal of 3d. Upon coke, by their own disintegration, they are charging 3d. at Lawley Street; and coal and coke are in exactly the same class—Class A. Therefore I ask the Court not to believe that disintegration upon coal. They come here and say they are only charging 1d. upon this traffic at Lawley Street, and that therefore when they say "1d. for your services," they have equated it. I say even if our services cost them 1d., I am still 2d. out by their own showing. But, my Lord, do you believe the deduction of this terminal? For two years after our application, they said they were charging at the receiving end a terminal upon the coke of 3d. But they were charging us 2½d., and even up to 8½d.; and it was only two years after our application that they reduced it to 1d. Now it is 1d. all round. How can they justify the 1d.? They now say that the services are worth 1d.; but they were charging us 8½d. on Lichfield City, and it varied in other cases. Was there really any proper charge made at all?

Justice LAWRENCE: But you are going to get the benefit of that.

Mr. BALFOUR BROWNE: With regard to that I am not complaining. I was only commenting on what they say now. Is it true when they say that they charge 1d.?

Justice LAWRENCE: The difficulty is in forming any sort of conclusion upon the point. The Legislature has thrown upon us the investigation of a matter which is unexplainable. The Company never have disintegrated before; and they naturally disintegrate as at the moment the particular clerk who has got charge of it may think best; and if that is found not to be good disintegration, another is substituted. But neither of the disintegrations has any relation to, or anything to do with, the original making up of the rate.

Mr. BALFOUR BROWNE: I agree as to the difficulty; but that is not to deprive the trader of his right to a rebate or an allowance.

Justice LAWRENCE: No, I do not say it is to deprive him in the least; but when you are arguing about whether it is, or whether it is not, the thing, whether it is true, or whether it is not, my mind really fails to see how one is to grope one's way to a conclusion.

Mr. BALFOUR BROWNE (continuing) said first he wanted the Court to infer, from the fact that the Company admitted a terminal charge at the receiving end (among others at Lawley Street) of 3d. in coke, that there was a 3d. terminal on coal. Therefore if the Company did a 1d. service for him, he was entitled to 2d. But, further, he claimed that a trader could demand a rebate when no terminal was included in the rate. He had tried, of course, to show that there was a terminal in this case. But he was going to assume now that there was no terminal at Lawley Street at all; and he said that under these circumstances he was still entitled to a rebate. The claim was not in respect of whether the terminal was included. It was that the Railway Company did not provide services or accommodation. Whether they charged a terminal or not, they did not provide station accommodation for the Corporation. In the Salt Union case, to which Sir Alfred Cripps had referred, Mr. Justice Wright, in his judgment, said: "I wish very emphatically to reserve to the Court the right and the power of inquiring, under section 4 of the Act of 1894, whether a trader is not entitled to a rebate without reference to the question whether the second terminal is, in fact, included in a rate, though the rate may be within the maximum, where a comparable rate can be shown with reference to which the question can be raised." In the same case, Lord Justice Rigby, in his judgment, said: "The question before us turns upon the construction of section 4 of the Railway and Canal Traffic Act, 1894. I am unable to read the section as if the words 'in respect that the railway company do not provide station accommodation or perform terminal services' were not there, and that in place thereof there were the words 'in respect that the railway company have charged for station accommodation or terminal services.' If that had been intended, it would have been easy for the Legislature to have said so. Having regard to the language used in the section, it appears to me to be open to an applicant who brings himself within the section to prove his claim to an allowance or rebate in any way he can; and I am far from saying—though I do not decide it—that he might not prove his claim to an allowance or rebate without proof that the railway company had, in fact, charged him station accommodation or terminal services. . . . An applicant can make out any case which reasonably shows his right to an allowance or rebate; and I cannot think he is confined to proving that the rate charged does, in fact, include a charge for station accommodation or terminal services."

Sir JAMES WOODHOUSE: That seems to me a very strong expression of opinion in favour of the argument you are presenting.

Mr. BALFOUR BROWNE (continuing) said that Lord Justice A. L. Smith, on whom his friend relied, said: "In my opinion, the meaning of the section is that if a trader makes out by any evidence, whether by means of a comparable rate or in any other way, a *prima facie* or presumptive case that he has been wrongly charged for station accommodation or terminal services, then the Railway Commissioners should say that a case has been made out which the railway company are called upon to answer, and that the company must then show that they have not made the charge of which *prima facie* evidence has been given." Lord Justice Vaughan Williams, in his judgment, entirely concurred with Lord Justice Rigny: "What the section seems to me to say is this: Where the trader has his own siding or branch railway, and the railway company and the trader cannot agree as to what shall be the rate, or whether the rate actually charged by the railway company in the past and proposed to be charged by them in the future is a just rate, then in any such case the Railway Commissioners shall fix the rate. The Commissioners are by the section to 'have jurisdiction to hear and determine such dispute,' a different thing to my mind, from a cause of complaint, 'and to determine what, if any, is a reasonable and just allowance or rebate.' I confess that I do not feel at all certain that, whenever it is proved that the trader owns a private siding or branch railway, and that he consigns goods from the siding or branch railway over the lines of the railway company, and that a charge is made by the railway company against him, the trader has not a right, upon proof of those facts, to call upon the Railway Commissioners to determine what, if any, is a reasonable and just allowance and rebate to make by reason of the fact that the railway company have not the expense and trouble of providing station accommodation or of performing terminal services." If this was right law, he (Mr. Balfour Browne) was landed, and his learned friend, with his various propositions, was out of it. Lord Justice Vaughan Williams continued: "I see nothing in the Act which throws upon the applicants the duty of doing more than showing that the amount charged seems to be an unreasonable amount to charge for the service rendered by the railway company"—not one word about maximum charge from beginning to end. Then the case of *Tennant v. Caledonian Railway Company and North British Railway Company* had a peculiar likeness to the one now before the Court; and there it was held that the special services the applicants received at the hands of the Railway Companies were not a satisfactory reason for the same rates being charged at the applicants' private sidings at Panmure as were charged at Carnoustie and Barry, and that the applicants were entitled to have lower rates than the rates in force for similar traffic at Carnoustie and Barry—the extent to which they should be lower to be determined by the amount presumably charged for terminals at that end, ascertained on the principle adopted in *Pidcock's case*, less the reasonable sum that might be found due to the Railway Companies for special services. It was also held that where a railway company provided station accommodation, or performed terminal services, it was only reasonable to suppose that station and service terminals were equally with the charge for conveyance a component part of their rates.

Mr. MACASSEY: The facts in that case differed materially from those in the present one. All the outgoing traffic was marshalled by the applicants themselves on their own sidings.

Mr. BALFOUR BROWNE (continuing) said that in the case of *Vickers, Sons, and Maxim v. Midland Railway Company and Others* (Vol. 11, "Railway and Canal Traffic Cases," p. 249), when it was before the Railway Commissioners, Sir Frederick Peel, in his judgment, said: "The first question is, Are 85 per cent. of these rates outside the Act of 1894 by reason of their amount being consistent with there not being in them any station or service terminal at the Sheffield end, and of there being no evidence that such terminals are included? That the section is not limited to cases where the rate takes in, as one element, a charge for expenses at a terminal station, but may entitle a person to a rebate where, for the same rate that other people pay, whether the rate is one entire sum or a sum in which there are particular portions for particular expenses, he does not receive the same station accommodation that they do, is a view which this Court has from the first kept itself free to take." This was a view which was not dissented from in the Court of Appeal, when the case went there. Mr. Justice Wright, in his judgment on the same case, said: "If it were necessary to decide the point, I should hold that section 4 of the Act of 1894 gave jurisdiction to allow a rebate even without proof that any definite amount of terminal was included in the rate." He would next refer to the case of *Cowan and Sons v. North British Railway Company* (Vol. 11, "Railway and Canal Traffic Cases," p. 271). Here Lord Cobham said: "The rates themselves are identical; and if we follow the principle laid down in *Tennant's case*, we must assume that the station rates include some charges for the station accommodation provided." His friend had relied on the judgment of Lord Kinnear in the Scottish Court of Appeal, when that case went there; but it was not a ruling in his favour, because the Judge distinctly said: "We are not going to decide it." In any case, there was no decision against the Court of Appeal in England; and under these circumstances he ventured to say that the argument on the other side could not prevail, having regard to the decision of the Court of Appeal in the Salt Union case.

Justice LAWRENCE: Do you mean the argument as to jurisdiction?

Mr. BALFOUR BROWNE: I mean the argument as to jurisdiction, or the argument that whenever they show on their allegation that a terminal is not charged, then your jurisdiction goes.

Justice LAWRENCE: That is part of the argument as to jurisdiction; but though they ventilated the argument, so to speak, as to jurisdiction, they did not proceed upon it. They did not ask us to stop the case.

Mr. BALFOUR BROWNE agreed, but said they did ask the Court to hold that, as they were under the maximum, the question did not arise. He maintained, on the authority of all the cases he had referred to, that when the Court found the rates charged to stations were the same as those charged to private sidings, they had to infer—and there was a presumption in favour of the view—that there was a station terminal included. He asked the Court to act upon this assumption—which was far more than an assumption in this case, because the Corporation had tried to prove that there were station terminals included. In a case of this sort, there was a retrospective claim. Section 12 of the Railway and Canal Traffic Act, 1888, said: "Where the Commissioners

have jurisdiction to hear and determine any matter, they may, in addition to, or in substitution for, any other relief, award to any complaining party who is aggrieved such damages as they find him to have sustained; and such award of damages shall be in complete satisfaction of any claim for damages, including repayment of overcharges, which, but for this Act, such party would have had by reason of the matter of complaint: Provided that such damages shall not be awarded unless complaint has been made to the Commissioners within one year from the discovery by the party aggrieved of the matter complained of." If the Corporation were right that the Companies had been charging them a station terminal in their rates when they had no right to do it, this was an overcharge. There was the case of *Gilstrap, Earp, and Co. v. Great Northern Railway Company and Midland Railway Company*. There Mr. Justice Wright's judgment was: "I will only say on this question that, on consideration, it seems to me that where this Court makes an allowance to an applicant under section 4 of the Act of 1894, *prima facie* that allowance ought to begin at the date of the application on the one hand, and not merely as at the date of the judgment." Why it went back merely to the date of the application, he could not conceive. Mr. Justice Wright, however, had vacillated, because in a previous case he had said: "I am very far from saying there may not be cases in which a retrospective claim for damages may not be made out by an applicant under section 4 of the Act of 1894." In the Salt Union case, Lord Justice Vaughan Williams said: "The scope of the section, as I understand it, is to provide, not only for the past, but also for the future." He proceeded to refer on the same point to the Scotch case of *Tennant and Co.*

Justice LAWRENCE: The existing authority in this Court is the *Gilstrap case*. These cases were all before Mr. Justice Wright. They were all cases in which he was concerned; and he finally gives judgment on the subject exactly upon the very point in the *Gilstrap case*.

Mr. BALFOUR BROWNE: But Lord Justice Vaughan Williams is not bound by Mr. Justice Wright; and he said "past and future." Then there is Sir Frederick Peel's judgment that the claim can go back to the passing of the Act—not before the passing of the Act, he said. Therefore I will ask you to come to the conclusion that we are entitled to look back with regard to these charges, if they were illegally made.

Justice LAWRENCE: If they were illegally made, Sir Alfred Cripps admits it; but illegally made in that sense is a different thing from you being entitled to a rebate or allowance.

Mr. BALFOUR BROWNE: I think if I can show, as was admitted in the old Birmingham case, that there was a terminal in the rate, I am entitled to succeed, and to go back certainly six years in the claim that we make.

Justice LAWRENCE: I cannot see how, in the teeth of a section which says that they shall be entitled to charge it, it can be an illegal charge, unless and until you have got a case, for example, of undue preference, in which circumstances there would be a judgment for damages *inter se*. That is a different case again; but to say at large, directly the Court decides under section 4 that there is a right to a rebate, that it goes back for six years as an illegal charge, seems to me to be a very bold proposition.

Mr. BALFOUR BROWNE: The only way I make it out to be illegal is they charge me for something they do not give. They charge for a station; and they give no station. It seems to me the very first principles of honesty and legality are that they should not charge me for something they do not provide. It is quite clear, under the definition of terminal station, that it is illegal to charge a terminal at my private sidings. They cannot do it. The terminal can only be charged at a terminal station where loading and unloading are done; and if they have charged that at my private siding, it is an illegal act, and they are prohibited by their own Order from doing it. Although I have only dealt at great length with the sidings question on the Midland, your Lordship will understand that my arguments apply with regard to Windsor Street, and the Great Western Company. I did admit that there might be something to be said for the independent sidings at Saltley, which hold forty trucks, as they were exclusively reserved; but they have given up the point of exclusive reservation.

Justice LAWRENCE: It does not depend, does it, upon exclusive reservation? The services would not be in fact any the less rendered, if the sidings were reserved or not. If they told you you could not have the siding at a certain time, I could understand the argument of exclusive devotion to your service.

Mr. BALFOUR BROWNE: Exclusive reservation might be really a foundation of a claim in this way: If a trader said, "I want you to keep this siding for me. Do not let anybody else go on it except myself"—I think in that case there might be a claim for it. But then it must be at our request and for our convenience.

Justice LAWRENCE: It must clearly be for your convenience, otherwise it would not come within the section.

Mr. BALFOUR BROWNE: The Saltley independent sidings are used by the Company; and they only perform their duty to the Corporation when they take the traffic from there and put it over the points into the works sidings. This is what the Sidings Act says they are bound to do. So I have some doubt as to whether these independent sidings are not in exactly the same category as those at Washwood Heath—used, no doubt, by our traffic, just as the rails are used all the way along, and various relief sidings are also used.

Justice LAWRENCE: What do you maintain the section means, when it says "at or in connection with a siding?" If it does not include such a thing as these independent sidings, what does it include?

Mr. BALFOUR BROWNE: It might include a dozen things. If we ask them to lend us an engine to shunt our stuff about the gas-works, or if they took it to the various retorts, there would be a service at a siding for which we should be bound to pay, or in connection with a siding, if we asked them to do anything else—such as convey the coal from Saltley to Nechells for testing purposes. That is a service they should be paid for; and we do pay them 6d. a truck. There is no service at all till they have delivered to me. There is not a word in their Act giving them a right to charge for anything until delivery. It is part of conveyance until they have handed it over to me. I assume that the Railway Company are working their line in the way most convenient to themselves. As to the dispute with regard to waggon-hire on the North-Western Railway, as nothing has been said on the other

side I will ask you to decide that we are entitled to have the waggons at 4½d., instead of 6d.

Mr. ASPINALL: It is a very small point; and we are quite prepared to leave the decision upon it in your Lordships' hands without further argument.

Mr. BALFOUR BROWNE, in concluding his speech for the Corporation, said he claimed that there were terminals in all these services—on coal a terminal of 3d., and on general goods a terminal varying from 6d. to 1s. 6d. It was true that, though in these general goods the traffic was very much smaller, the terminal was very much higher; and there was not any attempt upon the part of any one of the defendants to justify more than 1d. on anything. They did endeavour to justify 1d. on coke. He had already tried to show that this was not justified. They were charging upon coke, as he had shown, 3d.; and they were therefore charging on all the coal that went into Lawley Street Station the same figure, and this, he argued, must be allowed to him as a terminal. Even if he were wrong in this respect, and the Court determined to adhere rigidly to the Pidcock principle, he was still entitled to 66 per cent. of 3d., which was 2d. He also said with reference to coke outwards, as with regard to coal inwards, there was no service performed for the Corporation traffic for which any charge at or in connection with their siding could be made, because all the services were absolutely necessary for conveyance, and were not such as the Corporation could put an end to by any notice to the Railway Company. They could not give them notice, for instance, that they were not to convey the traffic from Nechells to Windsor Street. In order to be a service for the Corporation's convenience, and at their request, it must be one that was done specially for them, and not for everybody, so that they could put an end to it by notice. With regard to the coke rates, he was quite content to leave this to be a matter of account between the parties as to the past; but with reference to the other small matters, he would ask for a decision. He was not sure any question of account arose upon these terminals at all; and therefore to some extent he agreed with his friends that figures were unnecessary. If he had made out that the Company were charging a 3d. terminal, and that they did no service for the applicants, it would be a very simple calculation to ascertain what the Corporation ought to have. He would ask the Court to deal with the question of damages on the various points raised. With reference to the matters which the defendants had promised to adjust, he did not think it was necessary for him to ask for an order; but with regard to the other claims, an order was wanted.

At the conclusion of the hearing, the Court reserved judgment; and it has not yet been delivered.

RETIREMENT OF MR. W. SMITH OF BOLTON.

At the Meeting of the Gas Committee of the Bolton Corporation on the 3rd inst., Mr. William Smith, the Gas Engineer and Manager, tendered his resignation on account of the condition of his health, and the Committee passed a resolution expressing their regret at accepting it. They added that the valuable services Mr. Smith had rendered for the long period of 23 years called for grateful recognition; and they sincerely trusted he might be long spared to enjoy the leisure he had so well and justly earned.

The matter was referred to by the Chairman of the Gas Committee (Mr. W. Webster) at the meeting of the Town Council on Wednesday. He said he felt Mr. Smith's resignation more acutely than he could express, and he believed the feeling was shared by all his colleagues on the Committee. They were genuinely sorry to lose the services of so efficient and excellent an engineer. The public, too, would be the poorer by the retirement of Mr. Smith, who had served the Corporation faithfully and well for 23 years, saving the borough a large amount of money by his foresight and judicious management. Last year they rebuilt, at the Lum Street works, under Mr. Smith's direction, a commodious retort-house which was stated to be the finest in the kingdom, with larger producing power and healthier conditions for the workmen. This had been accomplished without expense to the ratepayers; the cost having been defrayed out of the reserve fund. A sum of £6000 or £7000 was spent upon the work, which was a credit to their Engineer and to the Corporation. The Gas Committee had been able, owing to Mr. Smith's capable management, to hand over each year large amounts in aid of rates.

Alderman Horridge and several other members of the Council having joined in the expression of regret at Mr. Smith's resignation, a somewhat animated discussion took place in regard to advertising for a successor. The Gas Committee proposed to pay the new Engineer a salary of £600 per annum. Alderman Horridge, however, moved that the minute of the Committee on this subject should be referred back for further consideration, as the amount they suggested was only fixed by the casting vote of the Chairman. Mr. A. S. Wild seconded the amendment. It was pointed out by Mr. Ritson that the Gas Department made a yearly profit of £40,000; and £600 was only 1½ per cent. on this amount. For works like theirs, they required a first-class man; and, in his opinion, £600 was little enough to pay. Mr. J. H. Crook submitted that there was no need to advertise for a successor to Mr. Smith, as they had in their works a man whom they could appoint—a man who had done similar work elsewhere, and who had been very highly commended. Mr. Webster said the sole object of the Committee was to get the very best man they could. If they got a man whose ability was inferior, they might lose a lot of money. It was wise, therefore, that they should offer a substantial salary, so as to attract the best men. On a division, the amendment was carried by 42 votes to 21. The minute was therefore referred back.

At the meeting of the Committee on Friday, the matter was reconsidered; and it was finally decided to advertise for a Gas Engineer at a salary of £500 per annum, rising by £25 a year to £600.

During last year no fewer than 1704 florins and 232 half-crowns found their way into the slot meters of the Manchester Corporation.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C., Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting; and then the report of the Directors, as follows:—

The Directors have the pleasure to report that the results of the second half of the year 1908 have been, on the whole, satisfactory.

The profit of the half year was £232,959. This, added to the sum of £33,289 brought forward from the preceding half year, makes a total of £266,248 available for dividend, pension reserve, &c., as compared with that of £263,411 for the corresponding half year of 1907.

The quantity of gas sold in the half year under review shows an increase at the rate of 6·1 per cent. The average gross cost of the 528,431 tons of coal carbonized in the half year was 19s. 2¼d. per ton of 1000 kilogrammes, or 0·44d. less than in the corresponding half year of 1907. The value derived from the sale of coke showed an increase, as also, to a slight extent, did the revenue from the sale of ammonia products; but the value of the tar showed a slight decrease. The number of meters placed on Dec. 31, 1908, was: Ordinary, 393,676; prepayment, 125,049—together, 518,725. These figures represent an increase of 28,003 ordinary, and 20,322 prepayment meters in the year—together 48,325. The number of consumers on the books at the end of the second half year of 1908 was 428,166—an increase of 41,909, or at the rate of 10·85 per cent. on the figures of the corresponding half year of 1907. The total length of mains laid on Dec. 31 last was 2324 miles—an increase of 117 miles since Dec. 31, 1907. The plant and mains were maintained in their usual efficient condition.

The plant of the Aix-le-Chapelle station, having become somewhat out of date, and barely sufficient for present requirements, it was thought desirable to build a new retort-house with twenty furnaces, each of ten vertical retorts, and the contracts for this work were given out.

At Antwerp, the new works at Hoboken were brought appreciably nearer completion. The retort-house, benches, coal store, purifiers, and second gasholder of 2½ million cubic feet were completed. The difficulties connected with the construction of the quay (referred to in the last report) were successfully overcome; and the quay, pier, and jetties were completed. The construction of the coal-cranes and conveying-plant was proceeded with.

A contract was concluded with the Commune of Hemixem, in which a portion of the Association's Hoboken property is situated, for the exclusive supply of gas up to the year 1936.

The foundations for the steel tank to contain the new 5½ million cubic feet gasholder at Schöneberg, Berlin, were completed; and the contract for the erection of the holder was let to the Berlin Anhaltische Maschinenbau Aktien-Gesellschaft. The erection of the six new vertical retort settings at Mariendorf (referred to in the last report) was completed, and the furnaces were put in action. The erection of a third retort-house on this works, to contain fourteen settings of twelve vertical retorts each, together with the necessary interior and exterior coal and coke conveying plant, was proceeded with.

At Brussels progress was made with the erection of a new retort-house with twelve furnaces of ten vertical retorts each. Owing to the extension of the business at this station, the offices in the Chaussée d'Ixelles had become inadequate to our requirements, and advantage was taken of a favourable opportunity to acquire Nos. 42 and 44, Rue de l'Arbre Bénit—two houses situated at the back of the Association's offices—which will enable the necessary extensions to be carried out. The Association's monopoly for the supply of gas in the Commune of Berchem State, Agathe, situated to the north-west of Brussels, was prolonged for a period of sixteen years, until 1940; and the exclusive concession for the supply of electric current in that Commune was secured up to the same date. It having been decided, in view of the demand for lighting by electricity which has arisen in several of the suburban communes with which the Association has gas and electricity contracts, to erect an electricity station for the production and supply of current, a suitable site for such works was acquired at Droogenbosch, south of Brussels, situated on the Charleroi Canal, and having also a connection with the railway.

At Flushing, the new three-lift 127,000 cubic feet gasholder (referred to in the last report) was completed.

At Frankfurt, the twelve furnaces of vertical retorts, with coal and coke handling plant, also mentioned in the last report, were finished, and put in action.

At Evreux, one of the towns in France supplied by the Compagnie Continentale du Gaz, an exclusive gas contract was concluded with the authorities of the suburb of Gravigny for 35 years, until 1945.

A contract until 1948, without monopoly, was also concluded with the authorities of Bourg-de-Thizy, adjoining the town of Thizy, another of the group of stations belonging to the Compagnie Continentale.

In conclusion, the Directors desire to draw the attention of the Proprietors to the accounts for the half year ended Dec. 31 last, and to the balance-sheet (a copy of which was appended to the circular calling this meeting). These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 4 per cent. for the half year ended Dec. 31, 1908, payable free of income-tax on and after Tuesday, the 11th May next.

The Directors who go out of office by rotation are: John Horsley Palmer, Esq., Hon. Sir E. Chandos Leigh, K.C.B., K.C., and Robert Tindall, Esq. These gentlemen are eligible for re-election, and offer themselves accordingly.

The Auditor who goes out of office by rotation is Joseph Gurney Fox, Esq., who is eligible for re-election, and offers himself accordingly.

Scheme for the Division of the Profits of the Half Year ended Dec. 31, 1908.

Balance brought forward from last half year	£33,289	2	4
Profit resulting from the workings at the stations and dividends on investments, less interest on debenture stock, and the charges on account of depreciation and income-tax	232,958	18	8
	£266,248	1	0
Dividend of 4 per cent. for the half year	£197,600	0	0
Credit to pension reserve	40,000	0	0
Balance carried forward to next half year	28,648	1	0
	£266,248	1	0

A NOTABLE FAMILY OF GAS ENGINEERS.

The CHAIRMAN, in moving the adoption of the report, said, before proceeding to make a few remarks on the general aspect of the affairs and business of the Association as outlined in the report just read, he had to refer to the losses by death that had been sustained by the Association since the close of the half year. He especially referred to the death of their Chief Engineer at Aix-la-Chapelle, Mr. James Drory. He was the youngest of that wonderful band of ten brothers who were all engineers, and of whom eight devoted, and some were still devoting, their lives and work to the interests of the Association. He thought it was the most marvellous record that could be stated by a Chairman of any great industrial company, that no less than eight brothers of one family—all great men in their own line—should have devoted the whole of their lives and interests to the same body of shareholders. [Hear, hear.] Mr. James Drory was 42 years in the service of the Association, and, still comparatively a young man, was struck down only a few weeks ago by an attack of pneumonia, when he was absolutely working for the remodelling of the Aix-la-Chapelle station. To him (the Chairman) his death was a great loss. He had been a personal friend of his for 34 years; and it was with the greatest pleasure that he used to visit his station, because Mr. Drory was such a charming, amiable, and intelligent man with whom to have intercourse. His loss was a great one for the Association. He left no children; but his widow had been properly provided for by means of the pension fund of the Association. A curious coincidence with regard to Mr. Drory's record of 42 years' service was that his three brothers who predeceased him—the Chief Engineers at Vienna, Antwerp, and Berlin—had all served exactly the same period of 42 years. The Association had now only left of that splendid family two brothers—the veteran Mr. William Drory, of Frankfurt, who had served the Association for 54 years, and the chief of the meter factory (one of the younger brothers) at Berlin. The other loss to which he wished to refer was that of the Auditor (Mr. Montagu Somes Pilcher), who was well known to the proprietors, because he had acted on their behalf for a period of twenty years. His death took place just before he was about to audit the accounts for the past half year; and it would be the duty of the proprietors, before the close of the present meeting, to elect someone to fill his place.

PROGRESS IN THE HALF YEAR.

Now with regard to the report, and the business of the six months, he could hardly remember any half year in which the Directors had had such anxious and strenuous work to undertake, but so little to have to report upon. Serious negotiations had been in progress with large towns on the Continent. But they had not yet been settled; and therefore he had nothing to say to the proprietors about them that day. He hoped, however, six months hence he should be able to enter fully into the details, but he could not do so on this occasion. When they looked at the report, it showed, he thought, that they had been making a great deal of progress in every direction—in the direction of constructing large and important works, in a large extent of main laying, in the production of gas, and, he was thankful to say, in the consumption of gas. The increase in the consumption of gas, as the report said, equalled upwards of 6 per cent., which was rather a remarkable record for an old-established gas company in these days of the fierce competition of the electric light. Progress, too, had been made in the number of their consumers. The increase of consumers, owing to the way in which their local agents and engineers pushed the business, had been of the most satisfactory nature. Likewise, they could congratulate themselves on the satisfactory increase in the profits of the concern. Going a little more into detail, the 6 per cent. increase in the consumption of gas perhaps conveyed little to the minds of the proprietors; but he might state that it represented an additional carbonization of no less than 30,000 tons of coal. This would give the proprietors some idea of the increase in the manufacturing part of the business.

THE ABANDONED GAS AND ELECTRICITY TAXES.

There was another thing they had to be very thankful for; and it was that the gas and electricity taxes which had been put forward by the German authorities had been definitely dropped. The Chairman pointed out that the Association were protected by its contracts, inasmuch as they had the right to increase the price of gas to the consumer by the amount of any tax of the kind. But, naturally, the imposition of such a tax would have had a very prejudicial effect on the progress of gas and electric lighting. And besides, the suppliers themselves—the Association at their stations—would practically have had to collect the tax; and there was no doubt that serious difficulties and friction would have arisen between themselves and the consumers, if such an unpleasant job had been put upon them. Therefore, he was exceedingly thankful the German Government had dropped the suggested tax on gas and electricity. (Applause.)

PRICE OF COAL.

With regard to coal, the proprietors had noticed in the papers there had been a considerable drop in the price of coal; but the business of the half year under review did not benefit wholly by the reduction. Certainly the net cost of the coal came out about 5½d. per ton less than in the corresponding half year; and as the quantity of coal carbonized in the half year was 528,000 tons, the lower price had helped in no contemptible degree in raising the profit. It amounted to something like £12,000. Of course, in the future, they would hope to get more profits from the coal, because they had entered into contracts which represented a reduction of something like 1s. 8d. per ton for the year 1909-10. (Applause.) "Pray," he remarked, "do not be too elated, because when the price of coal goes down, the price of coke equally falls, so it will not be all profit in our pockets."

PUSHING OUT INTO THE SUBURBS.

To give some idea of the way in which the business was extending, he said they had during the past half year laid something like 80 additional miles of mains in new districts; and, during the whole year, 117 miles were laid. On this he might say one word as to the policy of the Board. In all the great towns the Association lighted, it had been the policy of the Board to conclude contracts as much as possible with the

suburbs. It was to these suburbs they had to look in the future—not in the present—for profits; and it had always been the policy of the Board to look far in advance, so that they might hope the Association, which had existed now for something like 87 years, might have a long and prosperous future, to be enjoyed by those who would come after them. This was the policy they had always adopted. It was a policy that did not bring in any immediate profits on these miles of mains, but, he ventured to predict, it would produce a very prosperous business in the future.

CAPITAL EXPENDITURE AND NEW WORKS.

The allusion to all this main-laying and constructive work brought him to the question of capital expenditure; and it had been very heavy in the past half year. The item in the balance-sheet to Dec. 31 last, under the head of works and mains, indicated an increase of nearly £200,000, as compared with the half year ending June 30, 1908, or an increase compared with the corresponding half year to December, 1907, of no less than £265,000. This had been principally expended at Hoboken—the new works that were being built for Antwerp. They were now approaching completion, and would be put into action during the coming winter. The estimated cost of these works, without land, was £238,000. Of this sum, they had already spent £170,000; and there still remained to be paid about £68,000. Then, of course, they had had to expend a great deal of money at other places—especially at Berlin and Frankfurt; and they were contemplating the remodelling of the works at Aix-la-Chapelle, which would cost about £60,000. So it would be seen that, in the immediate future, they would have to spend a large sum of money for capital purposes; and he thought it would work out to nearly £500,000.

THE RECENT DEBENTURE ISSUE.

The reference to all this capital expenditure brought him naturally to the balance-sheet. In it there appeared for the first time an additional £761,400 of 3½ per cent. debenture stock, which was issued in August last. He thought the proprietors would agree with him, after the figures he had given with regard to capital expenditure, that the Directors were amply justified in making this issue. It would be seen that the debenture stock had now been brought up to a total of £1,235,000, as against £473,600 a year ago. The new issue having been made on Aug. 1, five months' interest on the new stock had to be included; and this interest now amounted to £18,062, compared with £6906. The other figures on the liability side of the balance-sheet remained much the same. On the assets side, works and mains, as he had already stated, showed an addition of £265,000, and on land the account had been increased by the sum of about £30,000.

GAS COMPANIES AS ELECTRICITY SUPPLIERS.

With reference to this latter increase, he should like to say a few words about another part of their business. The proprietors knew the Association were principally gas producers; but they had also a branch of lighting by electricity. In the suburbs of Brussels, where they had a large and extensive area to light, there had arisen a very considerable demand for electric light; and under their contracts there, they were entitled to supply electricity. It was manifest to the Directors that, in the immediate future, there would be a very considerable call for electricity both for lighting and power. They had two small stations there at which they could not produce electricity very economically; and therefore they looked about for a piece of land where there was both a good water supply and railway accommodation, on which they could erect a proper central electricity generating station. Some 33 acres of land were purchased in an exceedingly good situation, at a reasonable price; and there they would put up the electricity station. Such a large quantity of land was purchased, because it was evident to the Directors that, in a very few years, they would require another considerable gas-works to do the business in Brussels and the suburbs.

OTHER FEATURES OF THE ACCOUNTS—COAL STOCKS AND SEVERE WEATHER.

Then with regard to stocks, the increase seemed to be very large compared with a year ago. It was £112,000. This considerable addition was chiefly attributable to the heavy stocks of coal held at several of the larger stations. In 1907, owing to difficulties on the railways and at the mines, the Association was reduced to the pitiable state of having only three weeks' supply of coal at Vienna. This year precautions were taken that this sort of thing should not occur again. The result was that on Dec. 31 the increased value of the coal stocks at Berlin was £74,000; at Vienna, £13,000; and at Brussels, £4,000. He was very glad the Directors took these precautions, because immediately after the close of the year the Continent, more especially North Germany, was visited by tremendous snow storms and severe frosts; and the railways and canals were entirely blocked. And not only so, but when the snow melted, there were such serious inundations that the railways were much disorganized. It was a fortunate thing the Association had these immense stocks of coal at Berlin and other places. Since the close of the half year, these great stocks had been reduced, as well as the stocks of coke. Then as to "Cash at stations." This was a matter of finance. The item was £47,000 greater than on Dec. 31, 1907. The Directors were able to obtain satisfactory rates of interest from their bankers in Berlin and Vienna; and therefore it was considered advisable to have substantial sums of money on deposit there, to meet future commitments, rather than bring the money over to London, and then have to remit it back again, and probably incur loss on exchange. This was a matter that would be readily appreciated by business men. "Cash in London" was nearly £28,000 more. This was accounted for by a loan being repaid on Dec. 31, and lent again on Jan. 1. The item of "Sundry debtors at stations" was larger; but he did not think it was any larger than corresponded with the general increase of the business. It might be interesting to the proprietors to know that, in the course of the year, the bad debts amounted to under £2000; and when they came to think that the gross cash they had to handle approached very nearly 3 millions of money in the course of the year, he did not think £2000 was by any means excessive for bad debts.

THE PROFITS AND THEIR DIVISION.

The balance-sheet showed that the profit was £232,958. This was a decrease, compared with the corresponding half year, of £4600; but it was obvious to anybody who looked carefully into the balance-sheet, that this was more apparent than real. The Directors had decided that the expenses in connection with the recent issue of debenture stock should be written off over a period of three half years. The total amount of such expenditure, as indicated in the balance-sheet, was £64,653; and therefore a sum of £21,554 had been provided. The deduction of this amount from the revenue account resulted in the profit of the half year exhibiting the decrease he had mentioned. Consequently the true increase in profit amounted in round figures to £17,000, or at the rate of 7 per cent., which corresponded very closely with the increase of 6 per cent. in the gas sold. With regard to the division of the profits, the Directors were running on exactly the same lines as in former half years. They proposed to pay a dividend of 4 per cent., credit the pension reserve with £40,000, and then carry forward a balance of £28,648. He had on previous occasions pointed out the fact that it was absolutely necessary for the Association to have a very large pension reserve; but for the benefit of new shareholders, he should like to quote a few facts and figures with regard to the pensions, and also the contributions the Government put upon them for Government insurance funds and workmen's sick pay, which were obligatory in most of the countries in which the Association worked, and which were being perpetually added to. In 1907, the Association paid in pensions to the staff and workmen £34,700. This year it had increased to £35,800; and the workmen's sick pay and the contributions to the Government insurance fund was this year £14,300, against £12,600. Therefore, the total increase in this one year came to £2764 or a total of £50,143. He could hardly believe, after giving these figures, there would be a single dissentient voice to the adding of a considerable amount to the pension fund.

DONATIONS.

There were one or two small matters which had not been mentioned in the report to which he thought it his duty to refer. The Directors had made three donations in the last few months of which he believed all the proprietors would approve. In November last, there was a very disastrous explosion in one of the Westphalian coal pits, from whence the Association derived a large proportion of their German coal. A number of miners lost their lives, and a great deal of distress was caused. The Directors therefore thought it well to send through their agent for Germany—Mr. L. Delhrück, a well-known banker in Berlin—a donation of 5000 marks, or £250, to the fund which was being raised by their Royal Highnesses the German Crown Prince and Princess. He had already alluded to the disastrous inundations following the severe storms in the winter when a great many people suffered. The Association most fortunately escaped, through the energetic arrangements made by their Chief Engineer at Frankfurt and their Chief Engineer at Hanover, to prevent the works from being flooded, which event would have been most disastrous. The Association contributed £250 to the fund which was raised for the sufferers from these inundations. Then the third donation was an English one. He thought there were few shareholders of any gas company who did not know the name of Sir George Livesey, the late Chairman of the South Metropolitan Gas Company. He (the Chairman) did not think there was any necessity for him to enlarge upon the debt that every gas manufacturer and every gas company owed to Sir George as one of the most able, energetic, and far-seeing defenders, and promoters of the use, of gas in this and foreign countries. A fund was opened some time ago to commemorate the work of this great representative of the gas industry; and the Board, although the Association did not actively carry on business in the British Isles, thought it right to contribute the sum of £250 to the memorial which was being raised. (Applause.)

The DEPUTY CHAIRMAN (Mr. Arthur Lucas) seconded the motion.

Sir JOHN RUNTZ congratulated the Directors and proprietors generally upon the excellence of the report. Those who had attended the meetings of the Association for a number of years (he himself had attended them for between 30 and 40 years) had heard year by year the tale of continued prosperity. He emphasized certain of the figures presented by the Chairman, and repeated the suggestion made by him a few meetings since as to investing surplus cash in Colonial inscribed stocks, in which there was not the fluctuation that there was in other gilt-edged securities.

The CHAIRMAN said it might interest Sir John to know that temporarily the Directors had invested some of the Association's surplus funds in Canadian 3½ per cent. bonds, New South Wales Railway Stock, and Straits Settlements 3½ per cents. This he repeated was only a temporary investment, because the whole of the debenture issue would soon be swallowed up in capital extensions.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the Hon. Sir E. CHANDOS LEIGH, K.C.B., K.C., a dividend of 4 per cent. was declared on the £4,940,000 stock of the Association, free of income-tax. The Chairman mentioned that the additional 2d. on the income-tax meant that they would have to pay £5150 more to the Chancellor of the Exchequer.

Moved by the CHAIRMAN, and seconded by Mr. J. H. BIRCHENOUGH, C.M.G., the Hon. Sir E. Chandos Leigh, K.C.B., K.C. (who has been a Director for eighteen years), was unanimously re-elected.

Proposed by the CHAIRMAN, and seconded by Mr. CORBET WOODALL, Mr. Robert Tindall (who has been a Director for sixteen years) was also re-elected.

The DEPUTY-CHAIRMAN proposed the re-election of Mr. J. Horsley Palmer. In doing so, he remarked that for no less a period than 34 years Mr. Palmer had sat at the Board; and out of this time he had been six years Chairman of the Company. The Association had been fortunate during this long period to have the advantage of his guidance; and it was a pleasure to place on record publicly what he and his colleagues felt as to how much they owed Mr. Palmer for his continuous and able services.

The Hon. Sir E. CHANDOS LEIGH, in seconding the motion, endorsed the observations of the Deputy-Chairman.

The motion was heartily passed.

The CHAIRMAN, in his acknowledgment, said it had given him not only pleasure to work for the Association, but, owing to family connections ever since the Association started, to serve the Association had also been with him a matter of family honour.

Moved by Sir JOHN RUNTZ, seconded by Mr. L. C. CALLEY, the retiring Auditor (Mr. J. Gurney Fox) was re-appointed.

Mr. Fox, in the course of his reply, said he should like to refer to the loss of his colleague, Mr. Pilcher. The zeal and earnestness ever shown by him was only equalled by the invariable kindness that he (Mr. Fox) always received from him. He had lost a friend; the Company, a sound auditor.

Mr. W. CLEVERLY ALEXANDER proposed, and Mr. BERNARD F. HARRIS seconded, that Mr. Theodore Bromhead Bassett be elected to fill the vacant auditorship.

The motion was unanimously agreed to.

Mr. BASSETT having acknowledged it,

On the proposition of Mr. A. F. PHILLIPS, seconded by Mr. SAMUEL SPENCER, the Chairman and Directors were heartily thanked for their services.

Mr. CORBET WOODALL said he knew the proprietors would not grudge him a minute or two in receiving and adopting the resolution he had to propose. The circumstances to which the Chairman had given eloquent expression in the opening of his speech made this resolution of particular interest that day. They had lost one of their respected engineers—a member of a family who had done a great deal to establish the good repute in which the Association was held, and had been held for many years, on the Continent. It was satisfactory, however, to know, while they had lost so many members of the family, that there had grown up others in their places who were carrying on the good traditions in an equally satisfactory manner. The services rendered by their staff were peculiar and great. The amount of trust that had to be reposed in men so far away was considerable; but it had never, in his experience, been misplaced. The men they had in their service, both as agents and engineers, on the Continent were men of whom any company might be proud. He had much pleasure in proposing that a vote of thanks be given to their able Secretary (Mr. R. W. Wilson) and his staff, and to all the officials and their staffs on the Continent.

Mr. L. R. WILKINSON seconded the motion, which was heartily carried.

This concluded the proceedings.

BUENOS AYRES (NEW) GAS COMPANY.

Amalgamation of the Three Companies.

The Annual Meeting of this Company was held last Thursday, at No. 1, East India Avenue, E.C.—Mr. J. C. IM THURN in the chair.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN moved the adoption of the report and balance-sheet, and the declaration of a dividend at the rate of 7 per cent. (free of income-tax), 3 per cent. of which has already been distributed. In doing so, he said he was pleased to be able to meet the shareholders with what might be considered to be a very satisfactory report and balance-sheet. It would be recollected that last year he mentioned in his speech that the Directors had been negotiating with the municipal authorities. These negotiations had been going on ever since; and the past year had been a very arduous one for all three of the Gas Companies operating in Buenos Ayres. Mr. Bowen, the Chairman of the River Plate Gas Company, at their meeting on April 23, and Mr. H. E. Jones, the Chairman of the Primitiva Company, at their meeting on the previous Friday, both told their respective shareholders what close and anxious attention had had to be given to the negotiations with the Municipality, in order to obtain equitable and fair treatment; and it was with very considerable relief that he himself was able to state that an *ad-referendum* contract was signed by the Intendente (Lord Mayor) on the 22nd ult. This *ad-referendum* contract, after being confirmed by the Municipality, would, of course, require confirmation by the shareholders of the respective Companies; and the Directors trusted, ere long, to be in the position to call the shareholders together for the purpose. He must add, for the information of the shareholders, that, in order to give time for a permanent agreement, a temporary arrangement was made between the Companies and the Municipality, by which the price to be charged until the end of the current year was 22 cents, or (say) a reduction of 2 cents on the previous price of 24 cents per cubic metre. This, of course, only affected the accounts of the last three months of the year under review; but it would affect the whole of the current year. The Boards of the three Companies had acted in complete agreement, and had at all times taken common action for the protection of the interests of the shareholders. These constant meetings had paved the way to negotiations for amalgamation; but at the present time he was unable to state more than that the three Companies had gone a long way towards finding a satisfactory basis. He could assure the shareholders that it had been a very anxious time for the Directors; and he could heartily endorse what Mr. Bowen had said, that they would be very thankful indeed when the arrangements with the Municipality had been satisfactorily concluded. As he had before stated, the Directors would take the shareholders into their confidence when the time came; but he should be greatly obliged if they would, at this period of the negotiations, abstain from asking questions, which, in their own interests, it might be undesirable to answer. During the past year, many improvements had been carried out. There had been built a new reort-house complete with mechanical stoking and discharging apparatus of the most up-to-date kind. They had also erected a new gasholder, with a capacity of a million cubic feet. The new reorts had been at work for some little time, and were giving the greatest satisfaction; and the Directors daily expected to hear that the new gasholder was in use. In addition to this, the whole of the mains inside the works had been revised and renewed. Their Engineer (Mr. W. Angus) had brought about many changes, which had resulted in great economies, and were likely to effect considerably more. He (the Chairman) was glad to be able to say that the works were now very up-to-date and complete.

Out of the year's revenue, £27,946 had been expended on the upkeep of the works, mains, &c.; and the sales of gas had increased. During the year, they had lit 7777 public lamps—being an increase of 91 over the previous year. The number of gas-stoves in use at Dec. 31 was 5754, being an increase of 677 over the preceding year. Coal had cost 2s. 7d. per ton less. The Directors had sent out with the report and balance-sheet, a copy of the South Barracas report and balance-sheet for the same period. The results of that Company had been satisfactory, and would, they hoped, continue to improve now that the Water-Works Construction Syndicate, which was satisfactorily started at the end of last year, had begun constructing operations, and the erection of the plant and mains was being pushed on with all speed. Turning to the accounts, he would take the net revenue first. The profit for 1908 was £67,771, as against £54,634 for 1907. The interest on investments was £7510; and the profits other than trading were £13,809. With respect to this last item, it would be remembered that the Company assisted in forming the Bahia Blanca Gas-Works (Construction) Syndicate, Limited, and that the "A" and "B" shares so acquired were exchanged for similar shares in the Bahia Blanca Gas Company, on the terms and in the proportions then arranged—resulting in a holding of 1000 £5 "A" shares and 12,500 £1 "B" shares, at a net cost of £5000. A portion of these "B" shares were sold, and the remainder (5000) taken into account at face value (£1). Their holding on Dec. 31 last was 1000 £5 "A" shares and 5000 £1 "B" shares; but since then further sales had been made, as and when the Company needed funds; and their holding that day was 400 "A" and 4500 "B" shares. The Directors had thought it well to set out these figures in detail, so as to show the actual trading profits for the year; and the shareholders would notice that the Board transferred the profits other than trading to reserve funds, along with some £21,000 from revenue. Shareholders had doubtless been asking themselves why the Board had not recommended a larger final dividend, and had placed so large a sum to reserve. The reason was this: The shareholders would have gathered from his previous statements that the amalgamation of the three Gas Companies in Buenos Ayres was being considered. In such an event, this Company would retain its South Barracas holding, taken at par, as part of the purchase consideration. To effect this, it was necessary the reserves should be equal to their holding. Now, as the shareholders were aware, the business of the South Barracas Company had been increasing; and they had had to provide the funds for that. Thus at the end of 1907 their own Company held £150,000 of South Barracas shares, while their reserves were a little over £100,000—the balance being supplied from other sources. Now—at the end of 1908—by carrying the extra profits to reserve along with the £21,000 from revenue, they had a clean holding of £150,000 in South Barracas shares, outside their business, which shares (in the event of amalgamation) would be distributed *pro rata* to their respective holding among the shareholders. Had the Directors recommended (say) an extra 1 per cent. dividend out of these outside profits, they would have been that much short in their South Barracas holding. In other words, they could not have it both ways. Turning to the balance-sheet, it would be noted that the property of the Company had been written up by £54,943. This was done early last year at the request of their Local Committee, who, in the then state of negotiations, considered it necessary to agree these figures with those laid before the Municipality. The negotiations had taken a different turn since; and this figure was now immaterial—being a mere book entry (as would be seen by the *contra*). The Directors, however, left it as approved by the Auditors, to whom the matter was submitted. The figure at Dec. 31, 1907, was £708,940, adding to which the appreciation £54,943, and additional expenditure during year £48,621, gave the present figure of £812,504. The item of service-pipes, &c., had been increased by £8109. The stock of coal, &c., stood at £82,043, against £70,378 in 1907. Sundry debtors were about the same. The amount owing by the South Barracas Gas Company (£41,172) had since been paid off by the Company. Sundry creditors were heavier by reason of their heavy capital expenditure and advances to the South Barracas Gas Company. In this connection, he desired to point out that, had not the amalgamation negotiations come suddenly to a head last March, the Board would have asked the shareholders to authorize a further increase of capital to cover the additional capital expenditure already incurred by reason of the necessities of the expanding business. Probably the shareholders had seen from the papers of the strikes now going on. He had not heard that they had affected the Company. He did not suppose they would do so. They had in their Engineer (Mr. Angus) a man who was, owing to his temperament, extremely well able to deal with any difficulties that cropped up in this way; and the Local Committee and Local Manager (Mr. Mariano Obarrio) would afford him any assistance he was likely to require.

Mr. ROSS PINSENT seconded the motion, which was unanimously adopted.

The CHAIRMAN, in moving the re-election of Mr. F. J. Heseltine, read a letter from him, in which he said it was with some hesitation that he offered himself for re-election owing to indifferent health; but from his long connection with the Company—some 34 years—his intimate knowledge of the past and present position of their affairs might be of some service in the contemplated amalgamation of the Companies.

Mr. F. C. IM THURN seconded the motion; and it was cordially passed.

Proposed by the CHAIRMAN, and seconded by Mr. ROSS PINSENT, Mr. F. C. Im Thurn was also re-elected.

On the motion of Mr. SAMUEL SPENCER, seconded by Mr. PILLEY, Messrs. Turquand, Youngs, and Co. were re-appointed Auditors.

Votes of thanks were heartily passed to the Local Committee and Manager, to the Secretary, and the Engineer, and their respective staffs for their services during the responsible times through which the Company had been and were passing; and with equal cordiality the Chairman and Directors were also thanked.

At the meeting of the London County Council last Tuesday, estimates of expenditure of £4575 for gas testing and £9210 for meter testing in the current financial year were approved.

GAS, WATER, AND GENERAL INVESTMENT TRUST.

There was small satisfaction for the shareholders to be derived from the report which was submitted at the annual meeting of the Gas, Water, and General Investment Trust, which was held last Thursday, at Winchester House. It will be remembered that at the previous meeting a Committee was appointed to confer with the Board in regard to the existing unsatisfactory state of affairs; and it was arranged that they should subsequently make the shareholders acquainted with their views. This they did; and the various conclusions at which they arrived were published in the "JOURNAL" for June 16 (p. 714).

In the report which the Directors submitted at the meeting last week, it was stated that, after providing the interest on the debenture stock, special expenses amounting to £633, and expenses of management, there was a loss for the year ended Jan. 28 of £5528, which had been deducted from the amount brought forward from the previous year, leaving a balance of £8474 to be carried forward. The decrease in revenue was accounted for mainly by the fact that the previous year's revenue included sums amounting to £11,420, being a final dividend on the Company's holding in the City of Wellington Electric Light and Power Company, Limited, and the final instalment of the sum received by way of commission from the Utah Light and Railway Company. No credit had been taken to revenue on account of securities received in lieu of dividends. There still existed a heavy depreciation on the cost price of the Trust's investments; and loans advanced included some which were of doubtful value. The expenses of managing the Trust had been reduced by about £580; and arrangements were being made which would result in further reduction during the current year. The Directors were steadily pursuing the policy outlined in the Committee's report. The loans owing by the Trust at Jan. 28 stood at £155,592, showing a reduction of £36,843. During the year the entire investment of the Trust in the City of Wellington Electric Light and Power Company had been liquidated, resulting up to the present time in a profit of £2559. The Trust's holding in the United Railway and Trading Company, Limited, continued to be a source of grave anxiety. It may be mentioned that, accompanying the Directors' report, was a list of the securities held by the Trust on Jan. 28; and of these investments in gas and water undertakings formed quite a small proportion, the Board having apparently laid out most of the funds under the third heading of the Trust's title—namely, "General Investment."

In moving the adoption of the report, the Chairman (Mr. J. B. Braithwaite) said the policy of reducing the outstanding liabilities had been consistently pursued during the past year. Twelve months ago, the loans stood at £192,212; while at the date of the last balance-sheet they had been reduced to £155,323. At the present moment they showed a further reduction of something like £25,000; but, of course, this policy had been pursued to some extent at the expense of revenue. The Board had not at present worked out any scheme for the re-organization of the capital of the Trust, though this was one of the things that would have to come forward in the near future. He was in hopes that within the next twelve months they would be able to put an approximate value on their investment in the United Railway and Trading Company; and then the placing of the capital on a sounder basis could be proceeded with. There were considerable changes in the revenue account. He had previously told the proprietors that they could not hope to reinvest the money received from the City of Wellington Electric Light and Power Company to give them anything like the return they were getting from that. The sale, however, had resulted in a small profit over the price at which the undertaking had stood in the books of the Trust; and possibly there would be a little more to come, as the liquidation had not yet been completed. The revenue account had also been made up in a somewhat different manner, in deference to the views of the new members of the Board; and this had depleted the revenue to the extent of £2500. The expenses of management had been reduced from £2800 to £2221; and it was hoped that other changes would effect a further reduction of £600 or £700 in the current year. They still had a carry-forward of between £8000 and £9000; and they had also their revenue from suspense account securities. The position had certainly improved since they met a year ago. He had felt rather bound in honour to the stockholders to retain the chair during the past year; but he would be extremely glad now to resign it, in favour of one of the gentlemen who had been recently put on the Board as nominees of the shareholders.

Mr. G. T. Moody (one of the new Directors the Chairman had referred to), in seconding the adoption of the report, said the revenue account had not "been depleted;" but in past years amounts had been improperly credited to it. Perhaps, however, the main cause of all the trouble had been the large number of extremely speculative and hazardous securities that the Trust had invested their money in. At the present moment money had been lent to the extent of £78,000 in various loans; and on these loans not one penny of interest in cash was received last year. In many cases he feared the loans were absolutely bad. These troubles had arisen owing to the Board having no knowledge whatever of the way in which a trust company should conduct its affairs. He thought the only thing was to ask Mr. Braithwaite to retire from the Board altogether. With regard to the £250,000 invested in the United Railway and Trading Company, the accounts of that concern had not been made up later than 1906; and he could only conclude, when a company deferred making up their accounts for such a long time, that there was some considerable loss to face which they did not wish to disclose.

Mr. Cooper, a member of the Shareholders' Committee, said the present position of affairs was entirely due to the maladministration of the old Board. They had had over a million of money to deal with, and twenty-one years to do it in; and they had succeeded in losing half the money. The reckless policy pursued, of placing large amounts of the Trust's money in extremely speculative securities, could have no other result than ultimate disaster. Had the Committee been appointed years ago, thousands of pounds would have been saved to the Trust.

After a good deal more discussion, a show of hands was taken as to whether Mr. Braithwaite should resign the chairmanship of the Trust; and the majority of those present expressed themselves in favour of his retaining the position. The report was then adopted.

SOUTHAMPTON GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday—Captain A. J. CORSE-SCOTT, J.P., in the chair.

The ACTING-SECRETARY (Mr. Frank Lewis), having read the notice convening the meeting, the report of the Directors for the six months ended the 31st of December was presented. It showed a sum of £14,951 available for distribution; and the Directors recommended the payment of maximum dividends on the ordinary stock for the half year, less income-tax. These would amount to £13,421, and leave £1530 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, said it afforded him very great pleasure to do so. The usual maximum dividends would be paid, and there would be a balance of £1530 to go to the current half year. Notwithstanding the mildness of the past autumn and winter, the Directors were pleased to report an increase of 7,052,000 cubic feet of gas sold in the half year, compared with the corresponding period of 1907. Moreover, the extended adoption of incandescent gas lighting, more especially the inverted burner, had led to economy in consumption, at the same time adding to the beauty and efficiency of gas lighting. The total sales of residual products had realized less in the past half year than in the corresponding period of 1907. A similar result, however, had been experienced by gas companies generally. Gas continued to be held in high favour, as was amply demonstrated by the addition since the last meeting of 540 prepayment and 286 ordinary consumers. Not only as an illuminant was gas as popular as ever, but its requirements for heating and cooking had resulted in 70 extra cookers, 142 gas-fires, and 172 gas-steam radiators being fixed during the six months covered by the report. The contract for the sale and purchase of land at Redbridge for a distributing gasholder in connection with the supply of gas to Lyndhurst had been signed; and the Directors hoped shortly to be in possession. The Southampton Corporation had recently decided, without discussion, to displace 430 gas-lamps (one-fourth) in the side streets by electricity, on the faith of their Electrical Engineer's assertion that similar displacements had taken place in other towns. He undertook to charge the same price for his illuminant as that paid for gas, which, it was beyond argument, could not be done at a profit. This course, he might say, was taken without affording the Directors any opportunity of conferring with the Corporation on the subject. There had been no complaints against the public lighting by gas, and the Board naturally regarded the action of the Corporation with surprise, as the Company had hitherto been on most friendly terms with the Council in this matter. They felt that the members of the Corporation could not have been in possession of any reliable information as to what was happening elsewhere; and therefore they had prepared and despatched to each Councillor, as well as to the Borough Engineer and Borough Electrical Engineer, important facts bearing upon the subject of gas *v.* electricity. In a letter recently received from the Town Clerk, the Directors were given to understand that, after the foregoing number of lamps had been adapted to electricity, the greater proportion of public lighting would still be by gas. Mr. E. W. H. Eady, who had been Secretary of the Company for the past five years, had been compelled, on account of continued serious illness, to tender his resignation, which he (the Chairman) need hardly say had been accepted by the Directors with regret. As a practical recognition of Mr. Eady's 33 years' faithful and efficient service, the Board had decided, subject to the approval and sanction of the stockholders, which he hoped would be unanimously given, to grant him a retiring pension of £300 per annum. Quite recently the Directors made one of their periodical inspections of the Company's works, which they found in excellent condition. He concluded by congratulating the stockholders on the close of yet another successful half year.

The DEPUTY-CHAIRMAN (Mr. J. C. Moberly, M.A.) briefly seconded the motion.

Mr. PARSONS referred to the way in which the Corporation were extending the electric lighting in the Shirley district, and remarked that theirs was not the only opposition the Company had to face, as the previous day a Committee was appointed to inquire into the subject of lighting the South Stoneham Workhouse otherwise than by gas. A certain air gas had been mentioned as being cheaper and more safe than coal gas; and he should like to hear the opinion of their Consulting Engineer (Mr. Joseph Cash) on the subject.

Mr. CASH explained that the gas referred to was an old opponent in another form. It was dangerous, according to some people, and not so cheap as the public were led to believe. He assured the stockholders there was nothing to fear from the competition of this gas.

The report was adopted, and the maximum dividends declared.

The retiring Directors and Auditor having been re-elected, it was unanimously resolved that a retiring pension of £300 per annum should be granted to Mr. Eady.

Votes of thanks were then accorded to the Chairman and Directors, the Engineer and Manager (Mr. S. W. Durkin), the Consulting Engineer, the Acting-Secretary, and the staff; and with the acknowledgment of these compliments the proceedings closed.

Gas Explosion at Doncaster.—During the making of an excavation for a new 18-inch gas-main in a street at Doncaster, last Tuesday, a leakage from the old main was encountered, and an explosion followed. This caused the sides of the excavation to fall in, and two men, named James Jordan and Joe Robinson, were partly buried by the earth. Efforts were at once made to extricate them; but before this could be done the gas flames threatened the men with death by burning. To prevent this, and to subdue the flames, sand and earth had to be heaped upon them; and over an hour elapsed before one of them could be extricated from his perilous position. First aid was then rendered by a police-constable; and the two men were removed to the Infirmary. Four other men were taken to the Infirmary, suffering from burns about the arms and neck, but after their injuries had been dressed, they were able to leave. It is thought that a spark from a pick caused the gas to become ignited.

BELFAST CORPORATION GAS SUPPLY.

Control of the Electricity Undertaking—Question of Discounts.

At the Quarterly Meeting of the Council of the County Borough of Belfast, the following minutes of the Gas Committee were presented:

At a meeting of the Gas Committee on the 8th ult., it was resolved: "That in view of the fact that the Gas Committee gave the Electric Committee on March 27, 1903, £32,500, and that the Electric Committee, though so far as we know are not making any profit on their business, yet are competing for business, both private and public, against the Gas Committee, who are largely contributing to the reduction of the rates, this Committee desires the Corporation to consider the advisability of placing the electric concern under the Gas Committee, as it was originally." On the 23rd ult., Alderman Sir James Henderson and Councillor M'Mordie, with the Electrical Engineer, attended as a deputation from the Tramways and Electricity Committee as to this resolution, and requested the Committee to authorize the Chairman to withdraw the minute referred to when proposing the adoption of the minutes at the quarterly meeting of the Council. The Chairman thanked the deputation for their attendance. At the meeting on the 16th ult., Alderman Craig brought forward the question of gas discounts, and pointed out that consumers using up to 400,000 cubic feet of gas per quarter on the same premises are entitled to a discount of 15 per cent., while those consuming over that quantity are in receipt of a discount of 20 per cent., in each case provided the account is paid in the gas office within one month from the date of delivery. In order that the rate of discount should be equalized over all consumers, he moved: "That the discount of 15 per cent. be increased to 20 per cent." The motion was seconded by Councillor M'Cusker, and passed by seven to four.

Mr. J. A. Doran, Chairman of the Gas Committee, in moving the adoption of the minutes, said that for some time past the Electrical Engineer had gone out of his way for the sole purpose of taking away the earnings of the Gas Department—the only department which was doing anything towards the relief of the rates. This cutting of prices was very bad finance. What would they think of any firm in Belfast having a good paying concern if they started another concern next door in order to take some of the profits away by cutting prices? Would such a course not result in bankruptcy? Yet this was what the Electricity Department were now trying to do. They had never from their inception paid anything towards the rates. Their machinery, with the exception of that belonging to the Tramways Department, was entirely obsolete; and though they maintained that they had made £11,000, he believed that if they had written off a proper amount for depreciation, they would be nearly £5000 to the bad. He went on to complain that mains laid by the Gas Department were allowed to lie idle because some councillor wished the electric light to be extended to some particular district. The Gas Committee had been drained to the last penny in relieving the rates and otherwise helping the Corporation; and they could not give them any more. The year 1904 was the last year that the Electricity Department was under the control of the Gas Committee; and in that year the Electricity Department, under the guidance of the Gas Committee, made £6093; while in 1905, the first year that it came into conjunction with the Tramways Department, it only made £4357. In 1906, after two years of electrical tramway running, the department only made £691. The Gas Committee had made several reductions in the price of gas. When he became Chairman of the Committee, the price was 2s. 3d.; and they had increased the gas discount by 5, 10, and 15 per cent. They now asked the Corporation to agree to a further 5 per cent., making the total discount 20 per cent. in all. If they could get some kind of undertaking that the Electricity Department would not compete in such a manner as to do the Gas Department out of their profits, he would be able to understand it; but, as a matter of fact, they were now selling electric current at a less cost than it was manufactured for.

On being appealed to as to whether the resolution regarding the Electricity Department was in order, the Lord Mayor (Alderman Sir Robert Anderson) said the Gas Committee had not made any definite recommendation. They simply desired that the Corporation should consider the matter. It was a unique suggestion for one Committee to make concerning another. They must have a tremendous conceit of themselves when they wanted to manage, not only their own business, but also other people's affairs.

Alderman Sir James Henderson moved as an amendment that all reference to the Electricity Department be omitted from the Gas Committee's minutes. He said, when the question was brought forward, the Tramways and Electricity Committee set themselves to secure fuller information in regard to the whole matter. As a result, with reference to the statement that the Electricity Department was making no profit, they found from the abstract of the audited accounts that the net profit from the commencement to March, 1908, was £44,722. This sum had been disposed of as follows: Transferred to renewals fund, £28,950; transferred to depreciation fund, £7573; balance carried forward, £8198. This amount did not include the additional sum set aside annually as sinking fund, which was sufficient to pay off the various loans in the periods (varying from 25 to 30 years) fixed by the Local Government Board. These periods represented the life of the plant on which the loan was expended. The net profit might have been applied to the reduction of the rates, if the Committee had not very properly thought it better policy to build up a renewals fund against some unforeseen expenditure. As to the loan from the Gas Department of £32,500, the Electrical Department paid to the general purposes fund 6½ per cent. per annum for this sum. He thought these facts showed that the Electricity Department was in a very sound and satisfactory condition, and that so far as the Committee were concerned they were trying to do their duty in the same way as the Gas Committee—with benefit to the ratepayers. It was a most extraordinary thing that, though Mr. Doran made such a poor statement about the state of the Gas Committee's funds, at the same time he agreed to the enlarged discount of 20 per cent. It would be far better to leave the Electrical Department to be controlled as at present, and to let the

Gas Committee continue their own good work in their own useful way, without any opposition between the two Committees.

The amendment was seconded by Mr. Riddell, who said he certainly must disagree with the Chairman and the majority of the members of the Gas Committee in regard to their action in this matter. He believed the Committee had quite enough work to do of their own; that their responsibility would be very largely increased in the near future; and that it would be absolutely impossible for them to give the requisite care to the Electricity Department. In addition to this, it seemed to him that it would be perfectly absurd to place the management of the electrical light organization in the hands of the Committee who were now in charge of the department which must, in the very nature of things, be more or less a rival and competitor for some of the business. If this were done, either the Gas Department would have to give way to the electric light, or, what was more likely, as the manufacture of gas was so dear to the hearts of the Committee, the electric light would play the part of Cinderella without the fairy godmother. For these reasons, and for others, it would be more advantageous to keep the department in the hands of the present Committee. He considered there was a close connection between the Tramways and the Electricity Departments, which might at some future time be separated with benefit, but which it would be inopportune to separate now. In case they were separated, he still thought that the present Committee was the proper one to carry on the business, perhaps divided into two Sub-Committees—one taking charge of the electric light and the other of the tramways, and the full Committee exercising control over both, and directing matters of policy. At the same time, he maintained that up to the present the Electricity Department had made no profit. He was not finding fault with the management, but with what was almost the universal system of municipal finance throughout the kingdom; for municipal trading had been a mockery to business men for many years, and the methods adopted were a byword among engineers engaged in the management of private concerns. He had examined the accounts of over 200 municipal electrical undertakings during the past few weeks. He found 70 of them showed a dead-loss without any provision being made either for reserve or depreciation; about 90, among them being the city of Belfast, had carried over their surplus funds to some form of account for the purpose of meeting depreciation and reserve; while 45 only had carried forward, in addition to the sum provided for reserve, anything towards the relief of the rates. Of the 45, he might say that the major portion in his opinion had been in too great a hurry to do so, and had made no complete provision for depreciation and reserve. It stood to reason that plant bought ten or twelve years ago, and which was more extravagant in the matter of generating than more modern machinery, should not be valued on the balance-sheet like machinery with superior economy that could be bought to-day. As to the amount that should be allowed for depreciation, the method adopted in this respect, both by the Electrical Department and the Gas Department, was not satisfactory.

The Lord Mayor said he thought it was a pity that anything should be said there that was liable to mislead the public or cause them to think that the Electricity Department was a failure. Everything connected with the works was thoroughly up to date, whatever might be said. It was just possible, of course, that since certain machinery was purchased improvements might have been introduced; but the Corporation could not have waited for the improvements. They secured the best machinery they could at the time; and they had now to make the best use they could of it. In addition to the statistics which Alderman Sir James Henderson had mentioned, he might give the following figures in connection with the department: Transferred to renewal fund to March, 1908, £28,950; transferred to sinking fund to December, 1908, £45,871; transferred to depreciation fund to March, 1908, £7573; balance carried forward at March, 1908, £8198; estimated net profit to March, 1909, £10,000—making in all £100,592. He hoped there would be no more friction in the matter. The whole discussion had arisen because permission was given for four electric lamps to be erected in Castle Place. As to the question of electric lighting generally, the department were bound to supply current to those who applied for it, if they agreed to the terms; and the Gas Committee had no right to be angry with the Tramways and Electricity Committee for doing their duty in this respect.

Mr. Doran said that, after the discussion which had taken place, he would agree to take back the portion of the minutes referred to in the amendment.

The amendment was accordingly withdrawn. Discussion then took place with regard to the increased discount to gas consumers; and as the result an amendment was carried referring the matter back to the Committee for re-consideration.

MUNICIPAL UNDERTAKINGS AT LOUGHBOROUGH.

When the estimate for the general district rate was being considered by the Loughborough Town Council, Mr. Hands said he could not help feeling disappointed at the meagre result obtained after all by the reduction on the whole of the rates of but a penny. He would draw attention to one drain on their resources, the Electricity Department; for £1500 had to be provided for the maintenance of this "white elephant," amounting to 4d. in the pound. But another thing which struck him as equally bad was the loss upon the gas-works. It would be news to some to know that this concern was also worked at a loss. When they considered that after meeting the sinking fund and interest they had a loss of £921, which he was told should be really £831, and that this year the estimated loss would be £808, it would be seen that these two concerns were losing up to a 6d. rate. This did not speak specially well for municipal trading; and he was afraid it afforded a grand object-lesson. He fully appreciated the distress in the town and the empty houses, and all that sort of thing; but this did not account for the loss on the two undertakings named. Something was wrong; but he confessed he could not suggest a remedy. He would ask the Council to look jealously after any suggestion of capital expenditure on either concern. They had been too prone in the past to allow capital expenditure if they could

provide it by loan, which brought in its way interest and sinking fund, from which they were suffering at the present time. They ought to be very careful; and he was glad to see, for the first time in the history of the Council since he had been a member, a spirit of economy practised by all the spending Committees.

Alderman Clifford said that Mr. Hands had referred to trading concerns of the Committees of which he was not a member; but he had left out another Committee of which he was a member. It was in the memory of the Council that they were compelled to go to this expenditure on electricity. They had an order in the Gas Bill for providing electricity; and other companies were endeavouring to get into Loughborough. They put off what might be called the "evil day" as long as they could; but in the end the Board of Trade told them they must do something—they had to leave off what was practically a "dog-in-the-manger" policy, and go in for the Electricity Department. They would remember that the gas-works cost them a considerable sum of money more than was anticipated—nearly one-third more—but they had got the works, and were bound in self-defence to prevent some other party coming in and competing against their light. The interest and sinking fund on this item alone amounted to £2078, which had to be provided for year by year; and he was pleased to say that last year there was a profit made on electricity of £589. Certainly the undertaking was improving at the present time. He would be perfectly candid about the gas. Last year they had a balance brought forward of £1340; and a balance of profit was brought forward from revenue of £5766. They had to pay against this interest on loans and sinking fund of £6597; and they had to pay £295 income-tax. Then also they took from the Gas Committee out of the balance and contributed to the district fund £500; so their total payments amounted to £7392. Against this they had the balance of £1340, and profits £5766; and the deficiency, which was carried to the next account, was shown at £286. He did not think that, taking into consideration the diminution of revenue for large consumers, there was anything to get alarmed at. There were business men who made a loss one year, but a profit afterwards. As for the Committee which Mr. Hands had glossed over very nicely, the estimated expenditure on the water-works for 1909 was £9941, and the sum spent £10,190. They had more receipts; but the deficit upon the working amounted to £2006. It was only fair when they were attacking gas and electricity to also remember the other Committees. The Water Committee, he was glad to say, had done as other Committees, and gone well into the matter; and this year they estimated their expenditure at £9640, with receipts £8225, leaving a deficit for the coming year of £1415. These were the losing concerns. But they had got good assets in the gas-works, which had made enough within £237 to pay the interest and sinking fund. At the same time, the water-works would improve; and it was, he thought, only a question of time when they might hope to pay both interest and sinking fund, and have something over for the rates.

DUKINFIELD GAS DEPARTMENT.

The Past Year's Working—Reduction in Price.

The Manager of the Dukinfield Corporation Gas Department (Mr. William Lindley) reports that the carbonizing plant again worked satisfactorily during the past financial year; but, owing to depression in trade and the cotton strike, there was a decrease of 5 million cubic feet in the make of gas. The total quantity of gas accounted for was 80,433,200 cubic feet, apportioned as follows: Cottages, by ordinary meters, 39,829,300 cubic feet; do., slot-meter consumers, 9,993,100 cubic feet; mills, 23,262,076 cubic feet; public lamps, 6,133,995 cubic feet; offices, works, &c., 1,214,729 cubic feet. The total revenue for the year was £14,180 (£10,936 being for gas), and the expenditure £10,175 (£4998 being for coal); leaving a gross profit of £4005. Adding £35 received as cottage rents, a total of £4040 was produced. Of this sum, £3172 was required for annuities, interest, and sinking fund; leaving a net profit of £868, compared with a profit of £552 for the year 1907-8, and a loss of £242 for the year 1906-7. According to a table, which has been verified by Mr. W. Moss, of Ashton-under-Lyne, showing the cost of gas per 1000 cubic feet sold for the past and the preceding financial years, the total cost of production in the former was 2s. 6¼d., and in the latter 2s. 6¾d.; the average prices being 2s. 8¼d. and 2s. 7¼d. There was consequently a gain of 2½d. in 1908-9, compared with 1½d. in the preceding year and a loss of 0½d. in 1906-7. Mr. Lindley is consequently to be again congratulated on the results of his year's work. The quantity of coal and cannel carbonized in the twelve months was 7354 tons, and the total make of gas 86,904,000 cubic feet. As the quantity sold was 80,433,200 cubic feet, the unaccounted-for gas was 6,470,800 cubic feet, or 7¼ per cent. The make and sale per ton of coal were 11,817 and 10,937 cubic feet respectively, compared with 11,456 and 10,635 cubic feet in the preceding year. It may be added that the Gas Committee have decided to make a reduction in the price of 3d. per 1000 cubic feet.

The Proposed Pensions for Coventry Gas-Workers.—At the meeting of the Coventry Corporation last Tuesday, the report of the Gas Committee on a proposed scheme of pensions for employees in the Gas Department whose services will be dispensed with owing to the transfer of gas manufacture from Coventry to Foleshill, given in the "JOURNAL" last week (p. 323), was under consideration. Mr. Cash opposed the scheme, and moved, as an amendment, that the proposed pensions be reduced by one-half. After a long discussion, however, he withdrew it in favour of one proposed by Mr. Bannington, to the effect that the recommendation of the Committee be referred back, and that they be instructed to so readjust the hours of labour of the men that there would be no necessity to discharge any of them. The Mayor, however, ruled this amendment out of order, as it interfered with the powers which the Council had delegated to the Committee. A further amendment was eventually carried referring the whole scheme back to the Committee for reconsideration.

PUBLIC LIGHTING OF FINCHLEY.

Local Government Board Inquiry.

At the Offices of the Finchley Urban District Council, last Tuesday, Mr. H. R. Hooper, M.Inst.C.E., held an inquiry into an application made by the Council to the Local Government Board for sanction to the borrowing of £2200 for street lighting by means of arc electric lamps. The application was supported by the Clerk to the Council (Mr. E. H. Lister), and also by Mr. J. P. Connor, on behalf of the North Finchley Tradesmen's Association; but it was opposed by Mr. S. L. Oddie, for the North Middlesex (Hendon) Gas Company, and by Mr. Chambers, for the West Finchley Ratepayers' Association.

In addressing the Inspector in support of the scheme, Mr. Lister stated that the extra cost entailed by its adoption would be £739 per annum; the total annual outlay being estimated at £1000, less £261 the present cost of lighting. In addition, there would be the capital expenditure of £2200, for which application had been made. Several public bodies—notably the North Finchley Ratepayers' Association and Tradesmen's Club—passed resolutions in favour of the scheme.

Mr. Royston, the Chairman of the Highways Committee of the Council, said the Committee had considered the public lighting question in response to repeated applications for improvement; and as the arrival of trams in the district necessitated the widening of a thoroughfare, the present lighting of which would be inadequate to meet the new conditions, they were led to go into the matter. They came to the conclusion that flame arc lamps would be best; inasmuch as they would not only meet existing requirements, but were likely to satisfy the district for a number of years. The Committee were unanimous on the subject.

In cross-examination by Mr. Oddie, witness said the present cost of the incandescent electric light was £3 per lamp, and the cost of the new scheme would be £20 per lamp, inclusive of £3 for Council charges. They had only considered the question of gas in a general way. There was a discussion in 1905 as to how the lighting should be improved, and he received a tender from the Gas Company which was reported to the Council. The Electricity Committee intervened, however, and the Company's offer, which was to light 200 gas-lamps at £2 10s. per annum, was refused. He admitted that if these lamps stood by themselves, 10s. per lamp would have been saved by the acceptance of the offer. He suggested that electric arc lamps were cheaper than gas. Witness was questioned as to some figures he had given comparing the cost of electric light and gas; and he acknowledged that they were not correct. Counsel said they showed that the proposed scheme was a very extravagant one; and he submitted that the majority of the inhabitants were not in favour of it. Witness said he could prove to the contrary; but he added that all the members of the Council were not unanimous in its favour. Asked point-blank why he would not go in for gas lighting, he replied that the reason was that the Council determined several years ago to have electric lamps. Moreover, they had an undertaking which had pledged the ratepayers to the extent of about £100,000. Though the Gas Company might give them exceedingly advantageous terms, it would be a great advertisement for them and against the Council. He knew that electricity had been abandoned for street lighting in many places in the kingdom, including London. Questioned as to the Council's Bill of last year, witness said they withdrew the portion relating to the extension of the electric lighting area because the House of Lords sought to put upon them the Northumberland clause. Counsel remarked that they were now entitled to sell their light below cost price; and he asked witness if he called this a sound businesslike position to be in. Witness declined to answer the question, and denied that the scheme was put forward to benefit the electric light undertaking.

The Inspector interposed to point out that the Local Government Board had stated, in a communication dated Aug. 5, 1905, that "electric lighting was high compared with other lighting;" and that the Electrical Engineer called in by the Council had reported that the street lighting was unremunerative. Witness said they did not admit that it was unremunerative, but unprofitable. Asked by Mr. Wells (a ratepayer) whether, supposing he, as Chairman of the Highways Committee, had been considering a scheme for improving the lighting, and there had been in the parish a gas company and an electric light concern, not the property of the Council, he would have asked for a price, witness replied that, in those circumstances, he should have done so; but if there were an electric light undertaking owned by the Council he would not have their light regardless of whether or not it was supplied at a loss.

Mr. E. Calvert, the Electrical Engineer to the Council, in answer to the Clerk, gave particulars of the scheme, which he said was in no way connected with the present undertaking. In cross-examination by Mr. Oddie, witness said he did not agree with the Council's Consulting Engineer that the public lighting was unprofitable. He was aware that Mr. Preece had stated that they were supplying current for lighting at too low a price, and that their capital was abnormally high; and if he was correct, possibly the price ought to be put up. Answering further questions, Mr. Calvert said the loss on the first half-year's working of the electric light undertaking was £300; but in the second year there was a profit of £227, and in 1906 a profit of £106. In 1907, however, there was a loss of £719, and in 1908 one of £292. They had no depreciation fund and no reserve fund. Mr. Preece said it was desirable for them to fill up the reserve fund; but they were not able to do it.

Mr. Oddie then addressed the Inspector. He said the whole history of the electric light undertaking was tinged with extravagance. The reckless way in which capital had been lost, and the unbusinesslike manner in which current had been sold below cost price, showed that the Council were not taking serious care to run the concern as it should have been run. He referred to the Gas Company's offer to supply 200 lamps with gas and maintain them at £2 10s. per annum, and said that instead of accepting this offer, which would have shown a saving of 10s. a lamp, the Council entered upon a scheme which threw a burden upon the rates. From that time to this, more money had been spent on public lighting than should have been done. The duty of the municipal authority was not to say they had some form of municipal

trade in their hands and must not go outside their own building, but do what was in the best interests of the ratepayers. It was a matter of concern to the Gas Company, not only as competitors but as ratepayers, that the Council had given no consideration to the question of what was acknowledged throughout the kingdom to be the most economical form of lighting. He contended that they had ignored the Local Government Board and their duty to the ratepayers, and had not taken any trouble to find out what it would cost to light the roads with gas. In conclusion, he urged that electric current for street lighting was not profitable, and that the sum of £1000 would be sacrificed to the ratepayers by supplying current at a loss. If the Council had consulted the Gas Company, they could have had a better illuminant than the electric light at an incalculably smaller sum.

Mr. Chambers also addressed the Inspector, and complained that the Council did not consult the Gas Company.

The inquiry then concluded.

DISPUTE AS TO LAYING A GAS-MAIN AT TAUNTON.

As the result of some friction which has arisen between the Taunton Town Council and the Gas Company in regard to the laying of a main, a special meeting of the Council was held last Wednesday, under the presidency of the Mayor (Alderman J. G. Price) to consider and determine, upon the recommendation of the Main Drainage Committee, that the Town Clerk be instructed to take proceedings against the Company for their wrongful act in breaking the roads and laying a gas-main in Kingston Road and Station Road, "in contravention of law, and to the injury and prejudice of the Corporation, as the road authority, and their works in and under the said roads." It should be explained that within the last two or three weeks the Company's workmen had been engaged in laying a main in the roads mentioned, which are situate in the northern end of the town. The work has arisen in consequence of the Taunton Tramway Company having decided to extend their line for about a quarter-of-a-mile beyond the railway station in a northerly direction, where there is a resident population of upwards of 5000. In view of this work shortly taking place, the Gas Company, from the point of view of the public convenience, decided to lay a new main in the same direction, so as to obviate opening the roads again after the tramway extension had been completed. They finished their work about a week ago, and have since made good the roads. During the progress of the work, a question arose as to the Company having interfered with a manhole and sewer; and, moreover, the Council alleged that proper notice to open the roads had not been given by the Company.

At the special meeting of the Council, the Town Clerk (Mr. G. H. Kite) read some letters which had been written by him and by Mr. David Edwards, the Borough Surveyor, to Mr. Alfred Edwards, the Secretary and Manager of the Gas Company, and also one from Mr. Archibald Channing, the Company's Solicitor, to the effect that he was quite sure the Directors desired to settle the matter in dispute in an amicable manner. As there appeared to be an eagerness to discuss the question, the Council, on the suggestion of the Town Clerk, resolved itself into Committee; and ultimately, on the proposition of Alderman H. J. Spiller, Chairman of the Main Drainage Committee, the report of the Committee was unanimously adopted. Subsequently the representatives of the Press were supplied with a copy of the report, which was as follows:—

The Gas Company, without proper preliminary steps, and without depositing plans or making arrangements, in accordance with sections 8 and 9 of the Gas-Works Clauses Act, 1847, and in defiance of protests by the Borough Surveyor, as the proper adviser of the Council having control of the roads in the borough, and ignoring further protests by the Council through the Town Clerk, acting under instructions from your Committee, before and after the 27th of April, broke up, and persisted in breaking up, parts of Kingston and Station Roads, and altered and interfered with a manhole to the Council's sewer, and laid a gas-main over, and in close proximity to, the said sewer, thereby interfering with, and preventing access by the Council to, the said sewer. Your Committee present the letters before referred to and the notice served on the Gas Company, all of which have been ignored by the Company. Your Committee regret that the extraordinary procedure of the Company compels them to recommend the Council to instruct the Town Clerk to take proceedings, on behalf of the Council, for penalties under the said Act, or otherwise as he may advise, unless the Gas Company are prepared to divert the main (making good the manhole) in such direction as recommended by, and to the satisfaction of, the Borough Surveyor.

The Council then adjourned.

Statement by the Gas Manager.

In consequence of this dispute, our Taunton Correspondent called upon Mr. Edwards to ascertain his views on the subject for publication in our columns; and he obtained the following particulars.

With regard to the allegation that no proper notice had been given by him for permission to break open the roads, Mr. Edwards emphatically denied this, and showed, by a book in the Company's offices, proof of this having been done by the signatures of the person who delivered the notices—two really having been given. The first was on April 29, 1908, when the Company were engaged in laying a new main in Bridge Street; intimation being then given that they proposed in due course to lay a new main in the roads at the northern end of the town as mentioned. Then, on the 30th of March this year (the Tramway Company having intimated that they were about to proceed with their extension), Mr. Edwards again gave notice to the Council that he proposed to carry out the work from that date; and this was subsequently done. During its progress, the Borough Surveyor saw Mr. Edwards on the spot; and, in response to a question by the latter as to what was required to be done, the Surveyor said he wanted the line of the main altered so that the pipe should be inside the manhole instead of outside as at present. Mr. Edwards pointed out that there was not room for this to be done; but he told the Surveyor that if the manhole could be altered, he would put the pipe inside. The Surveyor asked at whose expense this was to be done; and Mr. Edwards immediately replied: "At the expense of

the Gas Company." The Surveyor then went away without coming to any decision; simply saying: "You will have to alter your line."

As the matter is now in the hands of the Solicitors on either side, Mr. Edwards declined to say anything more. We understand that the Company have offered to favourably consider any suggestion made to put an end to the dispute; and the general feeling in Taunton is that a settlement satisfactory to both sides will be arrived at.

METROPOLITAN WATER BOARD.

At the Meeting of the Board last Friday, Mr. W. I. Burns moved that the sum of £53,329 11s. 2d. in the cash paper which was recommended for payment by the Finance Committee be reduced by £500. He said that when the question of the salary for the Chairman first came before the Works Committee, it was passed there by a majority of 10 votes to 2. When it came before the Board, it was passed by a majority of 19 votes to 2—Lord Welby and the Vice-Chairman of the Board not voting, and only 24 members being present. A number of members did not consider it was a proper expression of the Board's opinion when only 21 voted out of a Board consisting of 66 members. Mr. Lawrence seconded the amendment. The Chairman (Mr. E. B. Barnard, M.P.) said that what was proposed at the preceding meeting did not in any shape or form emanate from him. It was perfectly well known that he did not stand to be a personal gainer. On the amendment being put, only eight members voted for it; and the original amount as recommended by the Committee was passed for payment. Mr. Burns said he should give notice to rescind the motion with reference to the Chairman's salary.

The Appeal and Assessment Committee reported that last year the Board decided to treat as domestic supplies, under sections 8 and 9 of the Charges Act, certain supplies which had been previously afforded by meter. Their attention had now been directed to the fact that in some cases the consumption had greatly increased as a result of this concession, and that a charge on value was not commensurate with the consumption. In such a case, the Board had power, under section 20 of the Charges Act, to require that the supply should be taken by meter, and it would be well if they were authorized to put the section into operation where necessary. The Committee recommended that they should be authorized to apply it in such cases as they might deem expedient; and the recommendation was agreed to.

A return was presented relating to the supply of water for the month of March. It showed that the average daily quantity sent out was 214,989,000 gallons. The houses, &c., supplied numbered 1,088,501; the estimated population being 7,045,814. The mean supply per head per day was 30.5 gallons, compared with 29.4 gallons in the corresponding month last year. The total quantity of water in store in impounding reservoirs at the end of the month was 6919 million gallons, against 6735 millions at the end of March, 1908.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The question of charging differential prices for gas is apparently about to become again the subject of controversy in the Glasgow Town Council. For long the Council refused to adopt the practice, holding firmly to the principle that gas should be charged the same to all the citizens, who, as ratepayers, are equally responsible or liable in the matter of the upkeep of the gas-works. In 1902, on the strong recommendation of the late Mr. W. Foulis, the Corporation made a reduction of 4d. per 1000 cubic feet in favour of motive power users. Then in 1905 a subdivision of the differentiated class was made by the granting of a special allowance on gas for manufacturing purposes, other than for lighting and domestic uses. This policy has been followed since. The subject has been again brought forward by the preparation of a report for the Gas Committee, by Mr. A. Wilson, the Engineer. In his report, Mr. Wilson states that when the Gas Committee decided to charge a reduced rate for gas for manufacturing purposes, as being in line with gas used for power, it was at once seen that there would be considerable difficulty in drawing a line of demarcation between gas to be charged at the manufacturing rate and that to be charged at the ordinary or domestic rate. With regard to gas for ordinary trade purposes—viz., that used in the making of ordinary articles for sale—there was little trouble. Under this head were classed the gas used for calendaring and singeing, kilns, furnaces, blowpipes, tailors' irons, hot-plates for bakers and confectioners, &c. It was also decided that gas used for cooking in restaurants and tea-rooms should be included under the manufacturing rate; but all applications from hotels, clubs, and lodging-houses had been denied, as, under the present system of charging, the only practical rule which had been found to be workable was that where the premises were used as a residence all the gas consumed was to be charged as domestic, but where, as in a tea-room or restaurant, there was no one in residence, the gas for the articles sold might be classed as manufacturing. At present, the number of meters installed to register the gas used for manufacturing purposes totalled 1030. Last year the quantity of gas sold for power was 356,903,000 cubic feet, and that sold for manufacturing purposes 206,371,000 feet. The Gas Committee, who had had the report under consideration, recommended that after June 1, and provided the estimates for next year would allow of this being done, the prices to be charged by the Corporation for gas supplied for non-illuminating purposes should be: For motive power purposes, 1s. 9d. per 1000 cubic feet for quantities of less than 500,000 cubic feet per annum, 1s. 8d. up to 2,000,000 feet, 1s. 7d. up to 5,000,000 feet, and 1s. 6d. above 5,000,000 feet; for manufacturing purposes, 2s. 1d. per 1000 cubic feet for quantities supplied of less than 100,000 cubic feet per annum, 1s. 9d. up to 500,000 feet, 1s. 8d. up to 2,000,000 feet, 1s. 7d. up to 5,000,000 feet, and 1s. 6d. above 5,000,000 cubic feet. From a census of the probable consumers who would come under these scales, Mr. Wilson estimated that the various hotels, clubs, institutions, &c.,

which would require to be added to the present consumers of gas for manufacturing purposes would use (say) 50 million cubic feet of gas per annum. This would mean a reduction of income to the department of probably £1000; and if the proposed scales of charges were adopted, the extra reduction of revenue to the department would be about £800. But these rates would no doubt greatly encourage the use of gas for non-illuminating purposes. The recommendation came before the Town Council on Thursday, but was not adopted. Mr. W. C. Martin moved that it be sent back to the Gas Committee for further consideration. In his opinion, the poor people of Glasgow would have to pay for the reduction of income which would result. Bailie M. W. Montgomery, the Convener of the Committee, agreed to take the minute back.

On Friday of last week, the Corporation of Aberdeen paid their annual visit of inspection to the gas-works. In the walk through the works, Mr. S. Milne, the Engineer, Mr. Smith, the Assistant-Manager, and Mr. W. A. Stewart, the Convener of the Gas Committee, acted as guides. It is reported that special interest was taken in the carburetted water-gas plant, which was introduced in the autumn of last year, and was seen that day by a number of the councillors for the first time. The working of the plant was explained by Mr. Milne. The company also looked at the coal-stores, of a capacity of over 7000 tons, the retort-bench, in which there are 432 retorts, West's charging and drawing machines and coal-breakers, and at all the other plant. Great satisfaction was expressed at the up-to-date condition of the entire works and plant. After refreshments had been served, Bailie Wilkie said that the very large and important Corporation department they had inspected must impress all who had seen it; and they must recognize that the man at the head of the concern must be possessed of brains. The Corporation had been very fortunate in having had as Manager of the gas-works the late Mr. Smith, who was an able, efficient, and admirable official. They were also fortunate in having, as Mr. Smith's successor, one who was brought up under him, and who therefore knew all the ways of the work. Mr. W. A. Stewart said the works had been so well managed that, although they had had a capital expenditure of £450,000, their total debt was only £170,000. The Corporation had, therefore, a very valuable asset in the gas-works; and it would become even more valuable. The price of gas in Aberdeen, at 2s. 7d. per 1000 feet, was as low, comparatively, as in any other city in Scotland. The installation of carburetted water plant gas was called for owing to the high price of coal. It had been necessary for them to introduce the new system, and they had been well pleased with it. Mr. Milne, on behalf of the officials, acknowledged, and expressed pleasure at, the great interest shown by the councillors in their visit to the gas-works. The illuminating power of their gas was 4½ candles above that supplied in Glasgow, and 3½ candles above that in Dundee. If more incandescent burners were used, there would be fewer complaints. In connection with the carburetted water gas plant, they anticipated being able to buy oil at from 5s. to 7s. 6d. per ton less than last year; and he expected that they would be able to reduce the price of gas.

It was scarcely to be expected that so important a step as the transfer of the Kirkcaldy Gas Company, Limited, could be effected without that ubiquitous individual, the anonymous writer to the newspaper editor, seeking to have a hand in the business. There have appeared in the local Press a number of letters, all anonymous, the burden of which is that more information should be given to the community before it is decided whether or not the Company's undertaking should be acquired. The letters are in themselves of no consequence; but they have had the effect of drawing from Mr. J. Wright, the Convener of the Lighting Committee of the Town Council, in a letter published to-day, some explanations as to the action of the Committee. The Committee, he says, found that the Act of Parliament lays down that a corporation cannot start the manufacture of gas where a company already exists, and that before entering into negotiations with this Company they must first of all come to a decision to purchase. They had no alternative, therefore, but to come to this decision. The correspondents may rest assured that the price to be paid for the undertaking will be on fair and equitable lines. In support of the transfer, Mr. Wright compares the case of Dunfermline with that of Kirkcaldy. Last year, he says, the price of gas in Dunfermline was 2s. 6d.; while in Kirkcaldy it was 3s. 4d. The rise in price in Dunfermline during the years 1897 to 1901, was 4d., while in Kirkcaldy it was 8½d.; and the fall in the price of gas in Dunfermline, since 1901, had been 1s. 5d., while in Kirkcaldy it had been only 3½d. These were some of the considerations which had led the Committee to the conclusion that it would be a good thing for Kirkcaldy to purchase, and that the present is the time to do so. What they had to see to now was to get the best possible men to settle the price for them.

The vexed, though small, question regarding the supply of gas to the village of Crossgates, in Fife, was before the Dunfermline District Committee of the County Council on Tuesday. Hitherto we have had our attention drawn to the subject by the controversy among the inhabitants as to whether they should take gas from the Cowdenbeath Gas Company or from the Corporation of Dunfermline. As it came before the District Committee, the subject resolved itself into a requisition by the inhabitants for the formation of a special lighting district, without regard to the nature of the illuminant; but it is to be noted that the Master of Works, in preparing estimates for the scheme, adopted gas as the illuminant. His estimate is that 4½d. per pound upon an assessable rental of £3472 will produce £65. The expenditure of this sum he estimates would be: Interest on the capital cost of 38 lamps (£123 10s.) £4 6s. 5d., and instalments of repayment, £6 3s. 6d.—together £10 9s. 11d.; and lighting, &c., at 28s. 6d. per lamp, £54 3s., making an annual outlay of £64 12s. 11d. The Finance and Public Health Committee reported that they had had before them an application by the Cowdenbeath Gas Company for permission to lay a gas-main between Cowdenbeath and Crossgates, and also a protest by inhabitants in Crossgates against the granting of the wayleave, and that the Committee recommended that a decision in both matters should be postponed until it was seen whether a lighting district would be formed. If a district were formed, the District Committee would have to provide for the lighting of it; and it would fall to them to negotiate as to the best source from which the lighting could be obtained. The

Committee further recommended that the Clerk should make inquiries as to the terms on which the Cowdenbeath Gas Company and the Corporation of Dunfermline would furnish supplies of gas to the district, both for public and for private lighting. The Clerk stated that offers from both parties had been received, but too late for consideration that day. The subject was therefore sent back to the Committee.

The Dumfries Town Council on Thursday made the joint appointment to the post of Gas Manager which was foreshadowed in the report of a meeting of the Town Council, held a fortnight ago—Mr. J. Smith, the Assistant-Manager, and Mr. S. Dickie, the Clerk, being appointed. The appointment was not a unanimous one. Mr. Dakers moved that they advertise the situation. Mr. Robinson considered that when they had two such men it would be absurd to go outside. Bailie Thomson, the Convener of the Gas Committee, remarked that Mr. Smith was an accomplished gas engineer, and had all the necessary qualifications for the position. During the time he had had charge of the gas-works they had got 500 cubic feet more gas per ton of coal than he ever remembered before. They had never had a more conscientious cashier than Mr. Dickie. The Council, on a division, made the joint appointment by 18 votes to 6. The Council then agreed to vote to Mr. Malam's widow his salary for the month of May, as a gratuity. They also resolved to advance the wages of the gas stokers by 6d. per shift.

The Kirkcudbright Town Council, on Thursday, considered a report by Mr. W. B. M'Lusky, of Perth, regarding the proposed alterations at the gas-works. Mr. M'Lusky estimated the cost of the alterations which were necessary at £2000. The Clerk said the Gas Committee had considered the report, and recommended the adoption of part of the scheme proposed. This included a steam-boiler, at a cost of £164; a gasholder and tank, at a cost of £820; foundations for the tank, £125; and a tar-column and alterations upon the condenser, £444. The Committee also recommended that a new setting of three retorts be put into a bench at present out of use, at a probable cost of from £65 to £75, the expense to be met out of revenue. The Council adopted the recommendation of the Committee by ten votes to four.

On Thursday of last week, the ceremony of cutting the first sod in connection with the erection of new gas-works at Fauldhouse was performed by Mr. W. Prentice, the Chairman of the newly-formed Gas Company, in the presence of the Directors and shareholders. Mr. Prentice, in the course of his remarks, said they were fortunate in having for their Engineer Mr. Wilson, the Manager of the Coatbridge Gas Company. All the money required had been subscribed in a very short time. The plant would be in full working order early in August.

At a meeting of the Helensburgh Town Council last night, Mr. Mitchell, the Convener of the Gas Committee, stated that during the past year there had been a considerable increase in the manufacture and consumption of gas, and it was worth noting that there had been a very marked increase in the use of prepayment meters. The money collected from these meters amounted to £413—an increase of £167. The Gas Committee intend to make overtures to the Town Council for the purchase of the old Grant Street School, for extending the gas-works.

The Directors of the St. Andrews Gas Company intimate the abolition of cooker-rentals, and state that they are now prepared to supply and fix, free of rental and free of charge, gas cookers, grills, and fires.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 8.

The month opened with a quiet market, and, there being no special demand for any point, production has only been disposed of at declining prices, and buyers who have contracts for May shipment to cover seem inclined to postpone the operation. The closing quotations are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. to £11 5s. per ton f.o.b. Liverpool, and £11 7s. 6d. per ton f.o.b. Leith. Although makers have modified their views with regard to prices in the forward position, they have not done so sufficiently to induce much business; buyers' ideas being scarcely above spot values for delivery up to the end of the year. For near months, however, spot prices have been accepted.

Nitrate of Soda.

Local supplies being strongly held, spot quotations are 10s. 4½d. per cwt. for 95 per cent., and 10s. 7½d. for refined quality, though spring demand has slackened, and stocks are somewhat plentiful.

Tar Products.

LONDON, May 10.

The markets for tar products have been unchanged throughout the past week, with the exception of pitch, which is still very firm. It is evident that the majority of manufacturers are well sold for this year's delivery, and will have no necessity to come into the market unless they consider that the price offered warrants them doing so. In addition to this, there is, of course, a great amount of uncertainty as to the quantity of tar which will go on the roads in the summer—it being felt that the proposals in the Budget with regard to roads will have a great effect on the market for this article. Up to the present, Continental consumers have been decidedly averse to paying the advanced prices. They still seem to think that by withholding from the market they will do better in the end; but this is doubtful, in the light of the very strong position of the article in this country. Creosote is firm, but without alteration in price; and it is still possible to buy at reasonable prices for prompt delivery. Carbolic acid is firm, but apparently offers are all emanating from dealers. It does not seem that consumers are willing at present to pay the price asked. Crystals are very quiet indeed. Benzol, 90 per cent., is dull; and 50-90 per cent. also has been sold at very low prices. Toluol appears to be easier than was the case last week. Solvent naphtha is steady; but there is no alteration in price, though actual London qualities are in good demand. Coke-oven crude naphtha is fetching a very poor price, owing to the fact that it consists almost entirely of benzols which are practically unsaleable.

The average values during the week were: Tar, 13s. 9d. to 17s. 9d., ex works. Pitch, London, 25s. 6d. to 26s.; east coast, 25s. to 26s.; west coast, 24s. 6d. to 25s. 6d., f.a.s., Mersey ports, 24s. 6d. to 25s.

f.o.b. others. Benzol, 90 per cent., casks included, London, 5½d. to 6d.; North, 5d. to 5½d.; 50-90 per cent., casks included, London, 4½d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8½d.; North, 7½d. to 8d. Crude naphtha, in bulk, London, 3½d. to 3½d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1½d. to 1s. 2d.; west coast, 1s. 0½d. to 1s. 1d. Naphthalene, £4 to £8; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been very dull throughout the past week, and prices closed lower all round. In London, £11 2s. 6d. would probably be accepted upon Beckton terms; and it is doubtful whether anything over this figure could be secured in Hull. In Liverpool, the price is about £11 5s.; while in Leith, though manufacturers are asking £11 10s., they cannot obtain this figure.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a steady request for coals in the north-eastern trade, but, on the whole, the prices are slightly easier than they were a fortnight ago, though the Baltic demand is now setting in in earnest. In steam coals, best Northumbrians are from about 12s. 1½d. to 12s. 3d. per ton f.o.b., second-class steams from 10s. to 10s. 6d., and steam smalls show a better demand at from about 5s. 6d. to 6s. 6d. The output at the collieries is heavy; and it is well taken up. Gas coals show a falling off in the demand for home use; but the exports seem to be heavier. Prices are generally steady for Durham gas coals at from about 9s. 3d. to 10s. 4½d. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," up to 10s. 9d. per ton is quoted. As to contracts, there are some in negotiation for Northern boroughs, but not to any large extent; and there are also some of moderate quantities for export over the shipping season. The prices that seem probable are not very much different from those that are above quoted for current sales, so that there is little difference in values over the week. In coke, the market is stronger. Gas coke is steadied by the smaller output, and is quoted at from 12s. 6d. to 13s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The demand for shipping is improving. The home request remains quiet, particularly for coal for manufacturing purposes. Coalmasters are taking up the position that present prices are unprofitable to them, and that they are entitled to a further reduction of miners' wages to the amount of 12½ per cent. The prices quoted are: Ell 8s. 6d. to 10s., splint 9s. 6d. to 9s. 9d., and steam 8s. 9d. to 9s. per ton f.o.b. Glasgow. The shipments for the week amounted to 311,564 tons—an increase of 8492 tons upon the preceding week, and of 1926 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,415,398 tons—an increase of 277,261 tons upon the corresponding period.

THE MIDLAND GAS-COAL PROBLEM.

The following article appeared in the editorial columns of the "Iron and Coal Trades Review" last Friday.

Negotiations for the renewal of gas-coal contracts have this year commenced at a much earlier date than usual. The uncertainty as to the higher cost of production, owing to the coming into operation of the Miners' Eight Hours Act on July 1, has, no doubt, tended to increase the anxiety of gas engineers to arrange their contracts as early as possible. The prices at which some of the large London Gas Companies have obtained supplies from Durham collieries make the possibility of any portion of their orders going to the Midlands very remote; for, even with a gas mixture, it would not be possible to compete, either by rail direct or *via* Hull. In fact, collieries will not attempt to do so, as the idea of quoting anything like the Durham prices is out of the question.

There have already been a good number of contracts renewed, especially with towns in the Southern Midlands. Generally, they have not adopted the usual method of advertising for tenders in the trade papers, but have asked only the firms who are at present supplying them; and in many cases they have renewed their contracts on the best terms possible. In colliery circles, there has been an understanding that 6d. per ton on last year's prices should be the maximum reduction given. But, as is usual in a falling market, coalowners do not stand loyally to each other, and their efforts at combination are greatly discounted by firms who are anxious to extend their operations, and will accept less than the general prices. Gas engineers are more successful in combination than colliery owners. At their meetings, held in different centres periodically, helpful hints are passed round; quotations and results obtained from different coals are compared; and a manager may thus readily obtain full information in regard to the comparative value of any fuel he wishes to use.

Many contracts have been renewed at 6d. per ton reduction; but in some cases it has been necessary to concede 9d. in order to secure a renewal of the business. This is a serious thing to collieries, and cannot, in many instances, leave any distinct margin of profit. There has been a reduction of 5 per cent. in miners' wages; but that is a very small thing compared with a reduction of 9d. per ton. The highest grade qualities of gas coals are holding their position best. The tonnage of this class raised has not greatly increased in recent years, while the demand is fully maintained; but in second-rate qualities a greater tonnage is raised, and consequently the competition is keener.

Since the coal boom of 1900, gas engineers have given special attention

to the question of using cheaper fuels than previous to that year; and at many large works a much greater proportion of small fuel—such as bean nuts, pea nuts, and slack—is carbonized. This is especially the case at works nearest the field of production, as at towns far removed it is found more economical to secure best coal; the results obtained being most satisfactory, and a considerable saving being effected in carriage and wear and tear.

West Bromwich Gas Undertaking.

At a meeting of West Bromwich Town Council last Wednesday, the Gas Committee reported that the sales of gas during the financial year ending March 31 were 329,345,388 cubic feet—a decrease of 12,718,352 cubic feet as compared with the previous year; and the amount of gas rental was £40,074—showing a decrease of £1514. Alderman Wilson said that the increased prices they had had to pay for their coal and the decreased sales would make a great difference to the concern. Mr. Lawley did not think the reduction was among the ordinary consumers, but was owing to the fact that several large works had changed their system and had ceased to use gas. Alderman Blades suggested that the falling off might be accounted for by the competition of the electricity undertaking. Alderman Wilson, in reply, said the reduction was chiefly by large consumers, who had adopted a system of their own for generating electricity. The gas undertaking had also suffered to some extent through the competition with the Electricity Department, and he suggested the advisability of adopting some such arrangement as they had in Birmingham, where there was a Joint Committee of the two undertakings. The report was adopted.

Bahia Blanca Gas Company, Limited.—In the report to be presented at the second ordinary general meeting of this Company on Thursday, the Directors state that the profits for the six months to Dec. 31 last amounted to £1867. Adding the £2048 carried forward makes an available total of £3915, out of which they recommend a dividend of 2 per cent. on the "A" shares, free of income-tax, carrying forward £915.

New Joint-Stock Companies.—The Mazza Centrifugal Gas Syndicate, Limited, has been registered with a capital of £35,000, in £1 shares, to adopt an agreement made between Edoardo Natale Mazza and H. A. Bourich, and to acquire any invention or machinery in connection with the separation of air or any other gaseous mixtures, compounds, liquids, and other bye-products and processes. Minimum subscription, ten shares. Among the first Directors is Mr. C. B. Tully. The Ashbourne Gas Company, Limited, has been registered with a capital of £20,000, in £10 shares, to acquire the undertaking of the Ashbourne Gas Company, Derbyshire, and to adopt an agreement with J. Lister. The purchase consideration is £20,000, in shares.

Comparisons of Gas and Electricity.

Referring to the article on "Gas or Electricity" which appeared in the "Daily Telegraph" on the 20th ult., and was reproduced in the "JOURNAL" the following Tuesday (p. 248), Mr. F. J. Walker, the Hon. Secretary of the conference of chief officials of the London Electric Supply Companies, recently wrote to our contemporary as follows, with regard to the statement that to light a shop with 1000-candle power for a year of 1500 hours costs £65 by gas and £320 by electricity: "Metal filament electric lamps can provide 1000-candle power at a consumption of $1\frac{1}{8}$ units per hour, or 1800 units for 1500 hours, which, at 4d. per unit, amounts to £30. To this should be added about £5 per annum for lamp renewals." This statement was replied to by Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, in a letter which appeared last Friday. In the course of it, Mr. Goodenough said: "I should like to point out that with inverted incandescent gas-burners, supplied with gas at 2s. 9d. per 1000 cubic feet, the cost of obtaining 1000-candle power for a year of 1500 hours, including the renewal of mantles at the contract price at which this Company undertake to maintain their consumers' burners, would be only £13—not £65 as stated. Moreover, the amount of £5 per annum which Mr. Walker allows for the renewal of metallic filament lamps is certainly a conservative estimate; and in actual working it is highly doubtful whether the consumer would escape with a bill of less than £10 for lamp renewals when providing himself with 1000-candle power for 1500 hours. This would make the cost of electric light £40, against £13 for gas, or three to one in favour of gas lighting."

Gas-Works Policy at Driffeld.—In an estimate submitted by the Finance Committee to the Driffeld Urban District Council, they stated that the Gas Committee had not asked for a contribution from the rates for the repayment of loans; the Committee hoping to meet these payments out of revenue. Mr. Purdon said he was pleased to hear that the gas-works had again been so successful; and he hoped the day was not far distant when the price of gas would be reduced. Mr. Longbottom said he was of opinion that it would be mistaken policy during the next eight years, during which time the repayment of loan and interest would be in operation, for the Council to interfere with the price of gas. Mr. Brown, in reply, said at present the consumers were purchasing the works for the town—that was, the loans and interest thereon were being paid entirely out of profits on the working. If they were to continue this for another eight years, he thought that at the end of this period the consumers would be justified in coming to the Council and pointing out that, as they had almost entirely purchased the works through the high price paid for gas, they were entitled to gas at something very little over the cost of its manufacture—which he supposed was somewhere about 1s. 6d. per 1000 cubic feet. It was scarcely fair on the part of the Council to make the consumers pay for the works, and then expect to get a big profit out of the consumers when the works were paid for.

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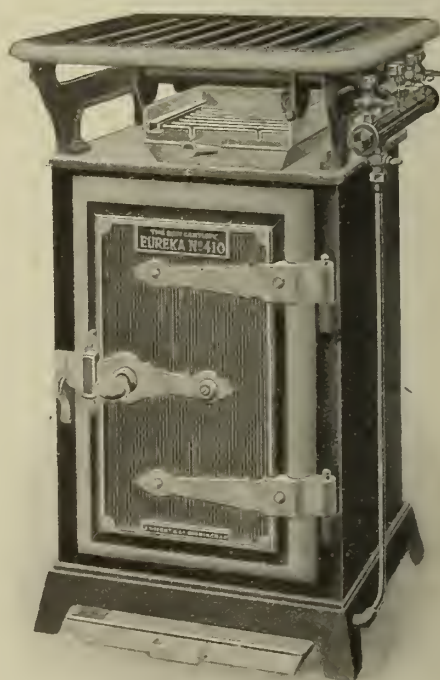
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Gas v. Electricity for Heating.

Our readers are aware that the merits of gas and electricity have recently been under discussion in the columns of the "Daily Mail." A few days ago, a correspondent—a bank manager, of Bristol—gave an example, from his own experience, of the cheapness of gas compared with electricity for heating purposes: He said: "At our Brighton branch the premises are heated by gas-radiators, of which there are three in number, and at the small cost of about £2 per quarter. When this branch was opened (which, by-the-way, is only about half the size of our Brighton branch), two electric-radiators were introduced for heating purposes as an experiment. During the cold weather, this method of heating proved totally inadequate, and cost us about £16 that quarter. The result is that the electric installation will be done away with, and gas laid down in its place." Another correspondent relates how he found an electric-radiator thrown out of use in an insurance office on account of its being inadequate to the warming of the room, and a movable oil-stove doing duty for it.

Plymouth Gas-Works Threatened by Fire.

A fire which occurred on Saturday afternoon, at a timber-yard and box-making factory at Plymouth, caused considerable fears for the safety of the works of the Plymouth and Stonehouse Gas Company. The timber-yard, which belongs to Messrs. Edred, Marshall, and Co., adjoins the gas-works on its westerly side. The fire broke out close to the boundary; and soon the flames were threatening one of the holders which immediately adjoins the timber-yard, and was at the time full of gas. In consequence of the danger which would have been caused by the spread of the fire to the premises of the Gas Company, all the men available were called to the scene, and fire appliances were used to check the progress of the flames in that direction. The hose was played on the threatened holder; and it was lowered as quickly as possible—the gas being turned into another holder. Fortunately, an easterly wind was blowing, and strongly carried the flames away from the gas-works; and this circumstance aided in a very material degree the efforts of those who were exerting themselves to prevent the disaster of a fire at the gas-works. The timber-yard was practically destroyed, and the roof of a school some hundred yards away in a westerly direction was burnt off; but the gas-works were uninjured, though the flames at one time licked the holder, and blistered the paint. Sir Joseph Bellamy, the Chairman of the Company, and Mr. P. S. Hoyte, the Engineer and Manager, were early on the scene.

A lad has been killed at Berkeley Heath by the explosion of an acetylene gas-generator. It was stated that a man named Allen (who was injured) had for some time been making acetylene; and at the moment of the accident he was "experimenting with a larger generator, made from two paint drums."

Testing of Prepayment Meters in Manchester.—In moving the adoption of the minutes of the Gas Committee in the Manchester City Council, Alderman Gibson made reference to a question asked at a recent meeting of the Manchester Magistrates Testing Committee, as to whether the same test was applied to penny-in-the-slot meters in the city as to others. He said he wished to assure the public that the "double test" was applied in every case, and that the same care was taken with every meter.

A Deficit at Huddersfield.—Proposing the adoption by the Huddersfield Borough Council of estimates as the basis for laying a borough rate, Alderman Woodhead said: "The revenue account of the gas-works fund, for the first time in the history of the undertaking, shows a deficit on the year of £5593, as compared with a surplus of £6651 last year. The reduction of 3d. per 1000 cubic feet in the price of gas for lighting purposes accounts for £5600, and the receipts for residuals have also declined £2600; while the expenditure has increased, mainly in connection with the cost of carbonization and the increase in the rateable value of the undertaking for the purposes of local taxation. The Committee have decided to transfer the amount of the deficit from depreciation and contingencies account. The latter account now shows a credit balance of £30,523. I say nothing as to the policy of the reduction in the price of gas, but point out that last year there was a balance in relief of rates equal to a rate of 2d. in the pound. There would have been an increase of 2d. or 3d. in the rate, but for the decrease of 1d. in the Health Committee's requirements, and nearly 3d. in those of the Finance Committee." He remarked that the borough had passed very satisfactorily through a time of comparative depression.

Gas v. Electricity for Public Lighting in Stepney.—At the meeting of the Stepney Borough Council last Wednesday, the Works Committee reported to the effect that on Oct. 28, 1903, the Council agreed that Globe Road and St. Paul's Road should be lighted by means of Nernst lamps as soon as mains were laid. The Borough Engineer had informed them that the Borough Electrical Engineer and Manager had transmitted to him plans showing the positions of the proposed electric lamps in certain portions of Globe Road and St. Paul's Road, and had mentioned that it was proposed that these sections of the streets in question should be lighted by means of Osram lamps. The Committee, however, did not view with favour the proposal to instal lamps of either kind, and therefore instructed the Borough Engineer to prepare an estimate of the cost of lighting by means of arc lamps. According to his report on this matter, the erection of arc lamps in the portions of Globe Road and St. Paul's Road referred to would necessitate a capital outlay of £120 and £135 respectively, and an annual expense to the Council of £70 and £78; while the existing cost for incandescent gas lighting is only £17 8s. and £22 15s. 6d. In view of this fact, the Committee recommended that the resolution previously passed by the Council should be rescinded, and the existing lighting of the thoroughfares in question by means of incandescent gas-burners continued. The recommendations were carried without discussion or dissent.

APPRECIATIONS.

SERIES No. 1.

A Gas Company writes:—

Messrs. The Richmond Gas Stove & Meter Co., Ltd.,

132, Queen Victoria Street, London, E.C.

Referring to the Automatic Meter Installations, the complete supplying and fitting of which you recently undertook for us, we are perfectly satisfied with the way in which the whole work has been carried out. The Canvassing and Exhibition, as well as the actual fitting up of the houses, being undertaken in the very best possible manner.

Your foreman and his men were courteous in their dealings with consumers, which led to the very desired result of the Consumers being satisfied.

The systematic methods adopted by your staff in dealing with this matter reduced the trouble and work consequent upon the large number of applications for installations to an absolute minimum.

The increased consumption resulting from the fitting of the installations has been remarkable, as will be seen from the following figures:—

September Quarter, 1907 (before installations fitted)	542,600 cubic feet.
" " " 1908 (after " " ")	1,298,700 "
December Quarter, 1907 (before installations fitted)	768,800 "
" " " 1908 (after " " ")	1,535,300 "

May we help you to develop your consumption generally?

THE RICHMOND GAS STOVE & METER CO., LTD.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C.

General Offices and Works: Warrington.

A Victory for Gas at Bradford.—It is stated by the "Leeds Mercury" that the experimental lighting of Manningham Lane, Bradford, which, as has already been fully recorded in the "JOURNAL," was in the form of a competition between the Gas Department and the Electricity Department, has ended in a victory for gas. Various types of gas lighting and electric lighting have been tried over an extended period; and as a result of the experience that has been thereby gained, it has been decided that the whole lane shall be lighted by gas-lamps.

Dangers of Electric Lighting.—What might easily have been a lamentable calamity took place recently at the Manor House, Stoke D'Abernon, the residence of Mrs. Phillips. Owing to the fusing of electric wires, a fire broke out in a portion of the building; but occurring in the daytime, it was quickly discovered and extinguished without any material damage. An alarming feature of the affair is that the experts who have been called in have been unable to account for the fusion—illustrating forcibly a serious danger of electric lighting.

Welsbach Incandescent Gaslight Company, Limited.—According to the report of this Company, the net profit of the whole undertaking for the year ended the 31st of March, including the dividend for the year 1907-8 upon the Company's holding in the Austrian Company, amounts to £46,041. To this must be added £5325 brought from last year; making in all £51,366. After deducting the interim dividend upon the 6 per cent. preference shares, there remains £33,369. The Board recommend that a final dividend on these shares at the rate of 6 per cent. per annum should be paid, that £10,000 be carried to the general reserve, and that £5372 should be placed to the credit of next year. They express regret that the result of the year's trading does not justify the declaration of any dividend on the ordinary shares.

Electric Light Failure at Hastings.—Half the town of Hastings was plunged into darkness for several hours last Thursday evening as the result of a breakdown (the second within a month) at the electric light works. Owing to the fact that apparently only one circuit was affected, there was light in some places and none in others. All the public lamps in Robertson Street were out; and the Baths Promenade and the Front were plunged in darkness, relieved only by the illuminations of the pier, on which gas is largely in use. Dinner was in progress in most of the hotels on the Front when the light failed; and as nearly all of them depend solely upon electricity for their light, its sudden extinction caused great confusion. It is reported that one hotel had to use 200 candles. Fortunately, none of the places of amusement were affected, except the one on the pier. The failure was caused by the fusing of wires. The light was restored by the following evening.

Gas and Electricity at Barnstaple.—In presenting the half-yearly financial statement to the Barnstaple Town Council yesterday week, the Mayor (Mr. F. W. Hunt) said that a saving of almost £100 had been effected in the cost of street lighting. The use of incandescent burners had resulted in a decrease in the consumption of gas, and there would be still greater advantage from this alteration in future. The accounts of the electricity undertaking showed a deficiency of £476 4s., which represented the loss on the past year's trading; but this was considerably less than that incurred on the previous year's working. Mr. H. Barrett, the Chairman of the Electric Lighting Committee, remarked that the estimates for public lighting showed a reduction of £216, due to a change in the lamps. There was no loss on the working of the electricity undertaking. The proper thing to have said was that the revenue account of the undertaking was insufficient by £476 to meet the capital charges they had to pay. It was not a loss at all.

Extension of the Newport Gas Company's Supply.—After considering, and subsequently abandoning on the ground of expense, acetylene and electricity for the public lighting of Rogerstone, near Newport, arrangements have been made with the Newport Gas Company and the St. Mellons District Council for affording a supply of gas in the near future. It appears that at least forty lamps are to be erected; and it is expected that there will also be a very considerable demand for gas on the part of the residents, who have been looking forward for some time past to the boon which such a supply will be to them. The Company propose to take advantage of the summer weather in order to carry out the work of laying some five miles of mains for the purposes named; and while they have contracted to light up the lamps on the 1st of September next, in all probability the lighting of houses will take place long before this date.

Entertainment to Gas Supply Students at Wrexham.—Students in the "Gas Supply" class in connection with the Wrexham Gas Company who sat for the City and Guilds of London Institute's recent examination in "Gas Supply" were entertained at tea last Wednesday by Mr. J. Braithwaite, the Engineer and Manager of the Company. After the repast, Mr. Evans proposed the toast of "Mr. and Mrs. Braithwaite." In responding, Mr. Braithwaite expressed his appreciation of the work done by the students during the past session, and referred to the exceptional opportunities afforded to the employees of the Company of furthering their technical education. It may be remembered that the Directors take a keen interest in this matter, and have for some years paid all the fees, &c., of the employees attending the local Science and Art and Evening Continuation Classes. Mr. S. H. Balsom proposed "The Wrexham Gas Company," and coupled with it the name of the class teacher, to which Mr. O. Evans suitably responded.

Progress of the Chard Gas Undertaking.—At the last meeting of the Chard Gas Committee, the Engineer and Manager, Mr. A. S. Brook, submitted a draft financial statement for the year ending March 31, showing a net profit, after paying interest and sinking fund, of £151. This was considered by the Committee very satisfactory, in view of the depression in the market for residuals. In moving the adoption of the report at the meeting of the Town Council last Thursday, the Mayor (Alderman S. H. Denning) said they were making steady and satisfactory progress. It had been pointed out, as proof that gas was holding its own in competition with other forms of lighting, that in Birmingham the gas-works had made a profit in the year of £70,000. At Chard, they had not these big figures to deal with; but they had actually made a greater advance *pro rata* with their size. For some time past, they had done without a rate-in-aid, and had been paying £1400 towards the principal and interest on their debt.

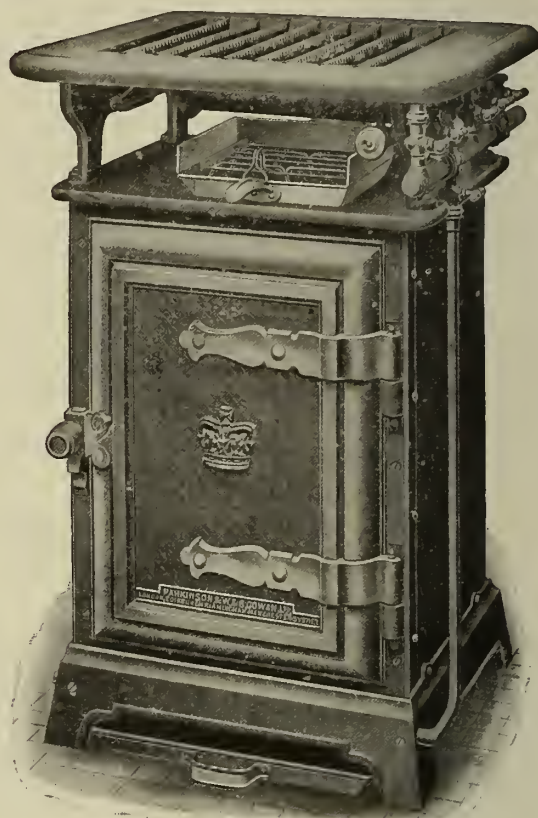
Gas Cookers

The

PARKINSON

"CROWN" PATTERN

STANDS UNRIVALLED.



SUBSTANTIALLY BUILT

ON

SCIENTIFIC PRINCIPLES

FOR LONG SERVICE.

THE PARKINSON STOVE CO., LD.

(Incorporating

Maughan's Patent Geyser Company).

BIRMINGHAM:

STOUR STREET.

LONDON:

Office and Show-Room:
129, HIGH HOLBORN, W.C.

Reductions in the Price of Gas.—To their consumers in the Caversham district the Reading Gas Company are reducing the price of gas to 2s. 10d. per 1000 cubic feet; and, in consequence, the reduced charge for public lighting purposes will be 2s. 7d. At Wokingham, the Town Council are allowing a rebate of 5 per cent. off the price of gas used in the public lamps.

Gas Profits in Aid of Rates.—The Bolton Corporation Gas Committee on Friday resolved that the Finance Committee be informed that they could anticipate to receive £17,500 from the profits of the department for the past year in aid of rates, and also estimate that the sum of £20,000 would be available in aid of the rates from the next year's profits.

Sir Christopher Furness and Co-Partnership.—Sir Christopher Furness and two other gentlemen have acquired the Wingate Colliery, Durham, and the estate. Sir Christopher has asked the employees, numbering 15,000, to meet him on the 31st inst., when he will submit a scheme of working for obtaining more beneficial results to both workmen and employers. It is understood that he intends to establish the co-partnership scheme at the colliery.

The rates of York have been fixed at an increase of $\frac{1}{4}$ d. in the pound for the current year; Alderman Sir Joseph S. Rymer, the Chairman of the Finance Committee, remarking that, had it not been for the shortcomings of the Electricity Committee in the past, the Corporation rate would have been reduced $\frac{1}{4}$ d. in the pound.

The Bethesda Urban District Council have decided to adopt a gas extension scheme prepared by Mr. Price White for the lighting of Rahub and Braichmelyn; an electric lighting scheme, also drafted up by him, being considered too expensive. It was resolved to ask Mr. Price White upon what terms he would prepare the plans and specifications and supervise the carrying out of the gas extension.

The Richmond Gas Stove and Meter Company, Limited, have forwarded a copy of their latest summer cooker booklet for general distribution to gas consumers. The booklet contains a selection only of the goods manufactured by the firm, though occupying 48 pages. A novel feature is a memoranda page facing the index page suitable for a customer to make notes. The "Humber" circulating boiler, made in two sizes, and which can be readily fixed to either supersede or supplement the coal-range boiler, occupies the centre of the booklet.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER, Brighouse Gas Department. Applications by May 15.
MAIN AND SERVICE LAYER. No. 5092.

Situations Wanted.

ASSISTANT ON LARGE WORKS. No. 5093.
GAS MANAGER OR ASSISTANT. J. R. Love, care of "Journal" Office.

Research Fellowship. University of Leeds. Particulars of Registrar.

Plant, &c. (Second-Hand), for Sale.

GAS-COOKERS. Coventry Gas Department.
GASHOLDER. Greenwood, Halifax.
PURIFIERS, &c. Sutton Gas Company.
PURIFIERS AND STATION METER, &c. Solihull Gas Company.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. May 18.
CHIGWELL, &c., GAS COMPANY. May 18.
ILFORD GAS COMPANY. May 25.
TENDRING HUNDRED WATER COMPANY. May 18.
UNBRIDGE GAS COMPANY. May 18.

TENDERS FOR

Benzol and Benzolized Creosote.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.

Coal and Cannel.

BATLEY GAS DEPARTMENT. Tenders by May 24.
BRIDGNORTH GAS DEPARTMENT. Tenders by May 15.
CIRENCESTER GAS COMPANY. Tenders by May 31.
CLITHEROE GAS DEPARTMENT. Tenders by May 22.
EXMOUTH GAS COMPANY. Tenders by May 27.
FILEY URBAN DISTRICT COUNCIL. Tenders by May 24.
GLOUCESTER GASLIGHT COMPANY. Tenders by June 1.

Coal and Cannel—(Continued).

GUILDFORD GASLIGHT AND COKE COMPANY. Tenders by May 21.
HAYWARDS HEATH GAS COMPANY. Tenders by May 18.
LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.
LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by May 20.
MIDDLETON CORPORATION. Tenders by May 29.
NEWMARKET GAS COMPANY. Tenders by May 15.
OMAGH GAS DEPARTMENT. Tenders by May 31.
OSWALD TWISTLE GAS DEPARTMENT. Tenders by May 24.
SAFFRON WALDEN GAS AND WATER DEPARTMENT. Tenders by May 24.
SHREWSBURY GASLIGHT COMPANY. Tenders by May 22.
SOUTH STAFFORDSHIRE WATER WORKS COMPANY. Tenders by May 17.
SUNBURY GAS COMPANY. Tenders by May 20.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 26.
TEIGNMOUTH GAS DEPARTMENT. Tenders by May 31.
TIVERTON LIGHTING COMMITTEE. Tenders by June 4.
TORQUAY GAS DEPARTMENT. Tenders by May 24.
TYLDESLEY-WITH-SHAKERLEY GAS AND WATER DEPARTMENT. Tenders by May 31.
ULVERSTON GAS AND WATER DEPARTMENT. Tenders by May 14.
WHITTINGTON GAS COMPANY. Tenders by May 22.

Conveying and Elevating Machinery, &c.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by May 25.

Exhauster and Engine, and Boiler, &c.

SOVERBY BRIDGE GAS DEPARTMENT. Tenders by May 24.

Gasholder (Re-Sheeting).

CLECKHEATON URBAN DISTRICT COUNCIL. Tenders by May 27.

General Stores—Lime, Block Tin, Pig Lead, Lead Pipe, &c.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 26.
TYLDESLEY-WITH-SHAKERLEY GAS AND WATER DEPARTMENT. Tenders by May 31.

Main Laying, Fitting, &c.

WEST DERBY UNION. Tenders by May 20.

Mantles and Fittings.

LONDON COUNTY COUNCIL. Tenders by May 25.

Meters.

TYLDESLEY-WITH-SHAKERLEY GAS AND WATER DEPARTMENT. Tenders by May 31.

Pipes, &c.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.
TYLDESLEY-WITH-SHAKERLEY GAS AND WATER DEPARTMENT. Tenders by May 31.

Purifiers.

TEIGNMOUTH URBAN DISTRICT COUNCIL. Tenders by May 31.

Retort-House and Retort-Bench.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by May 25.

Sulphuric Acid.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.

Tar.

LEIGH GAS AND WATER DEPARTMENT. Tenders by May 15.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 357.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½-18	..	5 11 1	561,000	Stk.	Feb. 25	10	Liverpool United A.	22½-227	..	4 8 1
298,955	10	"	7	Do. 7 p.c.	12½-12½	..	5 9 10	718,100	"	"	7	Do. B.	168-170	..	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	4 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd.	5½-6	..	5 8 4	75,000	5	Dec. 11	6	Malta & Mediterranean.	4½-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	4½-4½	..	5 15 6	550,000	100	Apl. 1	5	Met of 5 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne 10 p.c.	23½-29½	..	4 14 11	250,000	100	"	5	Melbourne 4½ p.c. Deb.	100-102	..	4 8 3
51,810	10	"	7	mouth Gas B 7 p.c.	16½-17	..	4 2 4	511,920	20	Nov. 13	4½	Monte Video Ltd.	12½-12½	..	5 9 10
53,200	10	"	6	and Water Pref. 6 p.c.	15½-15½	..	3 15 7	1,775,892	Stk.	Feb. 25	3½	Newcastle & G't's'd Con.	106½-107½	..	4 3 9
380,000	Stk.	"	12½	Brentford Consolidated	248-250	..	5 0 0	513,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	5½	Do. New	188-190	..	5 0 0	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½-20	..	5 0 0
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	55,940	10	"	7	Do. 7 p.c.	13-13½	..	5 5 8
206,250	"	Dec. 11	5	Do. 4 p.c. Deb.	101-103	..	3 17 8	302,030	Stk.	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	211-213	..	5 1 0	60,000	5	Mar. 31	13	Ottoman, Ltd.	6-6½	..	6 0 0
246,320	"	"	7½	Do. A Ord. Stk.	153-155	..	5 0 0	31,800	53	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
467,000	2½	Apl. 16	10	British 10 p.c.	44½-43	..	4 13 0	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	115-117	..	5 2 7	100,000	50	"	10	Do. C.	119-121	..	4 19 2
165,700	"	"	4½	Do. do. 3½ p.c.	85-87	..	5 3 6	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
500,000	10	Oct. 15	7	Buenos Ayres(New) Ltd.	133½-14½	..	4 18 3	398,490	5	Oct. 29	7	Primitiva Ord.	7-7½	..	4 16 7
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	79,000	100	Jan. 28	5	Do. 5 p.c. Pref.	58-58½	..	4 13 0
103,000	10	"	—	Cape Town & Dis., Ltd.	5½-5½	..	—	483,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-5½	..	—	1,200,000	10	Apl. 29	8	River Plate Ord.	14½-14½	..	5 8 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	77-79	..	5 13 11	250,000	10	Mar. 31	8	San Paulo, Ltd.	13-14	..	5 14 4
157,151	Stk.	Feb. 25	5	Cbeater 5 p.c. Ord.	109-111	..	4 10 1	62,500	10	"	—	Do. 6 p.c. Pref.	11½-12	..	5 0 0
1,493,285	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk.	102-104	..	4 16 2	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	52½-51½	..	4 17 1
560,000	"	"	5	Do. 3½ p.c. do.	102-104	..	4 16 2	135,200	Stk.	Mar. 12	10	Sheffield A.	230-238	..	4 4 0
475,000	"	"	3	Do. 3 p.c. Deb. Stk.	82-84	..	3 11 5	230,984	"	"	10	Do. B.	233-235	..	4 5 1
800,000	Stk.	"	6½	Continental Union, Ltd.	99-101	..	6 8 9	523,500	"	"	10	Do. C.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	139-141	..	4 19 3	70,000	10	Oct. 29	10	South African.	14-14½	..	6 17 11
491,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	6,429,895	Stk.	Feb. 11	5/6/8	South Met. 4 p.c. Ord.	123-125	..	4 5 4
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	1,895,445	"	Jan. 14	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
143,995	"	Mar. 31	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	209,821	Stk.	Mar. 12	8	South Shields Co. 1. Stk.	152-154	..	5 3 11
486,093	10	Jan. 25	12	European, Ltd.	23½-24½	..	4 19 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
354,063	10	"	12	Do. £7 10s. paid.	17½-18½	..	4 18 5	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
15,151,545	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 9 4
2,630,000	"	"	3½	light 3½ p.c. max.	88-89	..	3 18 8	502,310	Stk.	Nov. 13	5	Southampton Ord.	109-111	..	4 10 1
3,799,735	"	"	4	and 4 p.c. Con. Pref.	105-107	..	3 14 9	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c.	132-134	..	5 0 9
4,193,975	"	Dec. 11	3	Coke 3 p.c. Con. Deb.	85-86	..	3 9 9	423,940	"	"	5½	Do. B 3½ p.c.	101-103	..	4 13 9
258,740	Stk.	Mar. 12	4½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	149,470	"	Dec. 30	8	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
82,500	"	"	6½	Do. do. 5 p.c.	118-120	..	5 4 2	182,310	"	"	8	Tuscan, Ltd.	8½-9½	..	8 13 0
79,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½-17½	..	6 4 0	149,900	"	Jan. 5	5	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
123,500	Stk.	Mar. 12	6½	Ilford "A" and "C"	134-136	..	4 15 7	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105-107	..	4 13 6
51,781	"	"	5	Do. "B"	103-105	..	4 15 3	255,600	Stk.	Feb. 25	6½	Wands B 3½ p.c.	131-133	..	4 17 9
65,000	"	Dec. 30	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	79,416	"	Dec. 30	3	worth 3 p.c. Deb. Stk.	72-74	..	4 1 1
4,940,000	Stk.	Nov. 13	8	Imperial Continental	185-187	..	4 5 7	835,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	119-121	..	4 6 9
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	..	3 18 9
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	117-119	..	5 0 10	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5

Prices marked * are "Ex div."

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON 182 Palmerston House, Old Broad Street London, E.C. "Volcanism, London."

"HALLITE" Asbestos High-Pressure
Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street,
LONDON, E.C.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.
39, VICTORIA STREET, S.W.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, May 4, p. II. of Centre.

ALDRIDGE AND RANKEN,

33, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding
Oxide Lightly.

See Illustrated Advertisement May 4, p. 273.

OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the
NEW WESTBURY IRON COMPANY, LTD.
WESTBURY, WILTS.

SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON & CO., LTD., Chemical Manufacturers,
WORKS: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDER-
LAND.

"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

JOHN RILEY & SONS, Chemical Manu-
facturers, Hapton, near Accrington, are MAKERS
of Special SULPHURIC ACID, for Sulphate of Am-
monia Making. Highest percentage of Sulphate of
Ammonia obtained from the use of this Vitriol, which
has now been used for upwards of 50 Years. References
given to Gas Companies.

J. & J. BRADDOCK (Branch of Meters
Limited), Globe Meter Works, OLDHAM, and
54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT
METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,
110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 343.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant
and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment. 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Re-
pairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND
CONTRACTORS,

18 & 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS," Mechanical and Chemical," 61.;
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

TO Gas Managers, &c., Wanted, Old
Condemned GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
&c., also bought.
J. WILSON, Pleasant Grove, York Road, King's Cross,
LONDON, N.

OXIDE OF IRON.

(NATURAL.)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-
facture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.
36, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

APPLY TO THE

CHAIN BELT ENGINEERING CO.
DERBY, ENGLAND,

FOR REALLY HIGH-CLASS

ELEVATORS AND CONVEYORS,

ALSO

DRIVING AND CONVEYOR CHAINS.

AMMONIACAL Liquor wanted.

BROTHERTON & CO., LTD., Ammonia Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

J. E. C. LORD, Ship Canal Tar Works,
Waste, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, THOMAS HORROCKS

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent
Naphtha, Sulphate of Ammonia.

KINGS Patent Agency, Limited, 165,

Queen Victoria Street, London, E.C. Director
Benj. T. King, A.I.M.E., British Chartered Patent Agent
(Regd. by Exam.). Telep. 682 Central. Teleg. "Geologic,"
London. We sustain over quarter of a century's Experi-
ence and Reputation for Patenting Inventions and Re-
gistering Trade Marks throughout the World.
Write or call. We attend and advise you free.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of
AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

WORKS: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY,
WORCS.

Telegrams: "CHEMICALS, OLDBURY."

GAS TAR wanted.

BROTHERTON & CO., LTD., Tar Distillers.
WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS
and ELEVATING and CONVEYING PLANT, ROSE
MOUNT IRON-WORKS, ELLAND.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufactur-
ers, OLDBURY, WORCS.

DESSAU PATENT VERTICAL RETORTS.

FOR list of Installations, see "Journal,"
April 20, p. I. of Centre.
THE DESSAU VERTICAL RETORT COMPANY,
Care of Mr. CHARLES HUNT, Consulting Engineer,
17, Victoria Street, WESTMINSTER, S.W.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE ENN, LEENS.

HYDRATED OXIDE OF IRON.

PREPARED FROM Pure Iron.

Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLINAY ANN SONS, LTD., HUNDERSFIELD.

ADVERTISER (Age 25), son of a well-
known Gas Engineer, desires Situation as
MANAGER of small Works, or ASSISTANT on large.
Five Years' Practical Experience of Gas Manufacture
and Distribution. Two Years Retort Setting. Com-
petent Draughtsman, Chemist, and Book-Keeper. Ex-
cellent Testimonials. Disengaged.
Address JAS. R. LOVE, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

GERMAN Gas Engineer desires Situa-
tion as ASSISTANT on large Works. Two Years'
Practical Experience in Gas Manufacture and Distribu-
tion. Employed for nearly Three Years in the Drawing
Offices and for Retort Setting by the first German Firms
in this Line. Quite up in modern Retort-Houses.
Competent Draughtsman and Good Chemist. No
References.
Address No. 5093, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

THE UNIVERSITY OF LEEDS.

(DEPARTMENT OF FUEL AND GAS ENGINEERING.)

RESEARCH FELLOWSHIP.

APPLICATIONS are invited, up to May
28, for an OPEN FELLOWSHIP of £100 per
Annum, established by the Institution of Gas Engineers
for the Encouragement of Research in the Chemistry
of Gases and Combustion.
For further Particulars, Apply to the REGISTRAR.

GAS-FITTER Main and Service Layer.
Good Permanent situation. (Wanted, a Man of
Experience, not under 30 Years of Age, Married, for a
Gas-Works in a Provincial Town.
Apply, by letter, stating Age, Experience, where at
present Employed, and Wages, to No. 5092, care of Mr.
King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF BRIGHOUSE.

APPOINTMENT OF ENGINEER AND MANAGER
OF GAS-WORKS.

THE Gas Committee of the Corporation
invite APPLICATIONS, from duly Qualified
Persons, for the post of ENGINEER and MANAGER
to the Gas-Works.

Make of Gas, 170 Millions.
Salary, £250 per Annum.
Applications, in Candidates own Hand-writing,
stating Age, Experience, present Occupation, when at
Liberty, together with copies of Three recent Testi-
monials, to be delivered to the undersigned, endorsed
on the outside "Gas Engineer," not later than Saturday,
the 15th of May, 1909.

The person appointed is to devote his whole time to
the Duties of this Office.
Canvassing, either directly or indirectly, will be a
disqualification; but forwarding typed or printed copies
of Application and Testimonials to Members of the
Committee is permitted. Names and addresses may
be obtained on Application with Stamped Addressed
Foolscap Envelope.

JAMES PARKINSON,
Town Clerk.

Town Clerk's Office,
Brighouse, April 28, 1909.

THE Coventry Corporation Gas Depart-
ment have FOR SALE about 170 WESTERN
GAS-COOKERS, made by the Davis Gas Stove Com-
pany. These are excellent Gas-Cookers for Slot Con-
sumers and are only offered for Sale because of being
replaced by larger Cookers. They have been thoroughly
Repaired, Cleaned, and Renovated, and supplied with
New Grill Pans and Grids.
Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,
Engineer and General Manager.
Gas-Works, Coventry,
April, 1909.

FOR SALE—A Gasholder of 320,000

Cubic Feet Capacity (Condition as new), Columns
and Girders. Exceptionally low Price to clear.
Address GREENWOOD, Leamington Avenue, HALIFAX.

FOR SALE—Three Purifiers, by Newton,

Chambers, and Co., 20 ft. square by 5 ft. deep.
Planed Joints, 18-inch Valves and Connections, with
Bye-Passes, Travelling and Lifting Gear. In Good
Condition. Being Removed for Extension.
Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE—Four 8-feet Square by 4 ft.

6 in. deep PURIFIERS, with 8-inch diameter
Valves and Connections, and Lifting Gear; also
STATION METER, with 6-inch diameter Valves and
Connections. All in good condition. Replaced by
larger Plant.
Apply to the MANAGER, Gas Company, Solihull,
BIRMINGHAM.

FOR SALE, Cheap, the undermentioned

GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER
to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron VERTICAL CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkia's VALVES, 12-inch, 10-inch, 6-inch.
Apply to SAMUEL WHITE and SON, 60, Queen Victoria
Street, LONDON, E.C.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

TENDER FOR ENGINE SLACK.

THE Company are prepared to receive

TENDERS for the Supply of ENGINE SLACK,
at their various Pumping-Stations, for Twelve Months
from the 1st of July, 1909.

Forms of Tender, giving Particulars as to the Quan-
tity of Coal to be delivered at the various Stations, can
be obtained on Application to me.

Tenders, made out on the Forms provided, and
endorsed "Tenders for Slack," must reach me at latest
by Twelve noon on Monday, May 17, 1909.

The Company do not bind themselves to accept the
lowest or any Tender.

H. ASHTON HILL, M.Inst.C.E.,
Engineer.

Paradise Street, Birmingham.

GUILDFORD GASLIGHT AND COKE COMPANY.

COAL.

THE Directors of the above Company

are prepared to receive TENDERS for the Supply
of 12,000 Tons of Durham and South Yorkshire GAS
COAL (Screened or Unscreened), to be delivered free
at Guildford Station, between the 1st of July, 1909, and
the 30th of June, 1910, in such quantities and at such
times as required.

The Directors reserve the right to accept the whole
or any portion of the Quantity offered, and do not bind
themselves to accept the lowest or any Tender.

Tenders to be endorsed "Tender for Coal," and to be
sent to Ferdinand Smallpiece, Esq., J.P., Chairman of
the Gas Company, on or before Ten a.m. Friday, the
21st of May, 1909.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
May 1, 1909.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the

above Corporation are prepared to receive
TENDERS for the Supply of the following GOODS:—

- 1—14,000 Tons of Screened and Unscreened GAS
COAL, NUTS, and SLACK.
- 2—LEAD PIPING (Gas and Water).
- 3—VITRIOL.
- 4—LIME.
- 5—BENZOL.
- 6—WROUGHT-IRON TUBES and FITTINGS.
- 7—2-inch, and 4-inch, CAST-IRON PIPES and
SPECIALS.

Forms of Tender may be had on Application from
the undersigned, to whom all Inquiries must be ad-
dressed; and all Offers must be made on the Official
Forms, or they will not be considered.

Sealed and endorsed Tenders must be delivered to
Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh,
Lancashire, on or before Twelve o'clock noon on
Saturday, the 15th day of May, 1909.

The Corporation do not bind themselves to accept
the lowest or any Tender, and reserve to themselves
the right to divide any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices, Leigh,
Lancashire, April 28, 1909.

BOROUGH OF LEIGH.

(GAS DEPARTMENT.)

THE Gas and Water Committee of the

above Corporation invite TENDERS for the
Removal of the Surplus TAR produced at their Works
during the Year ending June 30, 1910.

Approximate Quantity, 850 Tons.
Forms of Tender and any further Information may
be had on Application from the undersigned, to whom
all Inquiries must be addressed.

Sealed Tenders, endorsed "Tender for Tar," must be
delivered to Mr. Stanley Wilson, Town Clerk, Town
Hall, Leigh, Lancs., on or before Twelve o'clock Noon,
on Saturday, the 15th day of May, 1909.

The Corporation do not bind themselves to accept the
highest or any Tender.

JAMES GIBSON,
Engineer and Manager.

Gas and Water Offices,
Leigh, Lancs., April 28, 1909.

COUNTY OF LONDON.

THE London County Council invite

TENDERS for the Supply and Delivery of IN-
CANDESCENT GAS MANTLES and FITTINGS.

Full Particulars as to the Conditions of Contract and
as to Inspection of Samples appear on the Official Forms
of Tender, which may be obtained on Application to the
Clerk of the Council, County Hall, Spring Gardens,
S.W., and no Tender received after Eleven a.m. on
Tuesday, the 25th of May, 1909, will be considered.

G. L. GOMME,

Clerk of the London County Council.
County Hall, Spring Gardens, S.W.,
May 6, 1909.

BOROUGH OF TORQUAY.

THE Gas-Works Committee of the

Torquay Town Council are prepared to receive
TENDERS for the Supply of 2000 to 3000 Tons of ap-
proved GAS COAL, delivered free into Stores at St.
Mary Church Gas-Works.

Further Particulars and Forms on which Tenders
must be submitted may be obtained at my Office, Town
Hall, Torquay.

Sealed Tenders, endorsed "Tender for Coal," to be
sent to the undersigned not later than Noon on Mon-
day, May 24, 1909.

The lowest or any Tender will not necessarily be
accepted.

FRENK. S. HEX,
Town Clerk.

Town Hall, Torquay,
May 8, 1909.

BOROUGH OF BATLEY.

TENDERS FOR GAS COAL.

THE Corporation are prepared to re-

ceive TENDERS for the Supply and Delivery at
their Gas-Works of 20,000 Tons of Screened GAS
COAL.

Conditions and Form of Tender may be obtained on
Application to the Manager of the Gas-Works.

Sealed Tenders, endorsed "Tender for Gas Coal," to
be delivered to me on or before Monday, the 24th of
May inst.

The Corporation do not bind themselves to accept the
lowest or any Tender, and may accept any Tender for a
part only of the specified quantity.

By order,
J. H. CRAIK,
Town Clerk.

Town Hall, Batley,
May 6, 1909.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Com-

mittees of the Town Council are prepared to
receive TENDERS for the Supply of about 2000 Tons
of Best Screened GAS COAL, and about 200 Tons of
Best Hand-Picked Hard STEAM COAL respectively,
for the Twelve Months ending the 30th of June, 1910.

Full Particulars can be obtained on Application to
Mr. A. H. Forbes, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Gas Coal," or
"Tender for Steam Coal," as the case may be, to be
addressed and sent to me, the undersigned, not later
than Five o'clock in the afternoon on Monday, the 24th
day of May inst.

The lowest or any Tender will not necessarily be
accepted.

W. ANAMS,
Town Clerk.

Saffron Walden,
May 7, 1909.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-

light Company invite TENDERS for the Supply
of about 19,000 Tons of Screened GAS COALS, to be
delivered free at the Great Western or London and
North Western Goods Yard, Shrewsbury, during the
Year commencing July 1, 1909, and ending June 30,
1910.

The Directors reserve to themselves the right to
divide the Quantity into Two or more Contracts, and do
not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further
Particulars) which may be obtained on Application at
the Company's Works or by post, and must be sent to
the undersigned on or before the 22nd day of May, 1909.

By order,
WM. BELTON, A.M.I.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
April 24, 1909.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.

THE Gas Committee are prepared to re-

ceive TENDERS:—

- 1—For the Supply, Delivery, and Fixing of a New
EXHAUSTER and ENGINE, with all necessary
Connections and Valves, for their Luddenden-
Foot Gas-Works.
- 2—For the Supply, Delivery, and Fixing of a
LANCASHIRE BOILER, with all the Mount-
ings, Furnace Fittings, &c., for their Sowerby
Bridge Gas-Works.

Both to be in accordance with Particulars and Speci-
fications which can be obtained, with any further In-
formation, on Application to the Engineer, Mr. A. W.
Bissell, Gas-Works, Sowerby Bridge.
The Council do not bind themselves to accept the
lowest or any Tender.

Sealed Tenders, endorsed "Exhauster or Boiler," to
be received by the undersigned not later than Twelve
Noon on Monday, May 24, 1909.

R. W. EVANS, J.P.,
Solicitor and Clerk to the Council.
Commercial Bank Chambers,
Halifax.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Lighting Committee are prepared to receive TENDERS for the whole or part of 4000 Tons of Freshly-Wrought GAS COAL, Screened or Unscreened, including NUTS, giving Full Particulars of Coal with Analysis, and to be Delivered at the Railway Siding adjoining their Gas-Works at Tiverton during One Year, and in such Quantities as may be directed by their Manager.

Further Particulars and Form of Tender (which must be used) may be obtained on Application to Mr. Clark Jeffery, Gas Manager.

Sealed Tenders, endorsed "Tender for Gas Coal, and addressed to the undersigned, must be received on or before Friday, the 4th day of June, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
C. M. HOLE,
Town Clerk.

Tiverton, May 7, 1909.

URBAN DISTRICT COUNCIL OF
OSWALDTWISTLE.

TENDERS FOR GAS COAL.

THE above Council invite Tenders for the Supply of the whole or part of 6000 Tons of NUTS, Unscreened COAL, or SLACK, to be delivered during the Year ending the 31st of May, 1910.

Conditions and Form of Tender may be obtained on Application to the Manager, Mr. J. H. Davies, Gas-Works, Church, Lancashire.

Sealed Tenders, endorsed "Tender for Coal," must be delivered to the undersigned not later than Twelve o'clock at noon on Monday, the 24th inst.

The Council do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract in any manner they think fit.

B. T. WESTWELL,
Clerk to the Council.

Town Hall, Oswaldtwistle,
Lancashire, May 7, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

TENDERS FOR NEW PURIFIERS.

TENDERS are invited by the above Council for the Provision and Erection of Four 16 feet Square Connectionless and Luteless PURIFIERS, fitted with Pickering's Patent Valve.

A Copy of the Drawings and Specifications may be obtained from Mr. J. Alex. Gray, the Gas Engineer, on payment of the Sum of £1 ls. which will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Purifiers," and addressed to the undersigned, to be delivered at the Town Hall, Teignmouth, not later than Monday, the 31st day of May, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

A. PERCIVAL DELL,
Clerk to the Council.

Town Hall, Teignmouth,
May 5, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Department of the above Council invite TENDERS for the Supply of 3800 Tons of Good GAS COAL, Screened or Unscreened. The same to be supplied to the requirements of the Council between the 31st day of July, 1909, and the 30th day of June, 1910.

The Coal must be fresh Wrought and free from all Impurities.

No Special Tender Form will be issued. Tenders must be accompanied by a full Description and Practical Working Analysis of the Coals quoted, and may be either f.o.b., c.i.f. Teignmouth Harbour, f.o.r. Teignmouth Railway Station, or delivered into the Gas-Works Store. Seaborne Coal to be delivered in 200-400 Ton Sailing Vessels only.

Sealed Tenders, endorsed "Gas Coals," to be addressed to A. Percival Dell, Esq., Clerk to the Council, Town Hall, Teignmouth, and delivered not later than Monday, the 31st day of May, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. ALEX. GRAY,
Gas Manager.

Gas-Works, Teignmouth,
May 6, 1909.

SWADLINCOTE DISTRICT URBAN DISTRICT
COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for—
LIME.

The Supply of about 150 Tons of Best Hand-Picked Buxton LIME, to be delivered at the Gas-Works in such Quantities and at such times as may be required during the Twelve Months ending June 30, 1910.

GAS COAL.

The Supply of 4000 Tons (more or less) of Best Screened GAS COAL, to be delivered in such Quantities as may be required during the Twelve Months ending June 30, 1910.

All Particulars and Forms of Tender may be obtained from Mr. G. B. Smedley, C.E., the Engineer and Manager.

Tenders must be on the Council's Forms and Envelope, and accompanied by Analysis, and must be delivered to the undersigned on or before Twelve noon, May 26, 1909, endorsed "Lime," or "Gas Coal," as the case may be.

The Council do not bind themselves to accept any Tender.

W. A. MUSSON,
Clerk to the Council.

Gas-Works, Swadlincote,
May 6, 1909.

OMAGH URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the Supply and Delivery of 2000 Tons, more or less, of Best Screened GAS COAL, for delivery during the Year ending June 30, 1910.

The Council reserve to themselves the right to divide the Contract as they may think fit.

Tender Forms may be had on Application to the undersigned, to whom all Tenders are to be sent, endorsed "Coal," on or before May 31, 1909.

WM. M. DOWNE,
Manager.

Gas Office, Omagh,
May 4, 1909.

TYLDESLEY-WITH-SHAKERLEY URBAN
DISTRICT COUNCIL.

TENDERS FOR COAL, &c.

THE Gas and Water Committee invite

TENDERS for the Supply, during the Twelve Months ending June 30, 1910, of the following:—

4000 Tons of GAS COAL, Cobbles or Nuts.
LEAD PIPE (Gas and Water) and PIG LEAD.
Cast-Iron PIPES and SPECIALS.
Wrought-Iron TUBES and FITTINGS.
GAS METERS.

BUXTON LIME (Gas-Works and Sewage Works). Forms of Tender and all Particulars may be obtained from the undersigned.

Sealed endorsed Tenders to be delivered to Mr. W. J. Matthews, Clerk to the Council, Tyldesley, on or before Monday, May 31, 1909.

The Council do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Contract.

H. R. S. WILLIAMS,
Engineer and Manager.

Gas and Water Works,
Tyldesley, May 8, 1909.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to

receive Sealed TENDERS for the Supply of Screened GAS COAL or Washed GAS NUTS, including Carriage to the Bridgnorth Railway Station, for One Year from, or soon after, the end of July next.

Evidence as to Quality of Coal must accompany each Tender.

The Coal or Nuts must be well Screened or Washed, free from Bats, Binds, and other Refuse, and be freshly got at the time for delivery.

Quantity required: About 2600 Tons in proportionate deliveries as directed—say, 70 per cent. during Winter Months, and 30 per cent. during Summer Months.

Sealed and marked Tenders must be sent to the undersigned not later than Saturday, the 15th of May.

The Committee reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender. Official Forms for Tender are not furnished.

By order,
J. H. COORSEY,
Town Clerk,
Secretary.

Bridgnorth, April 29, 1909.

FILEY URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Council invite Tenders for the

Supply of about 1850 Tons of GAS COAL in the Thirteen Months ending the 30th of June, 1910.

Delivery to be made at the North-Eastern Railway Company's Depot, Filey.

The Coal must be of Good Quality, suitable for Gas making, and free from Bats, Pyrites, and other Refuse. The Tender may be for Screened, Unscreened Coal, or Nuts.

Payments will be made Monthly.

The following are the approximate Monthly Quantities required:—

1909.	1910.
June . . . 110 Tons.	January . . 175 Tons.
July . . . 140 "	February . . 130 "
August . . 225 "	March . . . 130 "
September . 190 "	April . . . 100 "
October . . 145 "	May . . . 100 "
November . 150 "	June . . . 90 "
December . 180 "	
1140	725

Tenders to be addressed to the Chairman, Urban Council, Filey, and to be sent in on or before the 24th of May, 1909.

HENRY TOBEY,
Engineer.

Malton.

THE Llandudno Urban District Council

invite TENDERS for the Supply of about 7000 Tons of Best Screened GAS COAL and about 500 Tons of CANNEL. The Coal must be capable of producing a minimum of 10,600 Cubic Feet of 17-Candle Power Gas per Ton.

The whole will be required to be delivered between the 1st of July next and the 30th of June, 1910, at the Llandudno Station of the London and North-Western Railway, in such Quantities and at such periods as may be ordered from time to time.

Form of Tender may be obtained on Application to the undersigned; and only such Tenders as are on the prescribed form will be considered.

In every case where the Particulars asked for are not given, the Tenders will be thrown out and not considered.

Tenders, endorsed "Gas Coal, &c.," must be sent to the undersigned not later than the 20th day of May, 1909.

The Tender of any Person or Firm who, personally or through an Agent, Canvasses any of the Officers or Members of the Council will be rejected.

The Council do not bind themselves to accept the lowest or any Tender.

ALFRED CONOLLY,
Clerk to the Council.

Town Hall, Llandudno,
May 5, 1909.

ULVERSTON URBAN DISTRICT COUNCIL.

TENDERS FOR COAL AND CANNEL.

THE Gas and Water Committee are prepared to receive TENDERS for the Supply of Best Screened GAS COAL and CANNEL, for a period of One, Two, or Three Years, commencing the 1st of July, 1909.

Parties Tendering must give full Particulars of the Coal and Cannel they propose to Supply, and name the Pit from which the same will be raised.

Further Information and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas and Water Committee, to be sent in not later than the 14th inst., at Noon.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. SWAN,
Engineer and Manager.

SUTTON-IN-ASHFIELD URBAN DISTRICT
COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for the Construction of RETORT-HOUSE, RETORT-BENCH, COAL ELEVATOR AND CONVEYOR, HOPPERS, &c., in Connection with the above, are requested to send their names and addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., together with a Deposit of £3 3s. for Copies of Drawings, Specification, and Form of Tender. The Deposit will be returned on receipt of a *bona-fide* Tender.

Tenders must be delivered to the undersigned not later than Five p.m. on Tuesday, May 25.

The lowest or any Tender will not necessarily be accepted.

By order,
JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

HAYWARDS HEATH DISTRICT GAS
COMPANY.

GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 4000 Tons (more or less) of GAS COAL, to be delivered in such quantities and at such periods as may be ordered until the 30th of June, 1910.

The Coal required is to be Unscreened, and to be delivered in Trucks, free at Haywards Heath Railway Station (London, Brighton, and South Coast Railway), either from the South Yorkshire or Durham Coalfields.

Payment, net Cash Monthly. Tenders are to state the name of the Pits from which the above description of Coal will be supplied, the same to be Fresh Wrought and free from Slate, and to the entire satisfaction of the Company's Manager.

The Board have no Special Form of Tender, and do not bind themselves to accept the lowest or any Tender.

Tenders are to be received by me on or before the 18th of May next, and endorsed "Tender for Gas Coal."

(Signed) RUSSELL CORY,
Secretary.

85, Gresham Street, E.C.

SUNBURY GAS CONSUMERS' COMPANY
LIMITED.

TENDERS FOR GAS COAL.

THE Directors of the above Company

invite TENDERS for the Supply of about 2500 Tons of GAS COAL, and 100 to 150 Tons of Boghead CANNEL COAL for Delivery between the 1st of August, 1909, and the 31st of July, 1910, in such Quantities as may be required by the Company's Manager. Prices to be stated for Delivery, Free of all Charges, either alongside a riverside Wharf at Sunbury or at Sunbury Railway Station.

Sealed Tenders, endorsed "Tender for Gas Coal," and accompanied by Practical Working Analyses, to be addressed to the Chairman of the Company, and delivered at the Company's Offices on or before the 20th inst.

All further Information required may be obtained on Application to Mr. S. Bark, the Company's Manager.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
J. W. WYNN,
Secretary.

May 8, 1909.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company

invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Tenders to State the Price Delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b. and also the Price Delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Tuesday, the 1st day of June next.

The Directors reserve to themselves the right to accept the whole or any portion of any Quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 3, 1909.

THE Corporation of Middleton are prepared to receive TENDERS for COAL and CANNEL required at their Gas-Works.

Further Particulars and Form of Tender, which will include a Fair-Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer.

Tenders, addressed to the Chairman of the Gas Committee, endorsed "Tenders for Coal and Cannel," as the case may be, must be delivered at my Office not later than the 29th of May next.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
May 5, 1909.

BOROUGH OF CLITHEROE. (GAS DEPARTMENT.)

TENDER FOR GAS COAL.

THE Gas Committee invite Tenders for Screened GAS COAL, NUTS, and CANNEL, to be delivered on the Gas-Works Siding, during the Year ending June 30, 1910.

Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Saturday, the 22nd of May, 1909.

ROBT. BARRETT,
Engineer and Manager.

Gas-Works, Clitheroe,
May 6, 1909.

WEST DERBY UNION.

TO GAS-FITTERS AND OTHERS.

THE Guardians of the Poor of the West Derby Union invite TENDERS for LAYING GAS-MAINS, FITTING OF GAS-PIPES in Buildings, and the FIXING of all FITTINGS to Complete the Lighting of the Cottage Homes for Children at Fazakerley.

Samples of the Gas-Fittings to be fixed can be seen at the Cottage Homes, and Specifications obtained at the Union Offices, Brougham Terrace, Liverpool.

Sealed Tenders, endorsed "Gas Lighting," to be sent to the undersigned not later than Thursday, May 20 inst.

HARRIS P. CLEAVER,
Union Clerk.

Union Offices, Brougham Terrace,
Liverpool, May 1, 1909.

WHITTINGTON GAS COMPANY, LIMITED, NEAR CHESTERFIELD.

THE Directors of this Company are prepared to receive TENDERS for the Supply of 3000 Tons of Best Quality GAS COALS, from the South Yorkshire or Derbyshire Coalfields, for Twelve Months commencing July 1, 1909.

Tenders must state the name of the Pits from which the Coal will be obtained, which is to be fresh Wrought and free from Slate and other Impurities.

The Works of the Gas Company are situated on the Dunston and Barlow Siding of the Midland Railway, and the Price must include delivery free alongside.

Tenders, marked "Tender for Coal," are to be sent in the first instance to the undersigned not later than Saturday, the 22nd inst., to No. 3, Winchester Road, South Hampstead, London, N.W.

(Signed) S. PENNY, Assoc. M.Inst.C.E.
Engineer.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the Supply of about 6000 Tons of Best GAS COAL (Screened or Unscreened), to be delivered in such quantities and at such times as may be required from the 1st of August, 1909, to the 31st of August, 1910, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's Weighbridge, the Coal to be Fresh Wrought, Dry, and free from Hards, Smudge, Shale, and Pyrites.

Tenders to be accompanied by Practical Working Analysis.

Prices may be quoted c.i.f. or f.o.b. (by Sailing Vessels only) Exmouth Docks, or f.o.r. Exmouth Railway Station (London & South Western Railway).

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Saturday, the 27th day of May, 1909.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided or required.
JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
May 6, 1909.

URBAN DISTRICT OF CLECKHEATON.

GASHOLDER.

THE Council for the above District invite TENDERS for the necessary Works required in connection with the RE-SHEETING of the GASHOLDER at their Gas-Works, Cleckheaton, in accordance with Plans and Specification prepared by their Gas Engineer.

Such Specification and Plan may be Inspected, and any further Particulars obtained, on Application at the Gas Engineer's Office at the Town Hall during Office Hours thereat.

The successful Tenderer will be required to enter into a Contract with Sureties for the proper Performance of the Work, and comprising the Council's usual Form of General Conditions.

Sealed Tenders, endorsed "Gasholder," to be delivered to me at my Office not later than Four o'clock on Thursday, the 27th of May, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN H. LINFIELD,
Clerk to the Council.

Town Hall, Cleckheaton,
May 6, 1909.

TENDERS FOR GAS COAL.

THE Directors of the Newmarket Gas Company invite TENDERS for the Supply of 4500 Tons of Best Screened GAS COAL during the Twelve Months ending the 30th of June, 1910.

Tenders, stating Price per Ton delivered free at Newmarket Station as required, to be sent to the undersigned on or before the 15th of May next, from whom any further Particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
J. H. TROUGHTON,
Secretary and Manager.

Gas-Works, Newmarket,
May 6, 1909.

CIRENCESTER GAS COMPANY, LIMITED.

TENDER FOR GAS COAL.

THE Directors are prepared to receive TENDERS for the Supply, during the Twelve Months commencing July 1 next, of about 5000 Tons of GAS COAL, delivered at the Watermoor Station of the Midland and South Western Junction Railway Company at such times and in such Quantities as required by the Manager.

Tenders, Forms for which will be sent on Application, to be forwarded to the undersigned not later than May 31.

JOHN P. BEECHAM,
Secretary.

12, Silver Street, Cirencester,
May 4, 1909.

By order of the Directors of the ILFORD GAS COMPANY.

SALE BY TENDER OF £7500 ORDINARY "C"
STOCK,
AND
£2500 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

TENDERS will be received not later than Four p.m. on Tuesday, May 25, 1909.

For Particulars and Conditions of Sale, with Amounts and Forms of Tender, Apply to the SECRETARY, Ilford Gas Company, Broadway, ILFORD.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF £8300 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the TENDRING HUNDRED WATER-WORKS COMPANY.

(Supplying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £3000 CONSOLIDATED
ORDINARY STOCK,

AND
£2000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the UXBRIDGE GAS COMPANY.

NEW ISSUE OF £4000 CONSOLIDATED STOCK,
AND
£3000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

BUENOS AYRES (NEW) GAS COMPANY LIMITED.

NOTICE is Hereby Given, that the Shareholders, at their ORDINARY GENERAL MEETING held this day, have Declared a Dividend of 7 per cent. for the Year ended the 31st of December, 1908, of which 3 per cent. was distributed in October, 1908, by way of Interim Dividend, leaving the balance of 4 per cent. (8s. per share) to be paid forthwith, free of Income-Tax.

And NOTICE is HEREBY FURTHER GIVEN to the Holders of Share Warrants to bearer of this Company, that Coupon No. 38 is payable by the Company's Bankers, the Union of London and Smiths Bank, Limited, 50, Cornhill, E.C., at the rate of 8s. per Coupon.

Coupons must be left with the Bankers Three Clear Days for Examination.

By order,
J. M. MACMORRAN,
Secretary.

1, East India Avenue,
Leadenhall Street, E.C.,
May 6, 1909.

AUTOMATIC STREET LIGHTING MEANS

DR. ROSTIN'S APPARATUS.

Largest Installations in the World.

109, CANNON ST., E.C.

HEATHCOTE GAS COAL from the GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality
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Maintains a High Standard in Residuals.

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For Gas, Water, Electric, &c., Meters.
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For Pressure Scales in One Length up to 4 feet.
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Indicators, and for every purpose.

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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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THE LOTHIAN COAL COMPANY, LIMITED,

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NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO., ALFRETON IRON-WORKS, DERBYSHIRE, AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
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PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
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Makers of Cast-Iron PIPES and CONNEC-
TIONS for Gas, Water, Steam, Electrical,
Sanitary, and other purposes; also TANKS,
COLUMNS of every description, Hydraulic,
Gas, and Colliery PLANT, &c.

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London Offices:

46, CANNON STREET, E.C.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

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STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
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UNEQUALLED.

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Please apply for Price, Analyses, and Report, to the

MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.

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ROTARY
Station Meters
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Particulars from—
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LIMITED
Pepper Rd. Branch, Hunslet, Leeds.



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HYDRAULIC COKE PUSHERS
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WILL DISCHARGE A RETORT IN ONE OPERATION
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Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, April 13, p. 124.]

LARGEST MANUFACTURERS in the UNITED KINGDOM
of GAS-RETORTS,
Horizontal or Inclined;
also Makers of Segmental
Retorts of all Sections.

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**Machine-Flanged
RETORTS.**
DIBDALE WORKS, DUDLEY.

GIBBONS, JR., LD.
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SPECIAL BRICKS
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description for GENERATOR and REGENERATOR
FURNACES.

Large Stocks of Bricks of all sizes,
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Retorts and other Fire-Clay
Goods carefully packed for export.

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also VALVES of all descriptions.
R. LAIDLAW & SON, LTD.,
ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

THOMAS BUGDEN & CO.,
India-Rubber and Airproof Manufacturers and General Contractors,
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Largest Manufacturers of Gas Main Bags.

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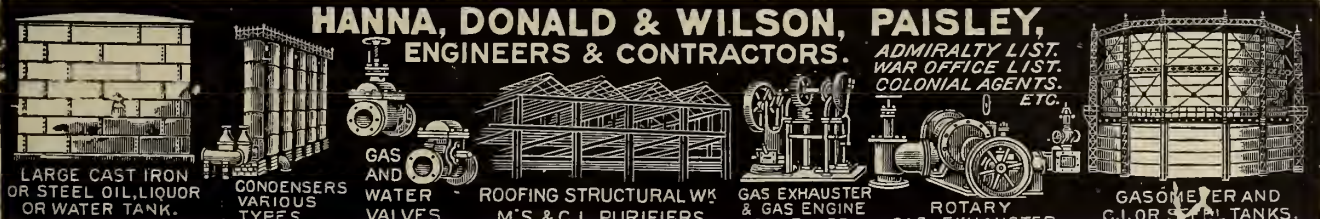
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Gas Bags for repairing Mains, All Seams Stitched and Taped.

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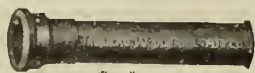
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ROTARY GAS EXHAUSTER.
GASOMETER AND C.I. OR STEEL TANKS.

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Excellent results obtained on HIGH-PRESSURE MAINS

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ROSE MOUNT IRON-WORKS, LTD.,

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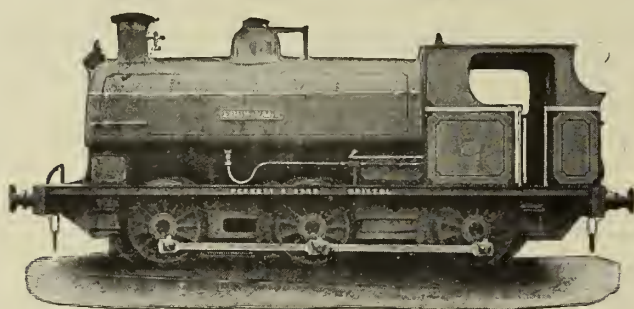
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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

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VERY FREE FROM IMPURITIES.

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Gas **INO** Mantles

PLEASE NOTE.—We specially invite you to make a **careful Test** of our various Brands which we Manufacture **specially** for **Street Lighting and Maintenance** purposes as we are convinced that for **Strength, Durability, and Candle Power** per Cubic Foot of Gas consumed **they are absolutely Unequalled.**

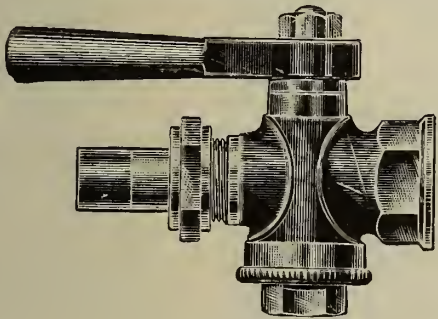
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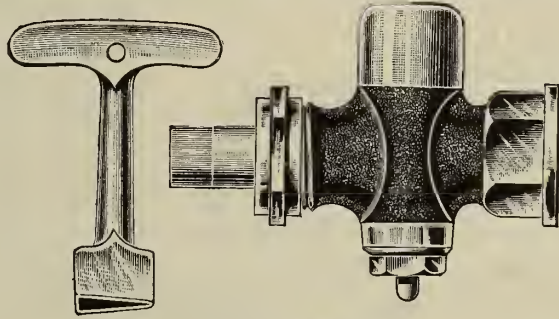
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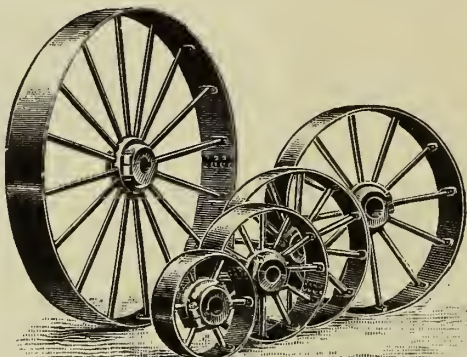
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Rope & Belt Pulleys,
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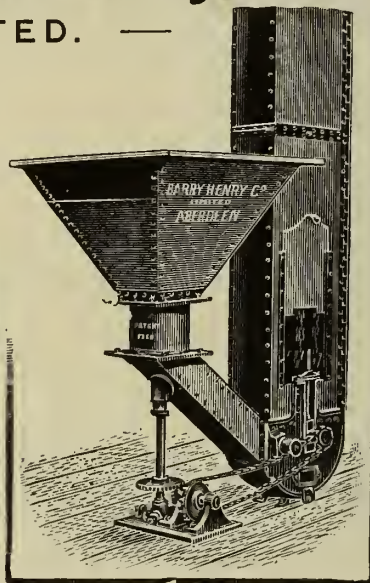
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**RETORT HOUSE GOVERNORS.**

THESE Governors are made to prevent fluctuation in the Pressure of Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.**JAMES MILNE & SON, LIMITED,****EDINBURGH. LONDON. GLASGOW. LEEDS.**

Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

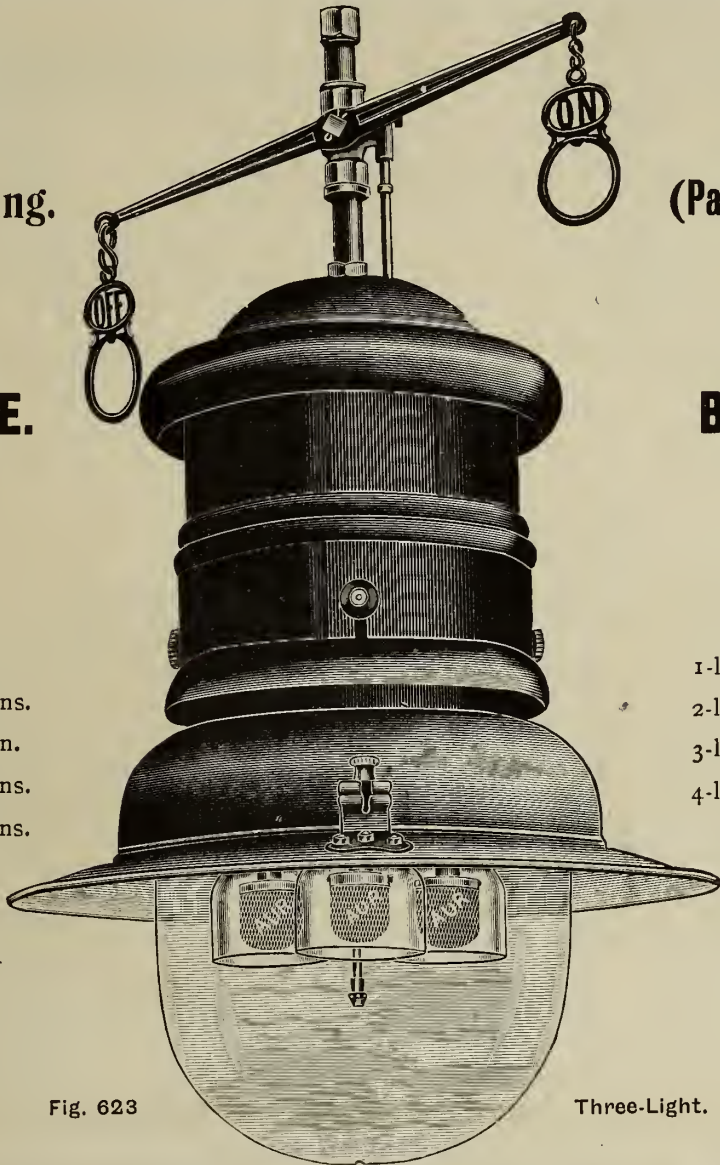


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 1 in.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 4 ins.
3-light	. . .	1 ft. 6 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	4/-	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	42/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made.
Case contains	80	48	18	12	Welsbach Mantles, each		6d.	subject as usual.	

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

THE WIGAN COAL & IRON CO., LIM^{TD.},

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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No skilled Stokers necessary.

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Heats under absolute control throughout the whole length of the Retorts.

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25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

Naphthalene always in solution. 45 per cent. less ground space required.

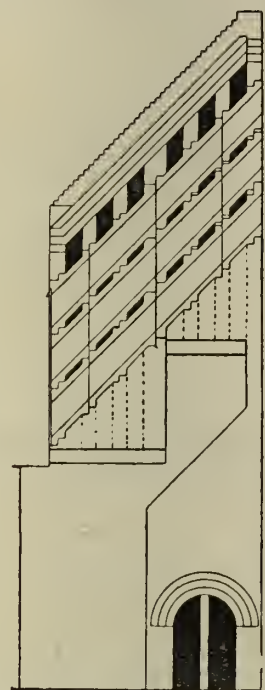
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

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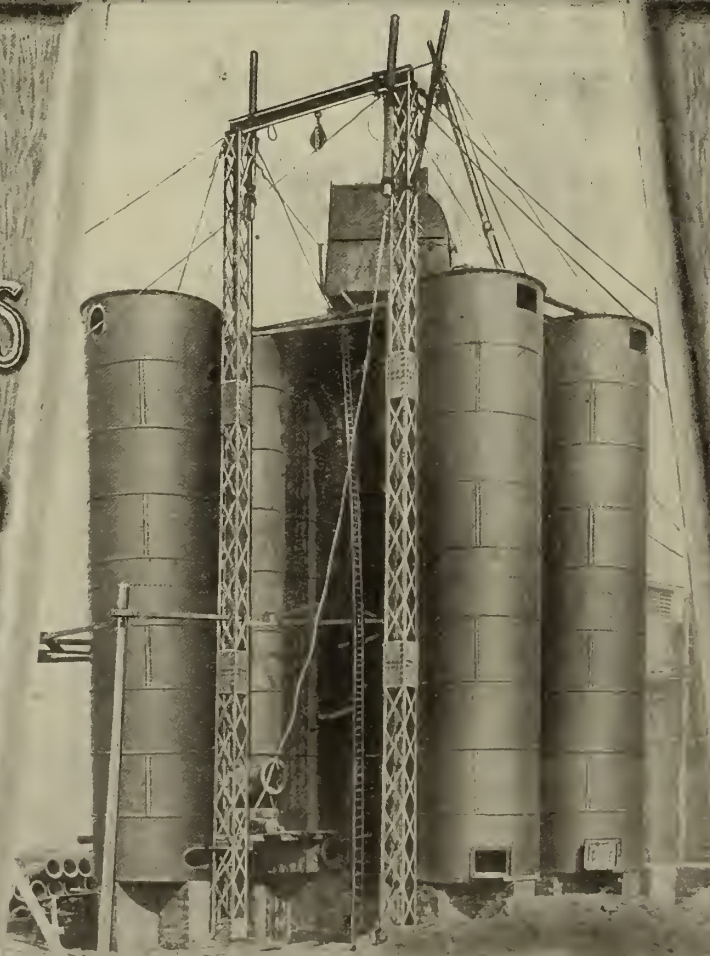
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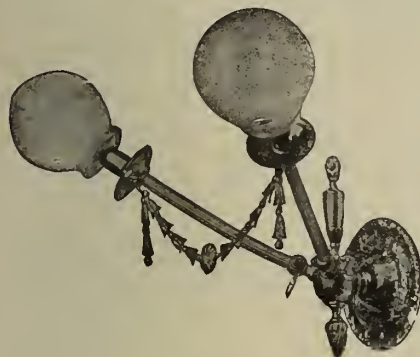
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Call at our Show-Rooms in Drury Lane
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WATER-GAS PLANTS

For Benzol, Tar or Oil Carburetting.

Over 80 Installations supplied for Gas-Works.

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CONTROLS COKE MARKET.**

Full Particulars on Application to—

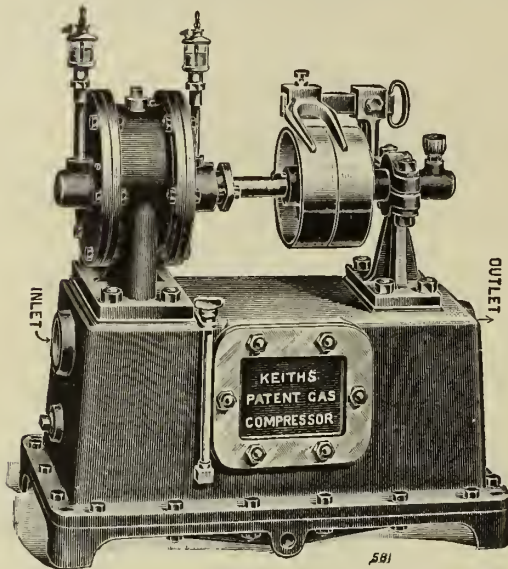
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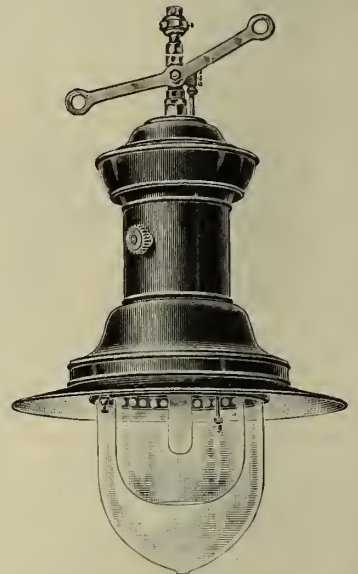
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THE MOST EFFICIENT ROTARY WASHER,

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VOL. CVI. No. 2401.]

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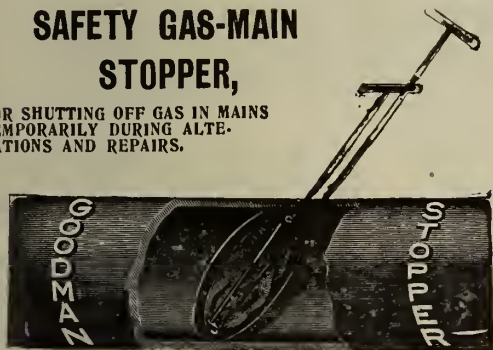
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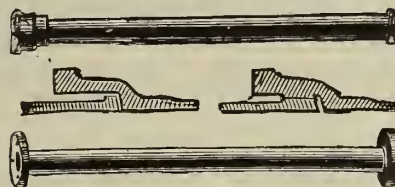
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1½ to 12 in. BORE.



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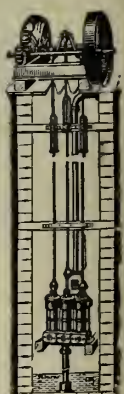
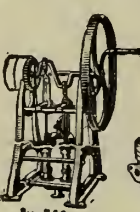
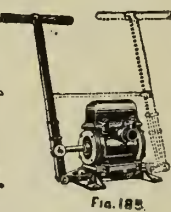
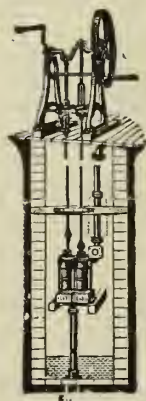
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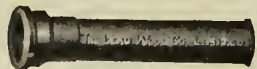
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TAR-FOG EXTRACTOR
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33 $\frac{1}{3}$ % Cheaper than Run Lead.

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Small Consumption.

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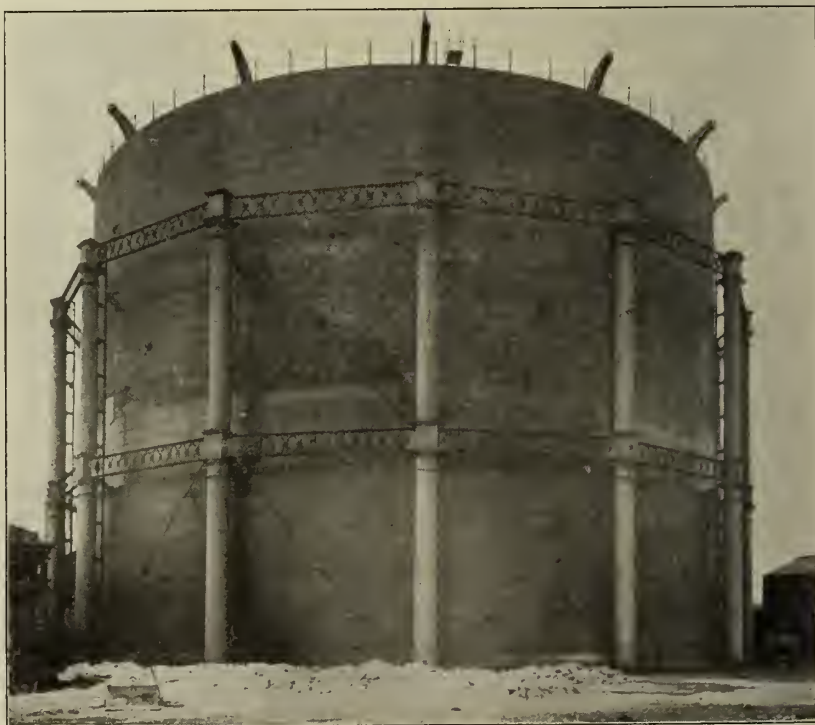
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The **"Titan,"**—a new departure in Slot-Cookers—is far ahead of any others of its Class;

THAT

The **"Titan"** is an ideal Cooker for Hiring out purposes;

THAT

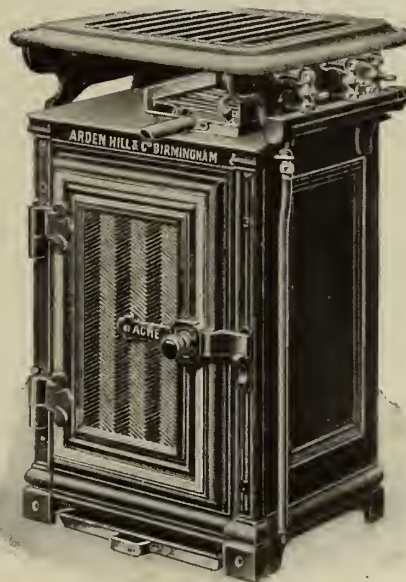
The **"Titan"** is proving an important Source of Revenue to Gas Undertakings who add it to their Lists.

THAT

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No. 230.

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Guest: So you've gone in for Electric Lighting?
Hostess: No my dear, better still! This is the Norwich System of Gas Lighting & is cheaper, better & quite as convenient.

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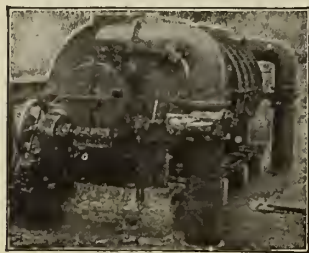
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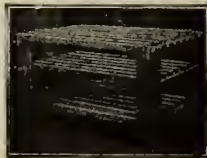


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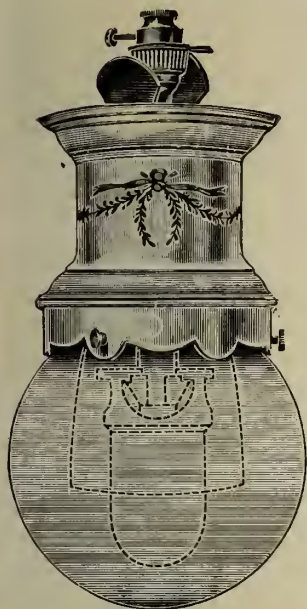
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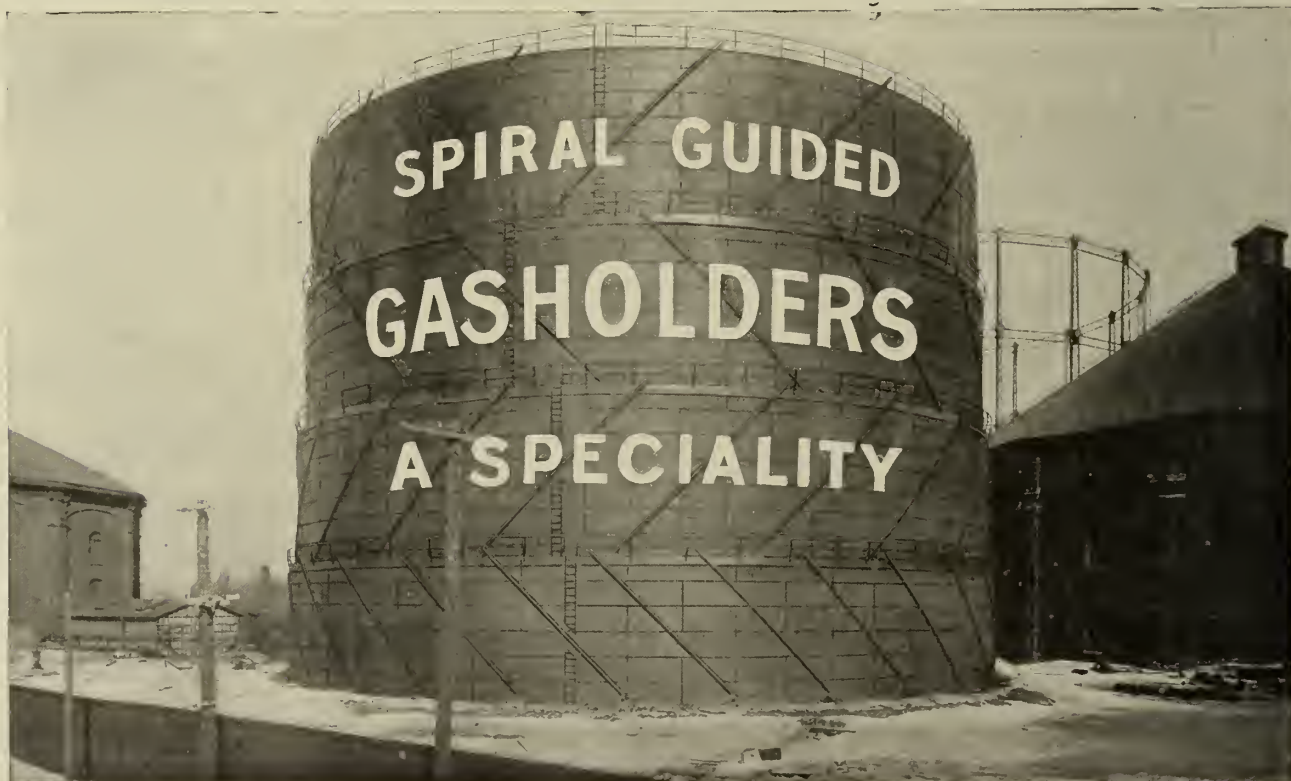
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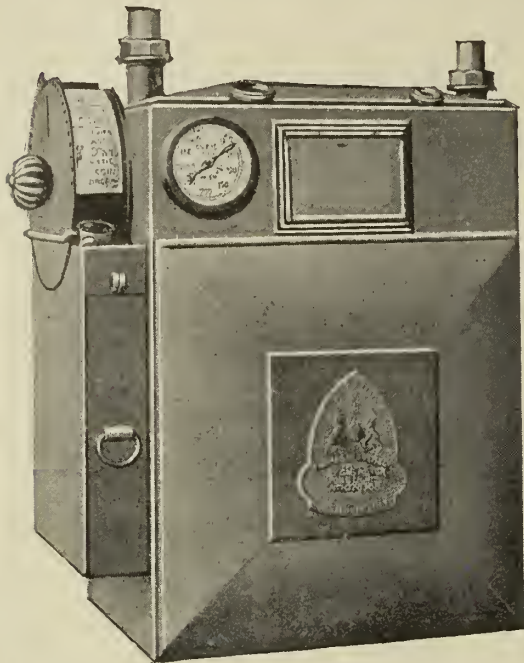
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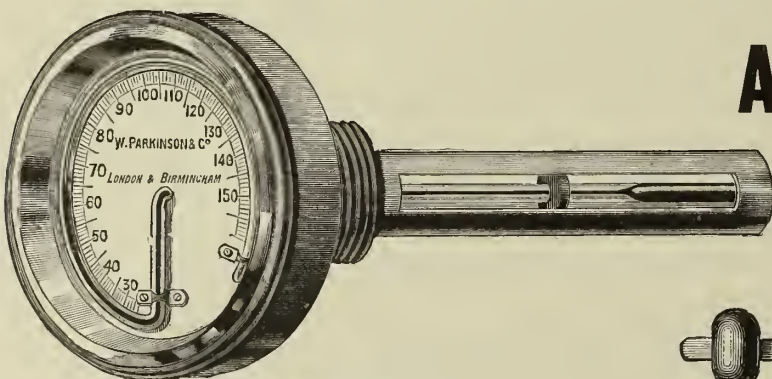
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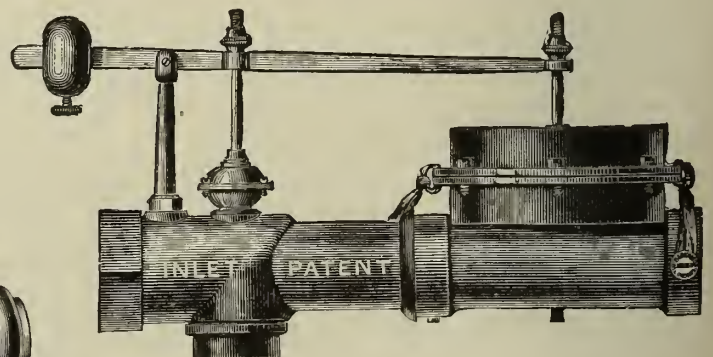
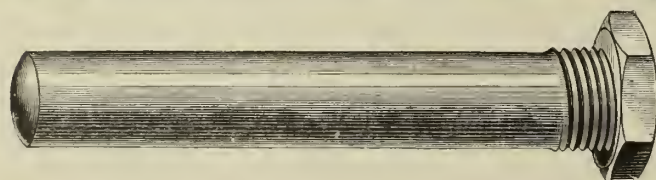
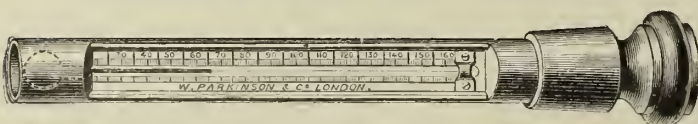
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VOL. CVI., No. 2401.—TUESDAY, MAY 18, 1909.

EDITORIAL NOTES—GAS, &c.

The International Candle.

THE Memorandum as to Photometric Units which is published on another page of to-day's "JOURNAL," appears to have been issued first by the Bureau of Standards, Washington, on April 1 last. It is now issued in this country by the National Physical Laboratory, with a covering note stating that it was intended that the announcement contained in the Memorandum should have been made simultaneously in America, France, and Great Britain. Attention may here be directed to the importance of the announcement, which, in effect, makes the value of the English parliamentary sperm candle as definitely established by the Gas Referees in 1898—when they first prescribed the Harcourt 10-candle pentane lamp for use as the standard of light in the Metropolitan gas testing places—the accepted unit of light for most civilized countries, and for the electrical as well as the gas industry. It is true that Germany for the present will adhere to the Hefner unit; but a definite ratio between it and the Harcourt unit is now accepted by the National Physical or Electrical Laboratories of the four countries, so that photometric results recorded in terms of one unit will be readily convertible into terms of the other.

Reference to the reports issued from time to time by the National Physical Laboratory, and the American Gas Institute shows that both bodies as well as the Reichsanstalt obtained Harcourt lamps which had been carefully standardized in the laboratory of the Gas Referees by comparison with the original standards established there. It was found that the "candle" of the Harcourt lamp differed from the unit of light which had been established at the Bureau of Standards at Washington, though this unit had been intended to represent the English standard candle. It was, however, based on a ratio established by Liebhenthal in 1893 between the Hefner unit and the English candle as adopted in Germany. It had been the custom in Germany, as is explained by Liebhenthal in his text-book on photometry, to snuff or trim the wick of the English candle in photometric testings, in order to maintain the height of flame as nearly as possible constant—i.e., at the arbitrarily chosen height of 45 millimetres. No such interference with, or disturbance of, the candle flame was, however, permitted in English photometry; and the candle burning thus undisturbed had a different and apparently slightly lower average value than when its wick was snuffed or trimmed according to the German convention. The Bureau of Standards at Washington, working through the Hefner unit and Liebhenthal ratio, established standards for America, which were based on the English candle when used according to the German convention, instead of according to English practice. It thus came about that the American standard "candle" acquired a value higher by about 1.6 per cent. than the English standard candle which it was intended to reproduce. When, however, direct comparisons could readily be made through the medium of the Harcourt lamp, which preserves the value of the English sperm candle as specified in the Gas Acts, and certified for many years by the Gas Referees, the discrepancy was discovered. After mature consideration, and consultation with the interests primarily affected, the Bureau of Standards decided to alter its standard "candle" in order to bring it into agreement with the English standard candle and the *bougie decimale* of France, which by a happy coincidence were already in agreement.

The Bureau of Standards at Washington is, we believe, in a position to impose its standards on both the gas and electrical industries of America, and the National Physical Laboratory and the Laboratoire Central d'Electricité are the standardizing authorities generally acknowledged by the electrical industry in Great Britain and France. The unit thus already widely accepted shall, it is suggested, be known as the "International Candle;" and it is anticipated that in the near future it will also be accepted on behalf of other

countries represented on the International Electrotechnical Commission. The gas industry of Great Britain may therefore rest well content that the English parliamentary sperm candle, the value of which has been defined and preserved by the Gas Referees, is, through the medium of the Harcourt lamp as standardized by them, in a fair way to become the unit of light for the gas and electrical industries throughout the world.

The Gaslight and Coke Company Bill.

EITHER wise counsels have prevailed with Mr. William Thorne, or he prudently appreciated that a heavy defeat awaited him if he persisted with his motion, having for its intention the strangling of the Bill of the Gaslight and Coke Company. Whichever of these reasons is the correct one, his opposition has ended in the most placid way, by the withdrawal of his motion last Thursday night, on which occasion he would have been bound to have presented his objections to the measure had he not taken the course he did. The Bill, he stated, would affect some thousands of gas consumers in West Ham; and the reason why his motion was put down was because there had been some disagreement between the West Ham Corporation and the Gaslight and Coke Company, and that there was a chance of settlement. It is quite true that the Bill will affect thousands of consumers in West Ham, and, we believe, beneficially. But in view of what occurred in the Committee rooms, we know of nothing that could have seriously happened, or that the Gaslight and Coke Company could have conceded as being open to further negotiation, after the ratification by the Select Committee of the new clause requiring the Company to continue to operate the West Ham Gas-Works for ten years substantially to the extent obtaining during the year preceding the introduction of the Bill.

The reason given by Mr. Thorne for delaying the progress of the measure so long, does not appear sufficient. His tactics commenced in the last week in March; and, since then, week after week during the sitting of the House, he has pursued the same course. If his sole reason was the one stated, it was more benevolent than vindictive. But we have suspected there was another motive. If we are right, however, we will not impugn it. It will be remembered that the West Ham Corporation insisted very strongly before Mr. Mooney's Committee that the continuation of the West Ham works for ten years should carry with it the condition that the number of men employed there, with seasonal variation, should, throughout the decade, be continued as previous to the introduction of the Bill. In this plea, they were unsuccessful, for the Committee saw that it would be an irrational proceeding to tie any industrial concern, subject to the vicissitudes of fortune and technical development, to a condition for ten years that might prove irksome to the proprietors and disadvantageous to the general body of consumers. As a defender (according to his lights) of labour, Mr. Thorne may not have regarded the suggested condition as unreasonable; but fortunately all of us do not see things as do Mr. Thorne and his colleagues. However, the incident has ended; and we can discern no reason now why the Bill should not proceed without further hindrance.

A serious consideration arising from it is that any single member of Parliament should hold in his hands the power to obstruct for such a length of time, without explanation, a measure of so much importance, or, in fact, any measure that has met with the approbation, after investigation, of a Select Committee. Such delay, though in accordance with custom and private members' existing privileges, is, from our way of thinking, both an insult to the House and to the Committee who have considered the measure; and had it been the case of a Bill that had been delayed some time in its initial stages, the obstruction by a private member for weeks later in the session than in this instance might have proved fatal to the passing of the measure. Expended money and resulting public benefit might lie at the mercy of a single

intractable and unreasonable partizan; and there are too many sections in the House now with their own particular "axes to grind." This condition makes the course of Private Bills more uncertain than ever. Procedure might at least now be altered so that it should be obligatory on an objecting member to at once state the grounds of his action, and let the House decide there and then whether or not the grounds are sufficient, or whether delay in advancing the stages of the Bill concerned would be advantageous. The reason given by Mr. Thorne also indicates how the power of obstruction by a single private member might bring undue pressure to bear upon promoters.

An Objectionable "Principle" in Municipal Service.

THERE are a good many principles ruling in personal and business conduct that would be all the better for revision and perhaps complete sacrifice. There is one existing in the Standing Orders of the Birmingham City Council, which, however, has been set aside in the past in connection with the Education Committee and the Free Libraries Committee, and which the Gas Committee desire to modify in the present in a manner that meets with our heartiest approbation, and for reasons which can be clearly stated. We do not wish to in any way embitter the position at Birmingham; but we must say that in the speeches in opposition to the Gas Committee's proposal at the meeting of the City Council on Tuesday last, was a degree of petty argument and narrow-mindedness that ill-befits the rank that the Birmingham City Council have taken in the municipal world. There is a minute of the Council of twenty years ago to the effect that Committees shall report to the Council any proposal for the increase of the salaries of officers when such increase shall amount to £50 and upwards. This constitutes the principle upon which there was much tedious harping in the Council Chamber when the Gas Committee introduced a recommendation that they should be empowered to raise the salaries of their Station Engineers at Saltley, Nechells, and Windsor Street to a maximum of £1000 each, awarding the difference between the present salaries and the maximum by progressive steps as and when in the judgment of the Committee it should be considered desirable. This was the only resolution that was placed before the Council; a further recommendation that the same power should be conferred on the Committee in respect of the remuneration of Mr. G. Hampton Barber, the Secretary and General Manager (the maximum in this case being £2000), being withdrawn on an adverse vote—29 to 27 votes—on the motion regarding the Station Engineers' salaries. There was no question publicly raised as to the fairness of the maxima suggested by the Committee; the whole of the *viva voce* opposition being directed to what was considered an infraction of the principle that imposes a condition of publicity that is a discredit to municipal administration, and an objection—and it is a growing objection—to municipal service. The principle, too, is one that would not for an instant be tolerated by any member of the Council who gave it support if he himself were personally affected. As a matter of fact, the Committee were not asking the Council to set aside the principle, but merely to moderate it by fixing increases in the case of their chief officials beyond which the Committee were not to go without again approaching the Council for their consent, and which increases should be awarded by the Committee progressively according to the deserts of those to whom they applied.

This is a proper thing to do for more reasons than one. The Council, on the recommendation of the Committee, have reorganized the executive staff of the most important of the trading departments of the city. They have put upon the General Manager and Works Engineers of the department increased responsibilities and duties. They have consequently raised their status; and the present proposal of the Committee we recognize as a just and necessary appendix to the already adopted scheme. Whether or not we admit the correctness of the policy forming the basis of the scheme as being one suitable for general acceptance, is not the question before us. The fact stands out with striking prominence—and it would be negligent on our part not to acknowledge it—that, under the new scheme, during the past year, an excellent working and financial record has been achieved by the department. The official head of the department, and the chief Works Engineers have a right, in view of their increased individual responsibilities, to fair and encouraging treatment at the hands of the whole Council—treatment that

accords with, and fits, the positions in which the Council have placed them. The Council require the highest efficiency in the chiefs of the department; but the Council may be warned that they are not going the right way to work to get it. If there is one way more effective than another in crushing energy, it is by a course of action that imposes indignity upon the individual. And the very principle which appears to be the object of so much veneration by a number of the councillors is, it is said deliberately, an obstacle to realizing the best service, to encouraging the highest efficiency, and, we will go further and say, to maintaining by the chief officials the best discipline among their subordinate officers and the rank-and-file of the workers, and the respect of those subordinates and workers. The Committee controlling such a department, with its complex technical and commercial details and with ramifications peculiar to its work, are far and away the best judges of the proper value of the services of those in chief executive command under them. But when they recommend a fresh and deserved pecuniary acknowledgment of those services, and the conferring of that which gives some further encouragement, should there be an adverse vote in the Council—and adverse votes on the questions of the salaries of officers are becoming more common than ever in municipal chambers, owing to changing constitution of the membership—the official or officials concerned keenly feel the indignity that it conveys both within and outside the offices and works.

Municipal councils are composed of men of various shades of opinion. And it is an uncomfortable and baneful condition of municipal service that just reward for ability and fealty to entrusted interests can only be obtained by running the risk of opposition from those whose proclivities in public administration are of a narrow-minded and parsimonious order, and whose success in persuading a majority of a council to their way of thinking heaps upon the person concerned unmerited ridicule from certain sections of the community, with whom abuse of those in command is regarded as proper and even virtuous. Beyond this, under the system of public discussion of every item of increase, the amount of an official's salary and the extent to which it is to be advanced, are heralded forth to those among whom he lives and moves. The position is not a happy one for any men—much less for men of refinement and talent. Their compeers working under private enterprise are in the fortunate position of not being subject to the same indignity. The salaries of engineers in the employ of gas companies are fixed by the boards of directors; and the amounts of their incomes are not bruited abroad in the same vulgar way that obtains in municipal service. In the case of secretaries of gas companies, too, for several years past Parliament has been granting to boards of directors the same power of remuneration advance that they already possess in the case of the engineers. The same privacy applies to every employee, high or low, of the employer members of the Birmingham City Council. And it is right that it should be so. If men are worthy of being officers of a great concern such as the Birmingham Gas Department—if they prove themselves worthy, willing, and able officers, to whom responsibility stands for much—they are quite entitled to every respect the members of the City Council can accord them. Not one of the Councillors who proclaimed their veneration for the principle of public disclosure and debate in this matter would, we assert with confidence, submit to like treatment. They babbled over this particular principle, as though it were irreproachable. There is another one that enjoins us to do to others as we would be done by; and the more this high principle is applied by our local governing bodies to their treatment of municipal officers, the more attractive will they make municipal service. We do not suggest that the control of salaries should be entirely removed from the Council; but the principle of a maximum salary, and the leaving to the discrimination of a competent Committee of the stages by which that maximum shall be attained, meets with our unqualified approval, just as much as we condemn the paltry principle of insisting upon the public discussion of every proposed advance of the propriety of which a heterogeneous Council are incapable (as a Committee are capable) of forming a right judgment, and especially in connection with a large technical and trading enterprise like that of the Birmingham Corporation Gas Department.

We hope Sir Hallelwell Rogers and the other members of the Gas Committee will stand firm in this matter, and that they will reintroduce their recommendation. The Committee are not going to abuse the power if granted by the Council. The members of the Committee are mostly men

of acknowledged business capacity, both within and beyond the city; and they are held in the highest esteem. They have the spending of large sums of money entrusted to them, with no more control than a report to the Council; and it will be a reflection on them if the Council refuse to empower them to dispense a few more hundred pounds as thought fit in adequately remunerating their chief officers. The action of the Committee in this matter will be closely watched by local authorities elsewhere. Sir Hallowell and his colleagues have the opportunity now of doing an important piece of work for municipal service, which, we repeat, has been for some years now losing ground in attractiveness to men of tried ability. The Birmingham Gas Committee can, if they stand firm, do something to restore that attractiveness, by bringing municipal service as nearly as possible in line with service under private enterprise. The Committee have able men in their service; and they want to retain them, and not allow them to depart at the call of a higher bidder, with conditions of service that confer greater personal dignity and give relief from the frequent irritation of an unenviable publicity. Municipal service has been weighed in the balance and found wanting; and we ask—and ask with sincerity—the City Council of Birmingham to do their part in showing a willingness to improve it in the manner suggested by the Gas Committee, and not persist in a course of procedure that has proved to be a failure, and is, to say the least, unjust and offensive to those chiefly concerned. The Birmingham Council have often led in municipal matters. Let them lead in performing this particular act of common justice as between man and man.

The Efficiency of the Slot Meter.

THERE are matters of the most commonplace order that do not strike one until—perhaps quite trivial—circumstances force them upon one's notice. Notwithstanding the large amount of popularity that slot meters have attained, there has been, we are indirectly reminded by a paper before us, comparatively little written about them, other than on their commercial aspects as valuable instruments in the development of the gas-supply business. The principles underlying design and their actual structure, outside the pages of patent specifications and reproductions in the technical press, have been neglected topics save by, in the seclusion of their works, the specialist makers. Perhaps the technicians of the gas-supply industry have given little attention to the discussion of principles and structure because the production of the meters has been a matter solely for makers of such apparatus. The interest of the technical officers of gas undertakings has, as a matter of fact, been largely confined to mechanical reliability and structural durability. But the tremendous increase that the slot meter has made in the number of meters on a gas-supply district is gradually causing the spread from the large undertakings to undertakings of more modest pretensions of the system of overhauling and repairing meters in the gas suppliers' own workshops. In view of this, there is an expansion of interest in the internal arrangements of meters, and careful records are now being kept on many gas-works as to the relative expense of repair and so forth of the various types.

Under these circumstances, there is opportuneness in the paper read before the Junior Institution of Engineers, by Mr. T. S. F. Gibson, Assoc.M.Inst.C.E., of the Old Kent Road works of the South Metropolitan Gas Company, on the construction of coin-freed mechanism as applied to gas-meters. The development of the slot gas-meter to the present state of perfection has been a gradual one; but it is remarkable how soon a number of workable instruments were brought forward in the early years when the phenomenal rise in popularity of this method of retailing gas gave splendid encouragement to workers to overcome the defects that experience disclosed. It could not be expected that a machine of this kind, in which there had to be harmonious working relationship between the coin and measuring and registering mechanisms, could be developed offhand free of every blemish. What seemed to be the correct thing in the workshop was not adequate in all its details to face the threefold practical work of receiving, measuring, and registering for which the slot meter was destined. But, speaking generally of present mechanisms, there is really little fault to be found with them; and the slot meter of to-day is accepted as being a fair arbiter between seller and consumer. Credit for the fact that there is comparatively little complaint arising from these meters must not, however, be

entirely claimed by the meter makers. Part of it is due to the fact that the meters receive a great deal more attention than the ordinary meters. The migration of householders using slot meters goes on to a far larger extent than is the case with ordinary consumers; and, from this cause alone, meters are brought at frequent intervals to the testing-plant and the repairing shop, in addition to the periodical systematic examination, district by district, that is made by many gas undertakings, and should be made by all. The meters are also frequently under the practised eye of the coin collector and meter reader; and anything that can be detected as wrong by outward sign is speedily reported. All this, of course, helps to keep the average of perfect working fairly high.

Though the coin mechanism is additional, the cost of repair per slot meter does not, on the average, within actual experience, work out to much, if anything, more than in the case of ordinary meters. But this is due to the more frequent attention; and this frequent attention costs money. Anything, therefore, that tends to simplification of mechanism without injury to efficiency will represent a welcome reduction of the cost of the maintenance of the important "ready-money" branch of the gas industry. Slot-meter maintenance costs are also greatly increased by money-box pilferers. But it would not be fair to attach the expense of this as though due to a defect in the slot-meter as an efficient instrument for the designed purposes. Mr. Gibson refers to the use of the strong money-box, and says that, where adopted, the cost of this must be regarded as "an insurance premium against robbery." We would suggest he should add to this the words "and against the heavy cost of repairing the mischief occasioned to the meter by the robbery." The addition makes all the difference.

Municipal Gas Undertakings.

For the next few weeks a considerable amount of "JOURNAL" space will be occupied with the customary chronicling of the results of the working of gas undertakings in the hands of local authorities during the past financial year; and in this matter we look forward to being able to tell the usual satisfactory tale. It is true that trade depression is leaving its mark on gas, as on all other industries; but the indications seem to be that the effect has, at any rate in many cases, been less than might have been expected under the circumstances. Following the report of the Birmingham Gas Committee which was noticed at length a fortnight ago, we are able to give to-day the working results of several municipal undertakings. At Burslem, there is nothing but congratulation—which is thoroughly justified—in spite of the keen competition which has been set up by the Corporation Electricity Department. A scale of charges is in operation which descends from 2s. per 1000 cubic feet for gas supplied to ordinary consumers, down to 1s. to the largest users for motive power purposes; and there is a net profit of £2321, of which £1200 goes in relief of the rates. Low prices are naturally coupled with a large make; and this, for the past twelve months, works out at no less than 12,036 cubic feet of gas per ton of coal carbonized. The capital amounts to £679 per million cubic feet of gas sold. All the carbonizing plant has been brought thoroughly up to date; and it will be noted that the whole of the gas is now being produced in inclined retorts. From Burton-upon-Trent there is also a good report; the Chairman of the Committee remarking upon the evidence given "of great care having been exercised to secure the best results." During the past year, for the first time in the history of the gas-works, over 10,000 cubic feet of gas were sold per ton of coal carbonized. The make per ton was 10,762 cubic feet. A surplus of £8733 has been realized (of which £6500 has been handed over in relief of the rates). The surplus is less than was the case twelve months ago; but the consumers have no cause to regret this falling off, inasmuch as for three-quarters of the past year they have been in the enjoyment of a reduction of 3d. per 1000 cubic feet on gas supplied through both ordinary and prepayment meters. There was a decrease of 1½ per cent. in the amount of gas sold; and it seems that the Committee have, unfortunately, for some years had to face a steady falling off in this direction. There is a net profit at Hinckley of £2683, which is about £800 less than in the previous year; but here, again, the smaller surplus is accounted for by a reduction in the price of gas. A sum of £520 is transferred to the general

district rate. At Rotherham, there was a record yield of gas, per ton of coal carbonized, for the department; the figure being 12,345 cubic feet, as against 12,130 feet in the preceding year. There is a net profit of £5395, compared with £7431; but here, once more, the consumers have benefited by a reduction of 3d. per 1000 feet. It seems that Rotherham is one of the places which enjoy "free public lighting;" for the following sentence appears in the report: "If the gas for public lighting (£2413) is again given by the department, as in former years, there remains an available surplus profit of £2981." From St. Helens, is reported a small increase in the output of gas, in spite of the bad state of trade; while the net profit amounts to £9100, out of which it has been decided, for the fourth year in succession, to hand over £5000 in relief of the rates. From a reference appearing in a local paper (which we reproduce elsewhere) it is evident that St. Helens is—and quite justly—thoroughly well pleased with its gas undertaking. It will be noticed that "very good results" are reported regarding the experiments that are taking place there with vertical retorts.

Profit Limitations and No Free Gas.

If the Salford and Oldham Corporation Bills inaugurate a new policy on the part of Parliament in exercising greater control over the revenues of municipal trading departments, and in producing greater protection for the consumers, it will do something to lessen the fascination that has so long existed among local authorities for launching out into municipal trading. The real incentive to municipal trading has not been improved service, but the obtaining of new sources of revenue to minister largely to prodigality, with the further result (which does not trouble the majority of our local governors) that a perpetual contribution to the public expenditure is extracted from one section of the community to lighten the share of the public burden of the, through those sources, non-contributing sections. Limitation of appropriation of gas profits in aid of the rates has existed at Oldham since 1886; but there is to be greater definiteness now than in the past by the amount to be taken annually being strictly confined to £7500. But Oldham has been taking full advantage of an antiquated power to use gas and water free for public purposes; and the cost of this has come out of the pockets of the consumers. The ratepayers, as a whole, are in future to pay for their public use of gas and water the same as they pay for other public services. Under this head the revenue of the Gas Department will benefit by something like £7500, and that of the Water Department by somewhere about £3000. This is so much to the good towards the cheapening of gas and water to the consumers, for the lowering of prices is to be the destination of surpluses in future. Bank interest on uninvested sinking funds is no longer to go to the borough rate, but is to be retained by the departments. One of our Oldham contemporaries calculates that, in consequence of all this revision of the relationship between the Corporation and the gas and water consumers, something like £13,000 more will have to be found by the borough rate. This cannot be helped. Every tub should stand on its own bottom. The attitude of the "JOURNAL" from its earliest days in its claim for the liberation of the consumer from unfair burdens which amounted to indirect taxation, has been vindicated by the action of Parliament this session in the cases of Salford and Oldham. The subject was fully discussed last week. But it may be mentioned here that the decisions of Lord Donoughmore's Committee and of the Local Legislation Committee have created much uneasiness in municipal circles; and certain corporations with municipal trading enterprises from which thousands and tens of thousands of pounds of profits are being extracted yearly are already quietly determining that a respectful distance shall as long as possible be maintained between them and Parliament.

The Position in South Wales.

Attempts at conciliation are being made in the South Wales coalfield, which give some small cause for hope that, after all, a way may be found out of the difficulties that have arisen in connection with the operation of the Miners' Eight-Hours Act. On Monday of last week, the South Wales Conciliation Board held a meeting at Cardiff, at which two far-reaching questions were discussed. The result was that a demand made by the owners for a 7½ per cent. reduction in wages, being resisted by the men's representatives, was referred to the Independent Chairman; while

(with the reservation of the right to tender notices on June 1) the owners agreed to refer to a Joint Sub-Committee the still more crucial question of the working arrangements under the Eight-Hours Act. This Committee will consist of six representatives from each side of the Board, with the two Secretaries. The first meeting was held last Friday; and a final report will be handed in at a special meeting of the Conciliation Board to take place on Friday of this week. That as little time as possible is to be spent in discussing the matter, and thus leaving the question open, may be taken as an encouraging sign, while the declaration that both sides are animated by a desire to avoid conflict may afford some additional comfort to those who are naturally optimistic. The men's representatives are credited with the assertion that they are prepared to consider any suggestion from the owners' side which would not involve a reduction of wages or hardship in the changing of shifts. What proposals the owners may be able to formulate which will not infringe one or other of these stipulations, we do not yet know; but one thing is clear—and it is that the whole of the discussion has been brought about by the firm belief of the owners that the operation of the Act will considerably increase the cost of working the collieries. Bearing this in mind, it seems that any terms they assent to must be such as will secure some economy in working which does not appear to them to be realizable, with the new Act in force, under existing conditions. Meanwhile, the opinion of one of the speakers at a meeting on behalf of the men is that any attempt to reduce the wages of the day-wage men will result in the most disastrous strike the world has ever seen. Of course, this sort of talk has been heard before, without anything very serious coming of it; but, for all that, it hardly seems to denote a "conciliatory" frame of mind.

Protection of Children from Gas-Fires.

A short time since a little girl in South London sustained such injuries by her clothes coming in contact with the lighted burner of a gas grill that she died. It appears that she climbed upon a chair to reach a bag hanging on a wall over the gas grill, with the lamentable result stated. The Coroner, at the inquest, incidentally made a remark that such a case as this was not contemplated by the framers of the Children Act. The words were instantly seized upon by a few doubtless well-meaning but unpractical people, who thought that, where there were children henceforth all gas fires and stoves should be provided with a guard. This view found expression in a question put in the House to the Home Secretary. Mr. Gladstone saw the impracticability of legislating for an uncommon danger. It is, as he said, quite impossible to provide by Act of Parliament against every source of danger. The Children Act was intended to meet the common case of open fire grates; and he was afraid that it would be impossible to prevent accidents under exceptional circumstances, such as occurred in this instance. When consideration is given to the fact that there are a few million cooking-stoves, grills, boiling-rings, gas-fires, &c., in use in the British Isles, it will be recognized that it would be a vast business to guard them all where there are children. But the fact that accidents to children through the existence of gas-stoves are such singular occurrences, and that death and injury are so frequent through ordinary open fires, speaks much for the safety of the former. If the suggestion to the Home Secretary had been that parents should be adjudged culpably negligent if they hang such things as bags over gas-fires or stoves in such a position as to necessitate a child mounting a chair to reach the article, there would have been a greater amount of sense in it than there is in the idea that all gas fires and stoves should be guarded.

The Growth of Trade Unionism.

Whatever may be the case with individual branches of industry, Trade Unionism—judging from official statistics, which are not, however, quite up to date—seems on the whole to be growing at a rate which must be satisfactory when gauged from the standpoint of the paid officials. There was last week issued the sixteenth report on Trade Unions in the United Kingdom, prepared by the Labour Department of the Board of Trade, and covering the three years from 1904 up to the end of 1907—the latest date to which returns were available. This lateness of publication, it must in fairness be pointed out, is largely owing to the fact that the accounts of the registered Unions

are, under the Trade Union Act of 1871, not due at the office of the Chief Registrar of Friendly Societies until the 1st of June following the year to which they relate; and they are not, even thus, always delivered within the prescribed limits of time. However, taking the statistics as the latest procurable, it may be stated that at the end of 1907 the total membership of Trade Unions was 2,406,746, or 500,000 more than at the end of 1904—a greater rate of increase than in any period of three years since the statistics were first compiled. The accounts of one hundred of the principal Trade Unions, comprising 1,460,000 members, show that their total income in 1907 was £2,493,000, or £378,000 more than in the year 1904; while their expenditure was £2,054,000, or the same as in 1904. The expenditure on unemployed benefit, which had risen every year, from £185,000 in 1899 to £655,000 in 1904, fell to £523,000 in 1905, and to £424,000 in 1906; rising again in 1907 to £466,000. The total cost of this benefit during the ten years from 1898 to 1907 was over £4,000,000. Dispute benefit cost £500,000 during the three years ending 1907, which is practically the same amount as was expended in each of the two previous triennial periods. The total cost of sick and accident, superannuation, funeral, and other benefits (except unemployed and dispute) showed an annual increase, from £849,000 in 1904 to £975,000 in 1907. Of the total expenditure of the hundred Trade Unions in the three years under review, 8·2 per cent. was spent on dispute benefit, 69·3 per cent. on unemployed and other friendly benefits, and 22·5 per cent. on working and miscellaneous expenses. The total funds of the Unions at the end of 1907 were £5,638,000, as compared with £4,666,000 at the end of 1904; the amount of funds per member being about £3 17s. 6d. in each of these two years, as against £2 8s. 8d. in 1898.

A Steel Water-Tank, erected in 1868, is still in service at the Rock Island Railway shops in Chicago, according to the report of the Committee on Water Service of the American Railway Engineering and Maintenance of Way Association. It is built of $\frac{3}{8}$ -inch and $\frac{1}{4}$ -inch plates. The pitting inside is shallow, and since the outside is now kept well painted, though it was formerly neglected, the tank is expected to last double its present life.

The Petrol Duty and Benzene.—In the House of Commons on Monday of last week, Mr. Lonsdale asked whether the duty on petrol and other spirits used for motor vehicles was a customs duty; and, if so, whether it was intended to put a corresponding excise duty upon Scottish paraffin spirit and upon British coal-tar benzene, and any other home-made spirit capable of being used for motor vehicles. Mr. Lloyd George replied that the duty on imported motor spirit was a customs duty, and there would be a corresponding excise duty. Mr. Lonsdale inquired whether the right hon. gentleman would name the products which were comprised within the term "petrol," for the purposes of the new taxation. Mr. Lloyd George, however, said he did not think it was desirable that he should make a statement on the subject until the Finance Bill was in the hands of the House.

Action of Impure Surface Water on Lead Pipes.—According to an abstract of an article by Herr Z. Aschoff in the "Journal of the Society of Chemical Industry," the author has recently examined a lead water-pipe which had lain for some fifteen years in a sandy clay soil. The outside of the pipe was very corroded, and yielded considerable quantities of lead, chlorine, nitric acid, and traces of ammonia when treated with hot water. The surrounding soil had a feeble alkaline reaction, was saturated with impure surface water, and contained appreciable quantities of lead derived from the pipe. While most of the compounds formed by the action of the wet soil on the lead pipe were soluble, and were consequently removed as the water percolated slowly through the soil, some lead carbonate was present on the pipe. The author considers that where it is necessary to employ lead pipes in such soils, the pipes should be coated with asphalt.

Incandescent Light for the Eyes.—The effect upon the eyes of prolonged work with artificial light of too great intensity, is discussed in a paper by Dr. Terrien in the "Journal de Medicine Interne." He finds that incandescent gas light and electric light are both liable to produce erythropsy, photophobia, and even temporary abolition of vision. These effects he attributes to the action of the ultra-violet rays upon the eye. He divides the different artificial lights into three classes, according to the proportion of ultra-violet rays they transmit. The first class comprises the candle and oil lamp, and are very poor in actinic rays. The second class includes petrol and gas (except with incandescent mantles); and the third class comprises all varieties of incandescent lamps, acetylene, and electric. From a hygienic point of view for the eye, the oil lamp is, the author considers, by far the most suitable; but he thinks that means can be adopted to annul the evil effects of the more modern forms of artificial light. He proposes that electric bulbs should be tinted a light yellow, and suggests that slightly yellow-tinted glasses mounted in pince-nez or spectacles should also be worn by those who are compelled to do prolonged near-work by the artificial lights named.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 470.)

THE Stock Exchange has had an active and lively week—almost like the old times revived—and, what with the settlement of a fairly heavy account, and with a considerable impetus in new business, members could not complain of time hanging on their hands. Pretty well every department came out better at the end; and conspicuous among the rest was the South African Market. The cheerful tone, with rising prices, characterized the opening day, but was not universal, as it failed to reach Consols and their class. On Tuesday, there was some hesitation at first, and prices were rather uncertain; but confidence gained ground, and a general advance ensued. Wednesday was quite cheerful. A happy factor in the gilded market was the popularity of the London County Council loan. All the best lines were higher; and some not of the best participated. On Thursday, the satisfactory settlement afforded gratification; cheerfulness continued to rule; and Consols continued to rise. On Friday (so often a day of realizing counteraction), the upward movement proceeded merrily. Consols rose $\frac{3}{4}$; and strength was apparent in the Foreign Market, Home Rails, and others. Business fell quite quiet on Saturday; but there was no reaction, and prices in general held on firmly. In the Money Market there was a strong demand, mainly for the Stock Exchange settlement and the London County Council loan, which stiffened rates in the mid-week. Discount quotations were on parallel lines. Business in the Gas Market was rather quieter than in the week before; but the general tendency was excellent, and a large number of quotations had further advances. At the Mart, on Tuesday, several parcels of Suburban and Provincial shares were offered and taken at good prices. In Gaslight and Coke issues, the ordinary was quieter and wholly unchanged, marking (as in the previous week) 103 to 103 $\frac{3}{4}$. In the secured issues, the maximum was done at 88 $\frac{1}{2}$ and 88 $\frac{1}{2}$; the preference at from 105 special to 105 $\frac{3}{4}$; and the debenture at 85 $\frac{1}{2}$ and 86. South Metropolitan was steady at from 123 to 124 $\frac{1}{4}$; but one transaction was noted as being done at 122 $\frac{1}{2}$. The debenture fetched 86. In Commercials, there were only two or three transactions in the 4 per cent. at from 108 $\frac{1}{4}$ to 109. In the Suburban and Provincial group, British realized 43 and 43 $\frac{1}{4}$, Ilford "A" 136, Tottenham "B" 111 $\frac{1}{2}$, ditto debentures 101 $\frac{1}{2}$, South Suburban 121 $\frac{1}{2}$, Wandsworth "B" 140 $\frac{1}{2}$, and West Ham 120 $\frac{1}{2}$. In the Continental companies, Imperial changed hands at from 186 $\frac{1}{2}$ to 188, *cum div.*, and from 182 $\frac{1}{2}$ to 183 $\frac{1}{2}$ *ex div.*, ditto debenture at from 95 $\frac{1}{2}$ to 96 $\frac{1}{2}$, Union at 100 $\frac{1}{4}$, ditto preference at 140 and 140 $\frac{1}{2}$, European fully-paid at 24, and ditto part-paid at 18 and 18 $\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres marked 13 $\frac{1}{2}$ and 13 $\frac{3}{4}$, Cape Town preference from 5 $\frac{1}{4}$ to 5 $\frac{3}{4}$, Monte Video 12 $\frac{1}{2}$, Primitiva preference 53 $\frac{1}{2}$ to 51 $\frac{5}{8}$, River Plate 14 $\frac{1}{4}$ to 14 $\frac{1}{8}$, and San Paulo 13 $\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Electricity Generating Station Chimneys—Domestic Smoke and Cooking by Gas and Electricity—Failures, Electrical and Explanatory—Exaggerations—Reminiscent of the Past—Fallen on Evil Days.

THE London County Council have their eyes on the chimneys of electricity generating stations. They, among other factory shafts, are guilty of belching forth smoke of a deleterious and sulphurous character; but there is something wrong about the colour of the smoke to secure convictions under the present law. This inadequacy of the enactments the Council are contemplating putting an end to in the parliamentary session of 1910. The sources of smoke nuisance in London, except locomotives and domestic chimneys, are subject to the operation of sections 23 and 24 of the Public Health London Act, 1891; but sections 23 and 24 are so crippled by qualifying words, that it is difficult to obtain a conviction under them. The provision that is of real value—section 24b—deals solely with "black" smoke; and this is the only portion of the smoke sections of the Act that is enforced by the majority of the Metropolitan Borough Councils. The limitation of this effective section to "black" smoke is unfortunate, as very frequently smoke of other colour than black is emitted in such volumes as to cause a very serious nuisance, and yet, under the existing law, it is impossible to penalize the offenders. Therefore the Public Control Committee of the County Council think that the extension of section 24b to cover any serious emission of smoke irrespective of colour would be most useful. The recollection has not been dimmed by time of the unsuccessful and costly proceedings in 1907 in connection with the Chelsea electricity generating station of the Underground Railways Company. That case was dismissed, with 300 guineas costs, against the Borough Council who had taken the proceedings; the magistrate stating that it had not been proved to his satisfaction that the smoke the subject of the summons was "black" smoke. Some of the electric lighting corporations contend they are exempt from penalties for smoke nuisance, as the nuisance arises in connection with the discharge of their statutory obligations. The plea has never yet held good in the case of statutory gas-works. Some electricity undertakers, when applying to Parliament for new powers, have endeavoured to obtain relief from the existing law

relating to this particular form of nuisance. There is no reason why such exemption should be granted. Only recently the Public Control Committee have had under consideration a serious nuisance arising from the electricity works of the Stepney Borough Council; and they think it would be well if the County Council had power to act in such a case. Hence the suggested amendment of the law. In a reference to the domestic smoke nuisance, with which it is not proposed to deal at present, the Committee look hopefully to a large reduction of smoke from private houses through the growing use of gas and electricity for heating and cooking. They mention that it has been found that nearly half-a-million gas cooking stoves are now in use in London, and that the use is steadily increasing. If the Committee had said the number of gas-cookers on hire from the three London Companies is nearly 650,000, they would have been closer to the mark. But in their report they leave out something important—that is the number of electric cooking stoves and ranges on hire in the Metropolitan area. It is hoped the omission will be repaired.

Misfortunes rarely come singly—the Hastings Electricity Department are in full agreement with this. The financial results of their recent trading are generally contrary to what is desired; extensions of the distribution system are made, and they turn out unprofitable; proposals are put forward, without any due regard for the tenth commandment, to convert gas-lamps to electric lamps, and the Local Government Board refuse to grant the necessary loan. And, in the midst of it all, there have been two failures of the lighting in the town. Both occurred on Thursdays—the Thursday preceding Good Friday, and the first Thursday in this month. It was most unfortunate that these mishaps should have coincided with the raising of the price of the current; and business people—especially hotel and boarding-house keepers—must have been considering, with anything but pleasurable feelings, the irony of circumstances that compel them to pay more for a light that is so unreliable, and occasions them so much inconvenience, anxiety, and loss. Of course, the Electrical Engineer of Hastings is only human. He cannot help these breakdowns; and no electrical engineer has yet been born who can prevent them. According to a statement in the Council, it was a main cable that fused and gave Hastings its latest electrical excitement. It was something of the same kind of thing that occurred at Belfast on April 13, and caused a breakdown there. But about the failure at Hastings, there were other interesting incidents accompanying it, according to Alderman Tree. But we refuse to be responsible for the accuracy of the aldermanic narrative, and so reproduce Mr. Tree's reported utterances: "The previous evening he met Mr. Ferguson about a quarter past ten. He informed him that the main cables had fused; and they had not been able to find out where it was. Mr. Ferguson had taken him to the chamber at the Hospital. They had found it full of sulphur; and from a portion of the plant flames were coming out. These were put out by throwing sand over them. There was a certain amount of plant very seriously damaged. Mr. Ferguson said several other boxes and transformers had fused; and it was impossible for him then to find out where it was. As a result, he had to go back to the first box from the works; and go on until eventually he found where the damage and breakdown had occurred." Fortunately, the people of Hastings are used to all sorts of complications in connection with the electricity supply; so they have not been surprised by the Alderman's explanation.

"The exaggerations of the gas interests really beggars description," says the "Electrical Contractor;" and accompanying this exhibition of a want of courtesy are such unkind expressions as "gas nonsense" and "absurd"—the last-named expression occurring twice in one line. As an interesting exercise our little monthly contemporary corrects some figures favourable to gas that were published recently, and "gives an honest comparison of the costs of electricity and gas." An interesting exercise will be to correct our contemporary's figures, and test the honesty of the statements.

"Electrical Contractor's" Figures.

ELECTRICITY.		GAS.	
30-c.p. Osram for 1000 hours consumes	33	30-c.p. inverted burner for 1000 hours consumes	4000 c.f.
units at 6d.	16 6	5 mantles at 4½d.	1 10½
Osram lamp	2 6	Matches	6
Six months' decoration . .	6 0	Six months' decoration . .	15 0
	£1 5 0		£1 17 4½

The first table we should correct by adopting 37½ units for a 30 Hefner unit Osram lamp for 1000 hours' use. But the most serious objections refer to the table dealing with gas. The "Electrical Contractor" has never met with a genuine 30-candle power inverted gas-burner which, giving such a light, consumes less than 4 cubic feet an hour—that is to say, the efficiency is only 7½ candles per cubic foot of gas consumed per hour! We shall, without permission, regard this as "nonsense" and "absurd" until the "Electrical Contractor" is able to show us the inverted burner giving only 30-candle power that will pass 4 cubic feet of gas per hour. The 4 cubic feet meanwhile we reduce to 1½ cubic feet; and the charge for gas should be (say) 2s. 6d. to 3s. Let us say 3s., and not 5s. Then, with great magnanimity, our contemporary says: "We will also credit the inverted mantle with a life of 300 hours, keeping in mind, of course, the necessity for maintaining a genuine 30-candle power light." After this display of generosity, it will be seen that the "Electrical Contractor" charges

up "five" mantles and not 3½ in the calculation, which 3½ on the average is too high. Then as to matches. Awfully extravagant this "Electrical Contractor" calculator! He must not play with matches. He suggests by the 6d. the lighting up of the inverted burner about twice every hour in the 1000, instead of keeping it in use (say) on an average something like three hours at a time. In a dozen ordinary safety-match boxes, purchasable at 1½d. or 2d., there are about 600 matches, so we will put down a 1d. for matches for the 1000 hours' lighting, which will allow us to light up the burner 300 times or upwards in the 1000 hours. Finally, we will adopt 6s. for cleaning in both cases. Then we got the following revision of the honest comparisons:

ELECTRICITY.		GAS.	
30-c.p. Osram for 1000 hours consumes	37½	30-c.p. inverted burner for 1000 hours consumes	1500
units at 6d.	18 9	c. ft. at 3s. per 1000 c. ft.	4 6
Osram lamp	2 6	3 mantles at 4½d.	1 1½
Six months' decoration . .	6 0	Matches	0 1
		Six months' decoration . .	6 0
	£1 7 3		11 8½

Even 6s. damage from a 30-candle power inverted lamp after 1000 hours' use is ridiculous. Redecoration is as necessary from sanitary reasons in the case of electricity as in that of gas; so that, if this cost be omitted, we get for the 30-candle power electric lamp an expense of £1 1s. 3d., against 5s. 8½d. for a 30-candle inverted gas lamp. The calculator of our contemporary in our —of course, disinterested—judgment is not so immaculate as he paints himself.

A reminder is given of the days when electric lighting schemes were as thick as the grapes on a fruitful vine. In those days schemes were boldly put forward, and estimates made by electricians as to profits which, alas! in a large percentage of cases, have not worked out as predicted. Southgate is agitated as to what shall be done in the matter of a supply of electricity in their area. The District Council are the owners of an Electric Lighting Provisional Order; and they are so satisfied with the arrangements they have made with the two Gas Companies in the district, and do not like the speculative aspect of electricity supply in their purely residential area, that they are averse to putting down a generating station of their own, or taking electricity in bulk from the North Metropolitan Electric Supply Company. They have therefore entered into an agreement for the transfer of their powers to the North Metropolitan Company. Then enters Mr. Spencer Hawes, a resident, and an electrical engineer of (we will not dispute the local newspaper's estimate) high repute. In the goodness of his heart, Mr. Hawes tenders some free advice to his fellow householders in Southgate. He prefers that the Council should take electricity in bulk, distribute it, and run the business. His computation of the profitable effect works out quite in the correct fashion of the penny novelette. If 400 householders in Southgate kindly consent to have their houses wired and take 132,000 units per annum at 5d. per unit, if 65 shops kindly agree to consume 47,000 units at 4½d. per unit, and if for power, heat, and other purposes 15,000 units are used at 2d., making a total consumption of 195,000 units out of 242,000 units purchased by the Council (allowing about 25 per cent. loss in distribution), well then there should be on the transaction a surplus of £500. There is far too much "if" about this; and there is not sufficient margin in the calculations and prospects in Southgate for safety. But, says Mr. Hawes, see what Rugby has done! It had a surplus of £362 last year! But Mr. Hawes we believe has intimate knowledge of the "Electrical Times" tables; and we reply, See what 79 of the electric undertakings have done whose figures for their last financial years are included in those tables. They have made deficits. In every case, we have no doubt, the owners of the undertakings were told by "eminent electrical engineers" that, if so and so occurred, there would be a profit. The necessary conditions have not been fulfilled, and prognostications have been falsified. Then it will interest the Harrow Gas Company to know that at Harrow "there is a successful Electric Light Company, gas is 3s. 6d., and electricity is popular for lighting, and gas is taken for cooking." This is merely a picturesque way of putting the matter. Of course gas is used for cooking where electric lighting is employed; but the use of gas for lighting has also been increasing by leaps and bounds in Harrow, despite the efforts of the Company in which Mr. Hawes is concerned.

The Reading Electric Supply Company, Limited, have fallen on evil days. They are only representative of many other electricity undertakings in the country that have not such opportunities as certain favoured west-end London Companies, Glasgow, Edinburgh, Liverpool, and other large Corporations, and the Newc—no, we must at present also exclude the at one-time paragon of electric power companies. Reading has long held interest for us, as it was one of the earliest of the provincial companies to try to build up their fortunes by maligning gas in circulated literature, which spoke of its supposed fearful poisonous qualities. The gas consumers of Reading still live; and gas has since been installed in several places where the electric light found temporary abode; the shareholders in the Gas Company continue to enjoy reasonable dividends, and have the felicity of seeing their business increasing. To-day the Electric Supply Company's capital account is overspent by £20,353, the balance of the reserve fund has been completely absorbed, no dividend can be paid owing to the financial condition of the undertaking, and the Directors have been working without fees since some time in 1907. The capital expended now stands at £167,778; the total issued

capital amounts to £147,425—showing the £20,353 overspent, though of the authorized capital there is only £2575 remaining to be issued. On this large expenditure of capital, only £3300 was set aside from revenue for depreciation last year, which represents an equated life of fifty years for the whole of the subjects on which there has been capital expenditure; whereas, if we deduct the £834 spent on land, the £23,685 on buildings, the £3823 representing the cost of the Licence, Provisional Order, &c., and the £403 expended on office furniture, &c., all the rest of the capital of £167,778 stands for subjects to which expert opinion allocates a useful life (according to subject) of not much more than thirty down to five years. It is not found that compensation is made for this small allowance for depreciation by large expenditure on repairs, maintenance, and renewals. Some of the amounts so spent seem absolutely trivial; and they give one the impression that there has been the smallest possible amount of work done in this direction to save the face of the revenue account. Of course, we cannot judge from the printed figures; but perhaps some of the repairs and maintenance has found harbourage in the capital account. This is not stated as a fact, but is merely a suggestion, as the items in the revenue account seem so remarkably low.

But with all the obvious shaving down of expenditure, with a revenue of £15,438, the balance (deducting the contribution to depreciation) of the net revenue account is only £4509. Carrying this and the balance of £700 at reserve to the net revenue account, there is a balance of £4830. But £4231 of this is to be utilized in wiping off part of £7231 standing in the capital account as representing discarded gas-producer plant, which was adopted on the advice of the Company's late Engineer. The anticipations originally formed as to the working of this plant have not been realized; and the late Engineer has to bear the blame. There will still be £3000 outstanding in respect of this plant, pending its sale. But the plant is not the real cause of the Company's want of commercial success. The new metallic filament lamps, the Directors say, have caused a "considerable diminution of the Company's profits;" and yet the number of units sold last year shows an increase of 67,337 on the previous year, and the increase of 1907 over 1906 was 50,282 units. Putting these statements together, they suggest that, as there was a considerable decrease of profits, the increased number of units sold must have been at prices much below lighting rates. We venture to say, too, that changes from electricity to gas have also caused a shrinkage of business of the more profitable kind. Taking this trend of trading affairs into consideration, the overspent capital account, the small spendings on repairs, maintenance, and renewals, the non-payment of Directors' fees, and the (in our view) comparatively small amount set aside for depreciation—well, were we shareholders in the concern, it would not be with delight and confidence that the future would be surveyed. The report of the Directors is dated April 23; the meeting of shareholders was only held on Friday last; and the accounts dealt with the position of affairs to Dec. 31 last! The delay can be appreciated.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
May 10	Previously acknowledged	9216	18	7
„ 11	James Braddock, Radcliffe		2	2 0
	Harold E. Riley, St. Austell.		0	10 6
	St. Austell Gas Company		1	1 0
	James M'Leod, Greenock		1	0 0
	Romford Gas Company		3	3 0
„ 13	W. F. Cotton, Dublin		10	10 0
„ 17	Gloucester Gas Company.		26	5 0
	Lawrence Hislop, Uddingston		2	2 0
	Alexander Waddell, Dunfermline		1	1 0
	Total	£9264	13	1

Gas v. Electricity for Secondary Schools.—In the course of a paper read before the Society of Architects last Thursday, by Mr. G. T. Forrest, Architect to the Northumberland Education Committee, on "Present Methods of Planning and Equipment," the author discussed the question of lighting, and said that up till quite recently it was surprising how relatively small an amount of consideration had been given to the problem of artificial illumination in schools. During the past nine years, he had had occasion to visit and report upon a great many schools of different types; and he regretted to have to state that the misapplication of artificial light was everywhere apparent, and this represented actual waste. Now, however, the competitive development of gas and electricity was steadily educating the architect to a higher standard of artificial illumination. This standard was the outcome of steady development of efficiency in the illuminants themselves, as well as in methods of their application. The general question as to whether gas or electricity was the more suitable illuminant for a school was a large one; but after careful study and inquiry he had come to the conclusion that incandescent gas was the better of the two illuminants, and a safer one for pupils' eyes.

PERSONAL.

Mr. A. DENFORD, of the Weymouth Consumers' Gas Company, has been appointed to the position of Maintenance Inspector to the Staines and Egham Gas Company, which was advertised in the "JOURNAL" recently. There were about 150 applications for the post.

At a meeting of the Directors of the Crewkerne Gas Company on Monday of last week, applications for the post of Manager and Secretary, in succession to the late Mr. John Nicholls, were considered. Mr. H. WILKINSON, of the Yeovil Gas-Works, was unanimously appointed to the position.

Mr. C. E. ROSEVEAR, of the Gaslight and Coke Company, has obtained the appointment of Distribution Superintendent to the Hythe and Sandgate Gas Company, applications for which were recently invited in the advertisement pages of the "JOURNAL." Mr. Rosevear has passed several examinations; the most important certificates, &c., held by him being the Regent Street Polytechnic and City and Guilds of London first-class passes, and a London County Council Scholarship for Gas Engineering.

OBITUARY.

After having been for some time in failing health, Mr. W. MORRIS, the Gas Manager to the Maryport Urban District Council, died last Sunday week. Deceased, who was about 62 years of age, leaves a widow and family of seven.

The death took place at Turriff, Aberdeenshire, on Wednesday last, of Mr. JOHN HUTCHEON, Provost of the burgh. Mr. Hutcheon was Chairman of the Turriff Gaslight Company, Limited, for many years. In 1865, he was elected Chief Magistrate of the burgh; and with two short breaks he had held the office since—his occupancy of the civic chair extending over the long period of about forty years.

The death took place last Thursday of Mr. JOHN WILLIAM SUTHERLAND, aged 69 years, the Secretary of the Sunderland and South Shields Water Company, to which position he was appointed in 1877. Mr. Sutherland completed, on Dec. 31 last, fifty years' service with the Company; and at the annual meeting in February he was presented by the Chairman (Mr. R. H. Gayner) with a silver salver, suitably inscribed, in commemoration of the occasion, and as an expression of the goodwill and esteem of those whom he had so long and faithfully served. The interment was fixed to take place yesterday at Bishopwearmouth Cemetery.

Association of Gas and Water Engineers of Austria-Hungary.

The programme of the annual general meeting (the 28th) of this Association, which, as already announced, is to be held at Grätz on the 20th to the 23rd inst., has now been issued. The proceedings will open with a reception and military concert on Thursday evening. The technical proceedings will commence on the following morning with the inaugural address of the President of the Association, Herr Joseph Anzböck, Chief Inspector of the Imperial Continental Gas Association's works at Vienna. The rest of the morning will be devoted to the reading of the papers dealing with gas supply—viz.:

- (1) "Modern Photometry," by Professor H. Strache, of Vienna.
- (2) "The Inclined Carbonizing Chambers at the Municipal Gas-Works at Vienna," by Herr F. Bössner, of Vienna.
- (3) "The Rental System of the Gas-Works at Innsbruck," by Herr Oswald Peischer, the Manager of the Works.
- (4) "The Use of Gas for Heating, Cooking, and Industrial Purposes," by Herr J. Häusler, of Vienna.
- (5) "Notes on a New Electric Distance Lighter for Gas-Lamps," by Herr Friedrich Lux, of Ludwigshafen.

In the afternoon a visit will be paid to the gas and electricity works of Grätz; and in the evening those attending the meeting will be entertained by the Vienna Gas Industry Society. On Saturday, the morning will be devoted to the election of officers and other private business and to the reading of the following papers:

- (1) "Preliminary Studies on the Quality of Underground Water," by Herr H. Adolf, of Vienna.
- (2) "Advances in Inverted Lighting, with Special Reference to High-Pressure Gas and High-Pressure Air Intensifying Lamps, and New Standards and Supports," by Herr Max Scholz, of Berlin.
- (3) "Street Lighting with Lofty Gas-Lamps and the Standards, Brackets, &c., required for the Same," by Herr H. Wunderlich, of Carlsbad.
- (4) "Ignition of Gas by Means of Metallic Cerium," by Herr H. Wunderlich, of Carlsbad.
- (5) "Complete Removal by Washing of Sulphuretted Hydrogen from Coal Gas with Recovery of the Whole of the Sulphur in the Lump Condition," by Herr Walter Feld, of Zehlendorf, near Berlin.

In the afternoon a visit will be paid to the new water-works of the town of Grätz, at Andritz; and in the evening there will be a banquet. On Sunday, an excursion will be made to Peggau. There will be a small exhibition of gas apparatus in a room adjoining the hall in which the meetings will be held.

NOTES FROM WESTMINSTER.

THE most important happening last week was the floating off again of the stranded Gaslight and Coke Bill, by Mr. William Thorne withdrawing the motion he had tabled. More has been heard of the question of gas profits and free gas in connection with the Oldham Corporation Bill; and the indications of the previous week have come to pass. The Harrogate Gas Bill which was hung up for a few days by the delay in the receipt by the Unopposed Bills Committee of the Home Office report, has now passed from the review of that Committee, with a clause inserted for the protection of persons in premises in which power gas is used; and, by the exclusion from the Bill of the words "in the case of any fittings which the Company may let on hire after the passing of this Act," the whole of the fittings of the Company on hire will be exempt from distraint when marked, whether or not they were let on hire before or after the passing of the Act. The Wells Gas Bill has been before the Unopposed Bills Committee; and, after hearing the Parliamentary Agent and Mr. Corbet Woodall, the Committee ordered it to be reported. The Glamorgan Water Board Bill has been creating a large amount of local interest. It was before a House of Commons Committee during the week, and up to the time of going to press was still under consideration. Further attention will be given to it in the "Notes" on the Committee's decision being delivered.

Oldham Profits and Free Gas.

By Wednesday last, the Local Legislation Committee were prepared to take up the gas and water clauses of the Oldham Corporation Bill. From what was stated last week, readers will have gathered that the Committee had given a decision unfavourable to the Corporation and favourable to the outside authorities and the consumers generally, respecting water profits and the use of water free in the borough; and it was also intimated that an agreement with the opponents, on much the same lines in respect of gas, had been arrived at by the Corporation. The new clause affecting these matters in respect of water supply somewhat, though not in any essential particular, modifies the decision of the Committee; but the intention of the Committee stands, so that we need not go into the details. With regard to the gas undertaking, provision has been made for the borough fund to have a sort of perpetual annuity of £7500 from the gas profits; a reserve fund is provided for, up to the usual one-tenth; and the surplus revenue is to be used, as there is sufficient for the purpose, for the reduction of the price of gas. The free supply of gas for public purposes is to be discontinued; and payment for it, equally by Corporation and outside authorities, is to be not more than 10 per cent. below the price to private consumers. The definite limitation of profit available for the borough fund represents about the amount the Corporation were able to save, out of the former limitation of 6 per cent. on capital, after meeting from the amount the obligations specified in their 1886 Act. But what the consumers really gain is the value of the much-debated free gas for public purposes, the worth of which was between £7000 and £8000. Payment for the gas used for public purposes will add so much more to the surplus disposable for reduction of price. Justice has been done to the consumers. There was some little discussion on the proposed new gas-works, and the estimates for them in connection with which Mr. William Newbigging, Mr. Arthur Andrew (General Manager of the Department), and Mr. Tim Duxbury (Corporation Gas Engineer) gave evidence. The periods of borrowing were fixed by the Committee at thirty years for the gas storage works, boundary wall, and distributing mains, and ten years for stoves and meters. The questions of the profits and the rates and free gas receive notice in a leaderette in another column.

Water Bills.

There was a large amount of opposition when the Bill of the South Staffordshire Water-Works Company recently came before Lord Ribblesdale's Committee; but in the Chairman of the Company (Mr. Charles G. Beale), who is also Chairman of the Birmingham Corporation Water Committee, and in the Engineer of the Company (Mr. H. Ashton Hill), are men who, while not averse to fighting in the protection of the interests under their care, are equally capable of taking a fair view of the interests of others. So it came to pass that piecemeal as the proceedings went forward, opponent after opponent was dropped by the way satisfied with agreed concession, until, when the Committee came to consider their judgment, there was comparatively little hostility remaining. The Company supply an extensive area; and are constantly on the look-out for more water to supply to their enlarging population. They want to construct a new well and other works now; but of equal importance, so far as this Bill goes, they desire to put themselves right in the sight of the law. The Frimley and Farnborough case has opened the eyes of many water authorities to the perilous position they occupy through a misconception of their powers. For many years water purveyors have been under the impression that, when they obtained parliamentary powers to acquire land by agreement to execute specific works, they could use the land for the purpose of sinking wells. Owing to frequent disputes, Parliament has the last few years inserted a special clause in Bills, providing that, where land is acquired, it should not be utilized for the purpose of taking water without express authority. The South Staffordshire Company have for years carried out constructional work, including wells, on land that Parliament has authorized them to acquire; but having regard to the decision in the Frimley

case, they now ask in this Bill for confirmation of these works. The opponents suggested that pumping in the unauthorized districts had done an infinity of harm to the agricultural interests; and that the proposed new well would cause depletion of the water supply in the area in which it is to be situated. All through, willingness to act fairly was seen to be characteristic of the promoters. For example, in the course of the proceedings (which lasted some days), they conceded a clause to the effect that, if it could be proved that pumping by the Company in any situation authorized or confirmed by the Bill, caused any diminution of the water supply from any existing well, at or after the date when the pumping commenced, they should, at the request of the owner, afford him an additional supply, and in the event of any deepening increasing the cost to the owner of obtaining a supply, the Company would pay the amount of the increase. It was not astonishing after what had happened in the way of conciliatory negotiation, that the Committee should, in the result, have found the preamble of the Bill proved. To the Staffordshire and Worcestershire Canal Company, they gave the Wolverhampton clause, with an amendment providing that the Company should not be called upon to make good any subsidence or injury, but only injuries shown to be due to their operations. It was also agreed that the onus of showing the nature and extent of any damage caused by leakage should rest upon the Canal Company.

There was no discussion before Lord Ribblesdale's Committee on the gas section of the Pontypool Gas and Water Company's Bill; and as a matter of fact, there was, as the Committee agreed, really no occasion for discussion on the water section of the measure. The Company had arrived at terms on all points with the three local authorities in whose district they operate; but the Monmouthshire County Council stepped in, and asked for unreasonable obligations to be fixed upon the Company—obligations that would have been contrary to the interests of the majority of the consumers. The Company are doing, and have arranged to do, all that can reasonably be asked of them in the matter of filtration; but the County Council wanted a clause put in giving them the right to have the questions of quality and filtration submitted to arbitration. They also desired that the pressure of the supply, where the pressure could be increased to supply at high altitudes at reasonable cost, should also be determined by arbitration. There is no precedent for the operations of a company being placed by Parliament under unknown conditions of this kind. The district is such an undulating one, that it would be anything but an economical proceeding to put the Company under the necessity at all times to send a supply of water to the tops of the houses situated at the highest parts of the district. The directions in an Act of Parliament are usually of a more specific nature. The simple declaration of the Committee that the preamble was passed, is sufficient proof that the County Council, in view of the action taken by the local authorities, had no grounds for intervening, and that their requests were unreasonable.

Gas-Firing for Pottery-Kilns.

A meeting of the English Ceramic Society was held recently at Longton, when Mr. M. Cowper-Smith, of Tunbridge Wells, read a paper on "A New Type of Furnace for Pottery Firing." He said he was aware that the idea of firing by gas had been tried for pottery, with, in most cases, he believed, very poor results. Nevertheless, he was fully convinced that the task was not by any means a hopeless one. He thought the conditions which obtained in ovens for firing pottery might be exactly copied, or even improved upon, by having ovens fired on the regenerator principle. The claims for the regenerator system, briefly, were: (1) There was a saving of 40 per cent. over the direct-fired system in fuel consumption; (2) the heat was generated where it was required, and the furnace was therefore cooler; (3) the heat could be regulated more exactly, and a more even heat maintained throughout the setting; (4) less loss of radiation, as the furnace proper contained a smaller body of fuel at a much lower temperature than in direct fires, and the smaller body of fuel required the combustion of a much less part of itself to maintain it in an incandescent state; and (5) less air was required by 50 per cent., and therefore less chimney draught was necessary, and less heat was lost up the chimney. Mr. Cowper-Smith described the regenerative setting used at gas-works for the carbonization of coal, and raised a question whether an adaptation of this would not be suitable for firing ceramic ware. The oven proposed was of a single, intermittent type. Economy would result from the chimney gases being brought into contact with the inflowing air, thus raising it to a high temperature before it was led to the place of combustion. The author pointed to the social advantages of a smokeless furnace, and suggested that arrangements might be made to have experiments carried out on the lines indicated. The experiments would not be costly, and might lead to a saving in fuel accounts of about 40 per cent. A discussion followed; and the author was heartily thanked for his paper.

It is stated that the Messina earthquake had no effect on the reinforced concrete buildings at Favelloni, in Calabria, though other structures in their vicinity were injured. These buildings were put up after the earthquake of 1905, which also had destructive results in the neighbourhood.

AT REDHILL AND AMONG SURREY HILLS.

GLORIOUS weather favoured the members of the Southern District Association of Gas Engineers and Managers last Thursday. It was the day of their May outing; and the programme comprised the visiting of their President (Mr. James Paterson) at the scene of his daily labours at Redhill, and subsequently a drive through the most exquisite of Nature's beauties gracing this part of Surrey.

A SINGLE ITEM OF BUSINESS.

The trip to Redhill was made both by road and rail—the bulk

of the members leaving the Charing Cross Station of the South-Eastern and Chatham Railway just before eleven o'clock; and Redhill was reached about noon. Immediately on assembling at the works, the Hon. Secretary (Mr. A. F. Browne) called the members together in the Gas Company's Board Room. It was singular that circumstances should have so fallen that this one piece of business should have been transacted so near the last home of Sir George Livesey.

The PRESIDENT observed that it would be remembered that, at the last meeting in March, the Committee put before the members the matter of a contribution from the funds of the Association to the Livesey Memorial Fund. Intimation of the provisional vote, and of the confirming proposition, had been made in the notice convening



General View of the Redhill Gas-Works, from the North.

this meeting; and they had now to formally pass a resolution empowering the contribution to the fund. He therefore moved—"That, as duly notified in the circular summoning this meeting, the provisional vote of members at the March meeting to contribute forty guineas to the Sir George Livesey Memorial Fund be now confirmed."

Mr. J. W. HELPS (Croydon) seconded the motion; and it was at once unanimously carried.

INSPECTION OF THE WORKS.

This necessary item of business having been transacted, the members at once commenced their inspection of the works. But we must not proceed without a deserved acknowledgment. A compliment was paid to the President, and the members sincerely felt honoured, in that the Chairman and the whole of

in parts, as opportunity has permitted. With comparatively small works of this kind, such drastic methods of carrying out change cannot be applied as in works of larger magnitude and with more space at command. As a matter of fact, under conditions such as exist at Redhill, a gas engineer has frequently to exercise greater ingenuity in effecting change and improvement than the engineer of larger works, who is in the enjoyment of more liberty. It might almost be taken as an axiom that in gas-works difficulties expand with the narrowing of limits. Thus it comes about that the condition of the Redhill works presents to the engineer to-day a combination of things modern and somewhat remote; and the arrangement is not as it will ultimately be when progress—with opportunity—is made in the work of modernization and redistribution. Knowing Mr. Paterson and the views of his Directors, this is a very safe assertion to make.

According to a little printed account distributed to the visitors by the President, the works were established in 1860; and the Company's first Act of Parliament was obtained in 1865. The



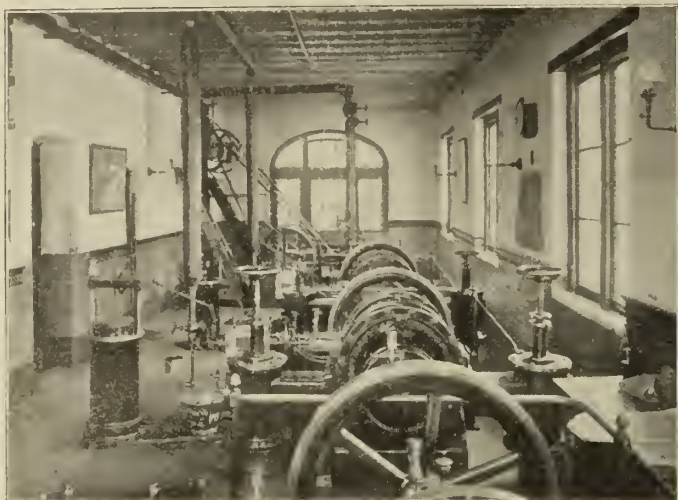
The New Retort-House, from the South.

the Directors of the Gas Company came to greet and receive the visitors. The gentlemen composing the Board are: Mr. G. R. Hunt (Chairman), Mr. W. L. Stenning, Mr. S. Brooks, Mr. W. Oram, Mr. H. Stacey, and Mr. W. H. Burchell. Their presence during the morning proceedings, and their subsequent entertainment were greatly appreciated by their guests. In conducting the visitors round the works, Mr. Paterson was aided by his foreman (Mr. B. L. Welch), Mr. W. H. Peat (pupil), and Mr. W. Norris.

The works were not seen at their best. They have been during the last three years undergoing reorganization and rebuilding



Interior of the New Retort-House.



Engine-Room—Exhausters and Blowing Engines.

works have passed through what may be regarded as the usual stages of demolition and reconstruction. The old retort-house, still in use, was built in the seventies. It is now filled with three double settings of nines, and one double setting of sixes, which were built by Messrs. Winstanley and Co., in the existing arches, in 1900. The retorts are 9 feet long, and are worked with stopped ends. An old direct-fired bench of two double beds of sevens, standing in the coal-store, is now abandoned.

The new retort-house was erected in 1906, and was necessitated by the wearing out of the direct-fired bench, and the gradual growth of the Company's business. The building is of steel framing, modelled on the lines of the new retort-house at Tottenham. The vertical stanchions are cased in brickwork, with half-brick panelling between. The building is 63 feet wide between the webs of the vertical stanchions, and was designed to accommodate whatever type of mechanical stoking might be considered advisable in the future. The floor is of steel troughing, filled with ordinary concrete, and topped with fine granite. The roof is of Somerset tiles. The retort-bench, of a nominal 500,000 cubic feet per day capacity, will accommodate six double settings of sevens, three of which are already erected, and two are at present in use. The whole house and bench can be duplicated towards the north. This, it is estimated, will give, with the proportionate addition of carburetted water-gas plant, the maximum producing capacity of the site. The settings are of a modified Klönne type, and are at present worked with a hydraulic liquor seal and tar-towers, which automatically separate tar and liquor running from the hydraulic main. At the middle of each bridge-pipe is a throttle valve, which is to be used for shutting off the retort when the settings are worked with a dry main.

The members were considerably interested in the new house and settings. There were points about them that attracted notice. Hand charging is still in vogue; the time not having yet arrived when, in the Engineer's view, machinery can be economically applied. The arrangement of tar towers and the automatic separation of the tar and liquor, as it passes from the hydraulic, claimed attention. But the feature that caused general inquiry was the fact that the ascension-pipes are all of one length; so that, the retorts in each setting being at three different levels, the tops of the ascensions are at irregular levels. The arrangement was, we believe, adopted for the purpose of diminishing the trouble from stopped pipes.

The rest of the plant is of the ordinary character, including a "Standard" washer-scrubber, with vertical engine, and ample purifiers, 20 feet square. One of Dr. Colman's "Cyclone" separators was an object of interest. The carburetted water-gas plant (by Messrs. Humphreys and Glasgow) was visited. It is housed in a building adjoining the old retort-house. It consists of two sets, of 275,000 and 300,000 cubic feet per day capacity respectively. The gas is separately condensed, purified, and metered, and mixes with the coal gas at the holder inlets.

There are two gasholders—one, of 300,000 cubic feet capacity at the works, and the second, about a quarter-of-a-mile away, of a capacity of 980,000 cubic feet. The latter was erected in 1901 by Messrs. Samuel Cutler and Sons.

The sulphate plant, of an old type, by Davis, is accommodated in a building near the coal-stores; and this house fixes the limit to which the new retort-house can be extended.

The workshops—comprising carpenters' shop, mechanics and gas-fitters' shop, smithy, and engine-room—are situated on the north side of the yard. An 8 horse-power Crossley gas-engine drives a line of shafting, which is connected to the coke-breaker, forge blower (a discarded exhaustor), grindstone, and lathe. The workshops were inspected; and they show that Mr. Paterson has a preference for his works being self-contained. It was noticed that the workshop buildings and the offices—all situated on a strip of ground on the same side of the works—are built of galvanized iron. The cause is not so much economy, as the fact that the land is the property of the Railway Company; and should they require this piece of ground, the Gas Company would have to give up possession.

LUNCHEON.

From the works the visitors walked to the Market Hall, where they were entertained at luncheon by the Chairman (Mr. G. R. Hunt) and Directors of the Company. The whole of the members of the Board were present, as well as the Mayor of Reigate (Mr. T. Gregory, J.P.). At the top table were also the President and the Hon. Secretary of the Association, and the Senior Vice-President of the Institution of Gas Engineers, Mr. James W. Helps. After lunch,

The CHAIRMAN submitted the toast of "The King."

Mr. S. BROOKS proposed "Success to the Southern District Association of Gas Engineers and Managers." He expressed the extreme pleasure of himself and his colleagues at meeting the members of so valuable an organization as the Southern District Association of Gas Engineers and Managers. He believed this was the first time the members had honoured the Company with their presence in the town. Probably he should not be far out if he attributed their presence now to the fact that the Engineer and Manager of the Redhill Gas Company had been honoured by being elected to the office of President. It was an honour Mr. Paterson fully deserved. In addition to his mental culture, their Gas Manager possessed an accurate theoretical knowledge of the complex business relating to the manufacture and distribution of illuminating gas, as well as a practical knowledge of the methods in use, and of the ways to work economically. With regard to the visit that day, the Directors of the Company did not pretend they had much to show the members. The experience and knowledge of their visitors of the gas-works throughout the country was very great; while it was not a large population the Redhill Gas Company catered for. They did very well, however, for the shareholders and for the consumers. The objects the Association had in view were to maintain the gas industry, to improve its methods, and to carry on the work both economically and efficiently. In these days, they were faced with rivalry—rivalry which presented itself sometimes, he could not help saying, in improper guise—that was to say, municipalities undertook large trading schemes from which they expected, or rather deluded the ratepayers into expecting, large profits—profits which simply went into the pockets of the financial corporations who lent the money. In Reigate, they had suffered from municipal trading in electric light; and the only advantage, or whatever else it might be suitably called, consisted in paying extra rates for the enjoyment of the few. (Laughter.) It was a sorry condition of affairs that those who did not use the electric light should have to pay for those who did. He believed that they would survive this kind of thing, and that out of the evil of municipal trading good would come to private enterprise, by the stopping of such municipal venture. If the trading were undertaken by men who knew about these things, there would not be much objection. However, he strongly expressed his approval of the Association and its proceedings. He for one was quite content to leave technical work in the hands of men professionally equipped for carrying it on. Most heartily, therefore, he proposed success to the Association; and he hoped the welcome of the Chairman and the Board would be accepted in the spirit in which it was extended to the members.

The PRESIDENT, in the course of his response, thanked the Chairman and Directors very cordially, both for himself and the Association, for the toast that had been proposed, and the hearty manner in which it had been presented. He should like to tell his professional colleagues that the words of Mr. Brooks not only echoed his feelings and those of his colleagues at the moment, but they could be applied to the attitude of the Board for as many years as he (Mr. Paterson) had been at Redhill—that was to say, for the last six years. He was pleased indeed to think, and proud to know, that the whole of the Board were present at the luncheon. He was proud, too, to remember on this occasion that, whenever any technical point had been brought up by him at the Board meetings, it had been met by an unflinching kindness. Most of those present knew that at times technical—sometimes financial—difficulties did occur; and personally he was grateful to his Directors for the way in which they received the troubles it was his duty to bring before them. He found it was a desirable thing to bring one's difficulties, as well as one's successes, into the Board room. This was the one way in which success could be achieved. There was one trouble to which he referred in his presidential address, and that was the leakage from the joints of the steel main that he laid some time since. He brought this matter before his Directors, having passed some uncomfortable nights thinking over the matter; and he was astounded and overcome by the way in which his trouble was received. There was nothing but sympathy with, and thought for, their Engineer in his trouble. The loss of gas was put into the background; and the first consideration of the Directors was their Engineer's solicitude for the welfare of the Company. However, he had also to thank the Chairman, Mr. Brooks, and their colleagues for their kind reception. When he (the President) spoke of the visit to the Board some time ago, they received the idea with enthusiasm; and the Association were deeply grateful.

Mr. STENNING said, as gas managers and engineers and directors, they were all equally interested in the success of the districts in which they lived and had their undertakings. All commercial undertakings were more or less governed by their locality. If the locality prospered, the gas company prospered. Though the Redhill Corporation had done things that were detrimental to the interests of the Gas Company, they had done their utmost to popularize the neighbourhood. In their Mayor, they had a gentleman who had graduated successfully in the school of commercial enterprise, and they were glad to think he had come to spend his days of retirement and rest among them. It was to his credit, too, that he had come forward to take up the arduous duties of municipal work. He proposed the toast of "The Mayor and Corporation of Reigate."

The MAYOR (Mr. T. Gregory), in reply, thanked the members for their reception of the toast; and, on behalf of the Corporation and himself, welcomed the Association to the borough. He was proud of the borough and its surroundings. The Corporation had gone into municipal trading, but he did not believe in municipal trading of any sort. There were things that were best left in the hands of private enterprise. The interest of councillors was not the same as the interest of those making the best of a private enterprise. He did not

think that anything in this way could be done as cheaply by corporations as by private concerns.

Mr. J. W. HELPS proposed "Prosperity to the Redhill Gas Company." He remarked that it was with great pleasure he did this, because he had the privilege of knowing some of the Directors. He was sure the members would wish him to, in the first place, say how sincerely they appreciated the honour the Directors had done them in inviting them to Redhill. He was sure the policy of the Gas Company in having good men on the Board, and good men as officers, would receive its reward. His own brother was once the Manager of the Company; and his experience of the Board was precisely that of Mr. Paterson. Under the management of Mr. Paterson, there was nothing but continued progress for the Company.

The CHAIRMAN, in reply, expressed the pleasure it had given him and his colleagues to have the Association with them that day. As a small Company, he thought they did do their best not only for the shareholders but for the consumers. In Mr. Paterson, they were fortunate in having a good practical man; and his election as President of the Association was an honour to the Company.

THROUGH PICTURESQUE COUNTRY.

The members spent the remainder of the afternoon in an enjoyable drive through the picturesque surroundings of the town. Leaving the Market Hall, they followed the main road between Redhill and Reigate, then drove to the top of Reigate Hill, through the uplands of the North Downs, and past the village of Lower Kingswood, then across Walton Heath, passing on one side the village of Walton-on-the-Hill. Going in a southerly direction, the top of Pebble Coombe or Pebble Hill was reached; and ultimately the top of Box Hill. The views *en route* were beautiful; and even at the end of the drive—which was at Burford Bridge Hotel—the scenic charms of the locality, it was found, had not been exhausted. At the hotel, tea was served; and it was welcome, after the drive. Before leaving the table, on the suggestion of Mr. W. E. Price, the members made acknowledgment—as it was richly deserved—of the work of the President and the Hon. Secretary in making the arrangements for the day, in the enjoyment of which there had not been a single flaw. An hour or so was spent in the lovely grounds of the hotel, and then the visitors wended their way to Box Hill Station, from which they were soon homeward bound.

NEW MEDIUM SIZE INVERTED BURNER.

IN arranging for burners for the lighting of a room or any other interior, the chief matter for consideration is the illuminating power at each point of lighting that is most suitable for requirement. There is another matter that needs consideration, and it is that the best artistic effect should be obtained by selecting burners bearing some proportionate relationship with the fittings used. Really there is nothing more grotesque than to see a full-sized inverted burner depending from a small size and slender fitting, or the bijou form of inverted burner attached to a heavy and substantial fitting. There are, for example, many three-branched pendants already in use, too light for three heavy ordinary size inverted lamps, and yet upon which three bijou burners would be insufficient. Effect is lost in disproportion. On the other hand, there are specially designed fittings for both forms of burners. Hence, and for meeting the lighting requirements of many situations, a size of burner (say) midway between the ordinary and the bijou, should command a ready sale, and for domestic use have considerable application. In their series of "Forward" burners, Messrs. Ingram and Kemp, Limited, of Birmingham, have introduced a burner such as is referred to; and we have had an opportunity of seeing its effect (at their London show-rooms, No. 30, Brook Street, Holborn) attached to some of the choice designs of fittings, following the arts of various periods, for which the firm have made a reputation.

This new intermediate size burner consumes about 2 feet of gas an hour, and gives a light of approximately 50 candles. From the constructional point of view, the lamp follows the lines of the previous "Forward" burners as described on Sept. 15 and April 6 last, including mixing-chambers, air and gas regulators, and other features that make for efficiency. The burner is supplied with a fancy hood, with opening on one side only, to protect from discoloration the fitting from which it is suspended. Inside the hood, there is a lining of special white metal, which is not affected by heat or the products of combustion, and therefore there is no inconvenience from any accumulations of deposit. Another point is that the top part of the burner has been designed so that there is no severely apparent junction between burner and fitting—that is to say, there is no sharp outward expansion of the burner from the fitting. The head of the burner is given a gradual ornamental curvature, so that to the eye there is a continuity in design between fitting and burner. Little points make for perfection in art, and therefore in effect. The aim, or rather one of the aims, has been not to allow the burner to detract in any way from fittings of classical type. The "Forward" burner, in the new size, will command attention. It is not quite ready for supply. But samples have been made, so that the effect may be seen upon various types of fittings in the firm's show-rooms. Those who make an inspection will concede that usefulness and effect are tastefully blended.

PHOTOMETRIC UNIT AGREEMENT.

IN forwarding the subjoined memorandum as to photometric units, Dr. R. T. Glazebrook, F.R.S., the Director of the National Physical Laboratory, says: "An important announcement with regard to the photometric units maintained at the Bureau of Standards, America, the Laboratoire Central d'Electricite, Paris, and the National Physical Laboratory, Teddington, has been issued by the Bureau of Standards in their Circular, No. 15, dated April 1, 1909. It was at first intended to make this announcement simultaneously in America, France, and Great Britain; but circumstances prevented this. It is desirable, however, to state authoritatively that the agreement described in the memorandum has been arrived at, and has the approval of the Gas Referees; and that the photometric standards of the National Physical Laboratory are being maintained in accordance with it."

NATIONAL PHYSICAL LABORATORY.

Memorandum as to Photometric Units.

In order to determine as accurately as possible the relations between the photometric units of America, France, Germany, and Great Britain, comparisons have been made at different times during the past few years between the unit of light maintained at the Bureau of Standards, Washington, at the Laboratoire Central d'Electricite, Paris, at the Physikalisch-Technische Reichsanstalt, Berlin, and at the National Physical Laboratory, London.

The unit of light at the Bureau of Standards has been maintained through the medium of a series of incandescent electric lamps, the values of which were originally intended to be in agreement with the British unit; being made 100/88 times the Hefner unit.

The unit of light at the Laboratoire Central is the bougie decimale, which is the twentieth part of the standard defined by the International Conference on Units of 1884, and which is taken, in accordance with the experiments of Violle, as 0.104 of the Carcel lamp.

The unit of light at the Physikalisch-Technische Reichsanstalt is that given by the Hefner lamp burning at normal barometric pressure (76 cm.) in an atmosphere containing 8.8 litres of water vapour per cubic metre.

The unit of light at the National Physical Laboratory is that given by the 10-candle power Harcourt pentane lamp burning at normal barometric pressure (76 cm.) in an atmosphere containing 8 litres of water vapour per cubic metre.

In addition to the direct intercomparison of flame standards carried out recently by the National Laboratories in Europe, one comparison was made in 1906 and two in 1908 between the American and European units by means of carefully-seasoned carbon filament electric standards; and as a result of all the comparisons, the following relationships are established between the above units. The pentane unit has the same value within the errors of experiment as the bougie decimale. It is 1.6 per cent. less than the standard candle of the United States of America, and 1.1 per cent. greater than the Hefner unit.

In order to come into agreement with Great Britain and France, the Bureau of Standards of America proposed to reduce its standard candle by 1.6 per cent., provided that France and Great Britain would unite with America in maintaining the common value constant, and with the approval of other countries would call it the "International Candle." The National Physical Laboratory, London, and the Laboratoire Central d'Electricite, Paris, have agreed to adopt this proposal in respect to the photometric standardization which they undertake; and the date agreed upon for the adoption of the common unit and the change of unit in America is April 1, 1909. The following simple relations will therefore hold after that date:—

Proposed new unit = 1 pentane candle.
 = 1 bougie decimale.
 = 1 American candle.
 = 1.11 Hefner units.
 = 0.104 Carcel unit.

Therefore, 1 Hefner unit = 0.90 of the proposed new unit.

The pentane and other photometric standards in use in America will hereafter be standardized by the Bureau of Standards in terms of the new unit. This, within the limits of experimental error, will bring the photometric units for both gas and electrical industries in America and Great Britain and for the electrical industry in France to a single value; and the Hefner unit will be in the simpler ratio of 9/10 to this international unit.

The proposal to call the common unit of light to be maintained jointly by the National Standardizing Laboratories of America, France, and Great Britain the "International Candle" has been submitted to the International Electrotechnical Commission, and through it to all the countries of the world which are represented on that Commission.

It is hoped that general approval will be secured, and that in the near future the term "International Candle" for the new unit will have official international sanction.

THE SEASON'S NOVELTIES AT JOHN WRIGHT AND CO.'S.

A CHAT with the powers that be in John Wright and Co., always leaves one with the impression of a firm having long views ahead. It is not sufficient to meet the requirements of to-day. Some new demands must be foreseen; others must be created; and all must be catered for. A new trend in any direction must be realized in its earliest beginnings. If the demand for one class of article shows the slightest prospect of falling off either through the supply being sufficient, or the public taste changing, or a newer type coming in, there must be no stopping to "flog a dead horse," still less to lament it. The closing of one door simply means that other two must be quickly opened. "What was good enough for our predecessors is good enough for us," is a stultifying maxim that finds short shrift with manufacturers holding views such as these. So far from entertaining any idea that the last word has been said in the development of gas-consuming apparatus, Messrs. Wright express a breezy confidence that the opportunities of fresh advance were never anything like so great as they are to-day.

Dealing, first of all, with domestic cooking by gas, this has had a long innings; and yet its wide popularity has, until now, been due entirely to the propaganda carried on by the gas authorities and the gas-stove makers, single-handed, without any special help from the building trades, for example. Messrs. Wright are firmly convinced that, in view of the recent great advances in gas-consuming appliances, the dwelling-house of the future ought to have fitted throughout its gas-consuming apparatus for cooking, hot-water supply, and heating, and that not merely in a makeshift fashion, as an afterthought in existing houses, but fitted into new houses designed with special provision for them. With this idea in view, and believing the time has come to claim the attention and co-operation of the building interest, Messrs. Wright have prepared two pamphlets—one entitled "Domestic Heating," appealing to architects on grounds of hygiene and æsthetic progress; the other (which has already been noticed in our columns), "Hints on House-Letting," a persuasive to the building trade from the point of view of utility and economy. The two brochures form part of a series which Messrs. Wright are this season issuing—each making its appeal to a distinct class. There is a pamphlet addressed to medical men, to which reference will be made presently; there is another written for school authorities, with a view to ensuring that the young idea shall be taught not only how to cook, but how to do it by gas. Another of the series is intended for householders generally, and, besides emphasizing the merits of gas for cooking, it makes an outstanding feature of the domestic supply of water heated by gas in conjunction with gas cooking—a direction in which progress has been exceedingly slow, and really serious developments, as yet, very recent and very partial.

While the cooking and hot-water requirements of the householder have been handled in this way, the other great domestic use of gas-heating—viz., for warming purposes—has had special treatment also. The position Messrs. Wright have taken in the designing and perfecting of fresh gas-heating apparatus is a matter of common knowledge; and their further developments in the way of increased laboratory accommodation and chemical staff, give sufficient promise of the further forward movement they at present contemplate.

Yet another aspect of the gas consumption problem has occupied much of Messrs. Wright's thought and effort, particularly in recent times—viz., gas-heated apparatus for various trade and manufacturing purposes. It is true that for many years past a certain amount of apparatus of this kind has been made; but in too many cases this has been done on the old lines of stocking certain apparatus which the public might either buy or leave alone, as they felt disposed. There has been but little vigorous propaganda in recent times to educate manufacturers generally in the usefulness and economy of gas-heated apparatus for their requirements, and, speaking generally, far too little effort to study these requirements and make a complete range of apparatus expressly contrived to meet them. In the comparatively familiar department of hotel cooking apparatus, there seemed ample scope for newer methods, and in other directions fresh outlets had to be thought out and fresh classes of users got at.

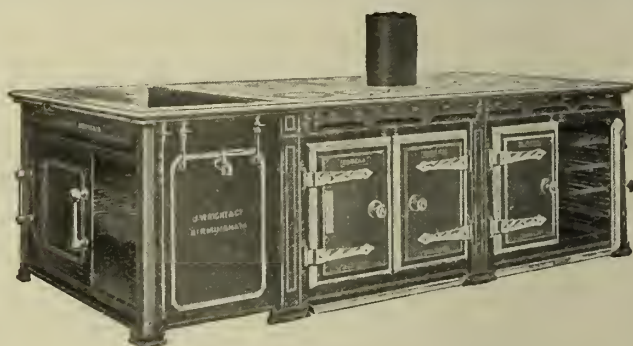
Treating their previously existing range of such apparatus merely as a starting point for their new departure, Messrs. Wright have within the last year or so created an entirely fresh class of plant of this kind, in which a great variety of users have offered to them precisely the kind of apparatus they specially need. Hotels, restaurants, and boarding-houses, for example, are all catered for; but it is recognized that each of these classes has special requirements of its own, and so different appliances are available for each. For hotels and large restaurants there are a variety of carving tables and hot-closets, in which the oldest experience and the newest methods make common cause in producing a range of gas-heating apparatus that will do everything that the best steam-heated appliances can do. They are made in various sizes—from a table that will keep hot a single joint, to an extensive apparatus that will take all the dishes contained in the elaborate bill-of-fare of a modern restaurant. They are all conspicuous for one or another of those little refinements of convenience which commend an apparatus to the enthusiastic appreciation of every chef who prides himself on his business. For example, the bottom plinths both front and back are recessed, so as to give easy access for carver and server.

For hotels, there is also the "Rostrum" roaster and baking oven, in which, by a number of excellent contrivances, the utmost economy of gas is made compatible with the quickest and most



The "Rostrum" Gas-Heated Baking Oven.

complete results. Again, a particularly effective example of what the newer ideas can effect in a large and yet compact form is the "Centaur" gas-heated central range, which has four independently controlled roasting ovens; hot-closet, bain-marie, and hot-



The "Centaur" Central Gas-Cooking Range.

plate, all combined in an apparatus measuring 10 feet by 5 feet and only 3 feet high. All the products of combustion are led into one central flue; and the apparatus can be placed in the middle of the floor with access from every side.



The "Cito" Combined Hotel Griller and Hot Closet on Stand.

Suitable also for hotels, but peculiarly adapted for restaurants, is the "Cito" series of combined grillers and toasters. These

have every modern contrivance for convenient working, and arrangements also for heating the accompanying hot-closet by waste heat from the grill, or, if necessary, utilizing the waste heat for boiling purposes. This apparatus may be had in a range of some half-dozen different forms, and with or without stand or hot-closet. Not only for restaurant purposes but also for clubs, schools, and large works' mess-rooms, the "Cito" is proving itself much in demand.



The "Sector" Carving Table, Bain Marie, and Hot Closet.

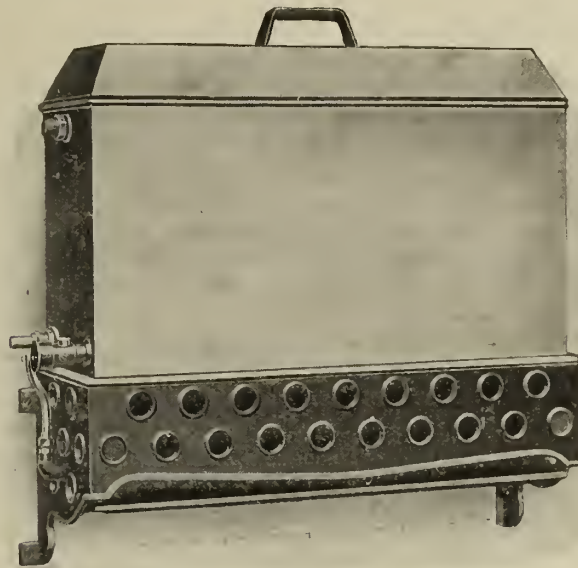
Another apparatus invaluable to restaurateurs is the "Friar." This is an appliance intended for frying fish. The deep cast-iron frying pan fits closely at its rim to the edge of the outer case, which contains the burners; and an ingenious water-lute arrangement all round ensures against the slightest risk of fire and overflow of melted fat on to the burners, and also against the flame or fumes rising to where the food is placed. There are covers to protect the taps against any falling grease; and condensation is provided against.

The innumerable boarding-houses throughout every visitors' resort are in the awkward position of having more cooking to do than ordinary domestic apparatus can cope with, and yet not sufficient to call for the large apparatus used in restaurants and hotels. An apparatus expressly designed for this very large class of consumer is the "Bordo," which has a larger oven and hot-plate than any ordinary domestic gas-cooker, and yet is kept within such moderate dimensions that it may be said to do the extra work without taking up extra room. The smallest size is arranged to cook a dinner for fifty persons. The "Bordo" has all Messrs. Wright's well-known features of removable parts, and entire interchangeability throughout. The oven and hot-plate come apart by undoing a few screws.



Gas-Heated Stock-Pot.

A gas-heated soup-boiler with a flue which carries off both the steam and the products of combustion, and also a gas-heated stock-pot of somewhat smaller dimensions, but similar construction, are also prominent in the new class of goods. These are arranged so as to be fitted up in batteries of any number.



The "Hotwell" Low-Pressure Automatic Boiler.

Many hairdressers' establishments have already appreciated the compactness and usefulness of the "Hotwell"—a gas-heated automatic low-pressure boiler, which, with a minimum of cost, can be connected up to give a continuous supply of hot water through the existing delivery taps. The apparatus has Wright's patent automatic gas-valve, known in connection with other of their apparatus; and by this means the gas consumption is kept at the lowest amount necessary to give water at the desired temperature. The "Hotwell" fixes on a light bracket against the wall. Its boiler is of copper, and the material and construction are such that the apparatus is practically indestructible.

In creating this new range of goods, the requirements of bakers and confectioners have not been overlooked; and it is claimed for the "Victor" gas-heated confectioners' oven that—while as simple and cheap to instal as a coal-oven, and as easily controlled as a steam-oven—it is more economical than either. In searching tests made by a leading confectionery expert in the Midlands, it was found to bake four tiers of pastry quicker and better than the expensive steam-ovens formerly used; and it was equally effective when set to bake two tiers only—every article being simultaneously browned to an equal degree. In the "Victor," the products of combustion do not get inside the oven, but are led all round; and at the same time the design is such that this arrangement, so far from using more gas than otherwise, leads to an actually reduced consumption, compared with many earlier types.



The "King Alfred" Bake-Plate on High Legs.

A further apparatus for bakers' use is a series of bake-plates, either on a low stand or on high legs, intended for baking muffins, crumpets, pikelets, &c.; and when one learns that among the articles it is meant to bake oat-cakes are included, one appreciates the appropriateness of the title given to the apparatus—viz., the "King Alfred." The "King Alfred" is also being used with much acceptance in brass works for lacquering purposes, and by manufacturing tobacconists as a drying plate—the necessary adaptation being made without any extra charge. For brass works and other establishments where japanning is carried on, Messrs. Wright have further improved their well-known series of gas-heated japanning ovens.

USES OF GAS AT WOOLWICH ARSENAL

As Seen by the London and Southern Junior Association.

The last of the visits for the present session of the London and Southern District Junior Gas Association was arranged to take place last Wednesday; and considering that it was a mid-week fixture, there was certainly a very good muster of members. That all those who were able to attend should have done so was not, however, surprising; for the visit was to Woolwich Arsenal, and, in addition to the generally interesting operations that are carried on in this important national establishment, it is well known that extensive use is made of the properties possessed by gas as a heating agent.

It had been explained to the authorities by the Hon. Secretary (Mr. J. G. Clark) that the special object of the Association in desiring to visit the Arsenal was to see the different methods and operations in which gas is employed; and the programme of the afternoon was accordingly drawn up with this object in view. There are probably few people who are not subject to fascination by those engines of destruction upon which, in the never-failing hands of her sons, the British Empire has had in the past, has now, and no doubt will also have in the future, to rely to so great an extent for her safety. And of these few it is pretty safe to hazard that none were to be found among the visitors last Wednesday; for in the course of the tour many a furtive glance was cast in directions which were not included in the itinerary. However, no wandering into bye-paths was allowed by the lynx-eyed cicerones. Gas was what the members had come to see; and gas, they should see. And so they did. Both ordinary coal gas and producer gas they saw harnessed to the needs of man, and performing the hardest of tasks with a smoothness and an efficiency which won universal admiration. But though gas was thus kept ever in the foreground, it was, towards the close of the inspection, shown in connection with operations which appealed to both the professional and the martial instincts of the members. Like the playwright and the novelist, the Arsenal authorities had kept the most striking "situations" until the last. Aware, as everyone connected with the industry is, how much has been done by Mr. A. W. Onslow, the Engineer and Manager of the Arsenal Gas-Works, in the direction of the application of high-pressure gas to manufacturing purposes, the members would no doubt have liked to have made a visit to him personally part of the afternoon's arrangements; but as events proved, a full programme had been mapped out for them, without the inclusion of an inspection of the gas-works.

On arrival, the members were split up into six or seven parties of about ten each; the different groups being distinguished by various letters of the alphabet which were borne along in front of them on the top of poles. This is an excellent method of dividing up a large number of visitors, and ensuring that everyone sees all that is to be shown. Precisely at the hour appointed, the first party (which included the President, Mr. W. J. Liberty) were led off; and they were followed at short intervals by the remaining ones. The route taken was from the main gate, through the brass foundry, the rifle shell factory, the scrap furnace house, the thermal house, the radial crane house, and the west forge, back to the main gate.

In the brass foundry, there are ten regenerative furnaces fired with producer gas, which is passed direct from the producers to the furnaces; while the visitors were next shown coal gas under a pressure of 72 inches, used in a furnace for the thermal treatment of steel. In front of this furnace was a Féry pyrometer, which was recording a temperature of about 970° C.; and this could be increased to 1400° C., if required. Then, again, were seen a series of low-pressure producer gas furnaces which are employed in connection with shell forging. After this, as was only fair, coal gas had another turn—that is to say, in the scrap forge shop. Here there are two horizontal high-pressure coal-gas furnaces, each about 30 feet long and less than 3 feet high, with a row of burners from end to end, which are used for heating iron bars to make springs. In the first of these the gas only is supplied under pressure of about 100 inches; while in the second both gas and air are compressed—mixing in the delivery pipe, and taking in a further supply of air at the furnace. The flame impinges upon the metal, which when ready is drawn out and coiled into springs. Coal gas was also seen employed in the thermal house, where there is a vertical high-pressure furnace, with three rows of three burners and one row of four. This is used for hardening axles. It holds from 6 to 8 cwt. of metal at a time; and can be heated up to a temperature of 800° in an hour.

After this, the members were destined to see further operations carried out by producer gas; and it was in this portion of the visit that the universal interest in both gas and guns could be wholly satisfied at one and the same time. The radial crane house is so called because there is in it a crane which travels from the centre right round the building. This crane in itself is of interest—lifting as it does with the present wire ropes 125 tons, or with chains about 250 tons. The utmost it is now called upon to lift is, however, considerably less than the former of these two weights. There are in this house a dozen and more furnaces fed with producer gas; there being both induced draught and air supplied under a pressure of 15 lbs. to the square inch. In the

largest of these chimney-shaped furnaces there was, at the time of the inspection, a tube for a 12-inch gun, some 53 feet long, and weighing 24 tons, which was being tempered by subjection to a temperature of about 1750° Fahr. The operation was just on the point of completion when the members arrived (the authorities having doubtless thoughtfully timed the arrangements with this object in view); and they saw the crane lift the tube some 20 feet or so, after which the whole front of the furnace was opened, and the tube was shifted from its position, and promptly dropped into a well of rape oil. After this bath, the tubes are again removed to the furnace for annealing. In the case of this particular furnace, the gas comes into contact with the outside of the metal; and all the way up there are doors or dampers which can be opened at will so as to admit air and thus secure the heat at any required point. If the heat is needed only at the top, the air is shut off from the bottom. Some eight or ten hours are occupied in the tempering of such a tube as the one just mentioned. In the same building there is to be seen another type of furnace, in which the flame does not come at all in contact with the metal—thus preventing the possibility of any oxidizing action, beyond the negligible amount which may be caused by the air already in the furnace. These latter are called spiral furnaces, because the flue runs round the side in spiral fashion. With this type of furnace such high temperatures cannot be attained as with the first-named pattern—only from 1300° to 1400° Fahr., as compared with about 2500° Fahr. where the flame impinges directly on the metal. This difference is, of course, accounted for by the brickwork through which, in spiral furnaces, the heat of the gas has to pass before reaching the metal. For the same reason, a much longer time is required to get up heat in them. The temperatures of the furnaces in this house are taken by means of thermo-couples with Roberts-Austin recorders, which give a complete record, half-a-mile away from the furnaces, of every minute of the twenty-four hours. The temperature is recorded from three parts of the furnace—the top, bottom, and centre.

The west forge was the last place to be visited; and here low-pressure producer gas is used in the furnaces. The inner tube of a 9½ inch gun, weighing 14 tons, was lifted by hydraulic apparatus from one of the furnaces, and placed under a hydraulic press capable of working up to 3000 tons, where the members saw the operation of forging carried on.

The parties were then conducted back to the main gate; and everybody left the Arsenal thoroughly pleased with his afternoon's experiences.

Association of Gas Managers of Holland.

The annual general meeting of this Association (the 37th) is to be held at Utrecht, on Wednesday and Thursday, the 7th and 8th of July, under the presidency of Heer J. E. H. Bakhuis, the Manager of the Hague Gas-Works. The programme of the proceedings comprises, in addition to the private business, the presentation of the reports of the Technical Committees appointed by the Association, of which the more important are those dealing with: (1) Photometry; (2) Coal; (3) Training of Gas-Fitters; (4) Standard Conditions for the Purchase of Gas Oil. There are twenty-six technical questions set down for discussion. Of these questions, three will be introduced by the reading of short papers; while the remainder are merely topics on which members will be invited to give their views. In the course of the meeting a visit will be paid to the Utrecht Gas-Works.

Electricity Works and Steam, Gas, and Oil Engines.—At a recent meeting of the Institution of Electrical Engineers, Mr. A. J. J. Pfeiffer read a paper in which he gave a description of the Diesel oil-engine, and then made some comparison of the capital and the operating cost of steam, gas, and oil plants respectively in electric power stations to deal with a maximum load of 1600 kw. He quoted figures to show that the difference in capital outlay on high-grade plants of the three kinds was nominal, and said that the limit of application of the Diesel oil-engine principle depended primarily upon relative fuel costs, which for Great Britain would mean that it probably cannot compete with steam or gas engines in the immediate neighbourhood of coal centres. He added, however, that, where coal was dear, oil possessed great advantages over both the other systems from the point of view of working costs. The author remarked that an oil-engine plant burning crude petroleum of about 18,500 B.Th.U. per pound had a thermo-dynamic efficiency far exceeding that of a steam or gas plant; and this efficiency remained practically constant over a wide range of units. The type of engine he was dealing with could burn almost any liquid fuel; but generally, and especially in Great Britain, petroleum residue from the Dutch East Indies, Texas, and Roumania was used, while on the Continent gas oils and paraffin oils were successfully employed. Of late, a new source of oil fuel had been found—and that was gas plants. Carburetted water-gas plants, of which there were a large number in Great Britain, gave off an oil tar as a bye-product which lent itself admirably as oil-engine fuel, having a calorific value of about 16,500 B.Th.U. per pound. Such fuel oil had already been used for some time past on the Continent in connection with Diesel oil-engines. Then, again, among the bye-products of a retort-gas plant using bituminous coal was a tar oil containing asphalt, which had to be removed before the oil could be employed.

IRON—ITS OXIDATION, CORROSION, PROTECTION

By Mr. W. CRANFIELD.

[A Paper read before the Yorkshire Junior Gas Association, May 15.]

While the noble metals—gold, silver, and platinum—remain practically unaffected on exposure to air, provided no other agency is at work (e.g., sulphuretted hydrogen in the case of silver), the baser metals—iron, copper, lead, zinc, &c.—exposed to air acquire a superficial coating, and lose their lustre. In the case of lead and zinc, this thin film is coherent and impervious; consequently it completely protects the metal from further corrosion. If the skin is damaged, it is quickly replaced, and no further encroachment of air action ensues. Artificial protection is thus unnecessary. On the other hand, iron, which much more rapidly corrodes, forms a porous mass of rust, instead of a coherent coating. This porous structure can easily be demonstrated by seeing how a hydrocarbon oil makes its way through the mass if put on to dry rust. On this circumstance depends the well-known device of first saturating rust before scraping it off. Whenever iron is exposed to air and water, this corrosion proceeds; so that even when embedded or covered up—unless in non-porous materials—little protection is afforded. Girders, &c., embedded in brickwork, masonry, or mortar, all rust; while nails driven into wood are rusted by the moisture in the wood.

Rust, being porous, leaves the metal below it still exposed to the rusting conditions; so it may be said that rust produces rust, though, of course, rust is not the actual chemical agent of the operation. All porous bodies have the power of condensing or occluding gases; and rust does this with oxygen and carbon dioxide. Moreover, it can absorb and retain water; so we have here the most favourable circumstances for the continuous production of rust, and rapid progress of this action must ensue. This continuous development of rust is the most serious phase of the question; and to it is due the complete corrosion of screws and rivets in iron structures, and the fact that pipes may become so completely converted into rust that they either fall to pieces of their own accord or can easily be broken up. Occasionally one hears of small mains and services that exist as pipes in the imagination or on plans, rather than in sober reality. They retain their form and allow gas to pass along them; but gas also passes through them and swells the unaccounted-for gas total.

When continuously exposed to water, rusting varies according to the amount of oxygen (and carbon dioxide) present. Thus boilers in constant use do not rust on the inside, because the continuous boiling of the water expels the dissolved gases. Since, however, the feed water is constantly introducing fresh quantities of oxygen, it follows that rust may form at the water-line, because here we have both water and the necessary gases. Similarly, the interior of hot-water pipes does not rust, as the circulating water soon becomes air-free. Iron rusts much more rapidly when intermittently exposed to water than when continuously immersed, and mainly between the varying levels of the water in which it is standing. This at once calls to mind the corrosion of that part of the lid of a gas-purifier adjacent to the water-level in the lute. A short shower of rain causes more rusting than a whole day's immersion in water. The thin adherent film of water is in contact with air; and as fast as its dissolved oxygen is used up in rust formation, a fresh supply is absorbed from the air. The water thus remains saturated with it, whereas the deeper layers of a mass of water can only very gradually renew their lost oxygen. Then, too, the raindrops, during their passage through the air, have had the opportunity of becoming saturated with oxygen and carbon dioxide.

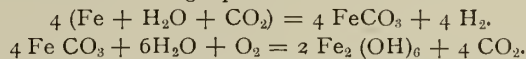
As has been mentioned, if the coating of rust were impervious and coherent, it would itself be a defence against further corrosion. Several processes are in use for the forming of such a layer of oxide on iron, only it is not the sesqui-oxide of red rust, but the tri-ferric tetroxide (Fe₃O₄) that is produced. Such operations mainly consist of strongly heating and thus burning the surface, or heating the iron object in superheated steam. These devices are more suitable for small articles than for the iron of gas-works structures. This is commonly known as the "browning" of iron; and Barfed iron is perhaps the best known instance. For small articles not likely to get violent treatment, this is fairly satisfactory, only as the film is but thin any chipping prepares the way for eventual rusting.

Wherever iron is in contact with iron, rust readily forms. It is often overlooked that such places are in an eminent degree favourable for its formation; being more or less inaccessible to scouring treatment and to paint, out-of-sight and consequently unexamined, and offering facilities for the retention of water. An almost imperceptible space between a rivet-head and the iron plate is sufficient to admit water, and thus originate and maintain rusting, so that in course of time the rivet may be entirely eaten away. The rusting of a few rivets may not endanger a structure provided that plenty of others are sound; but where some are affected, many others exposed to the same conditions will probably have shared the same fate. The stability and soundness of an iron structure are more imperilled thus than by corrosion of the more massive and visible parts. Besides, unsoundness of joints in ironwork on a gas-works commonly means gas leakage; and rivet holes are just the commonest places for this trouble. A word of warning may here be given. Whenever iron bolts are embedded in stone, rusting conditions must be avoided, as the increase in

bulk caused by rusting has split many an otherwise sound stone and loosened the bolt. The use of mortar instead of lead in such cases is inadmissible, being porous. Rust once formed in such a situation greedily absorbs moisture from the mortar, and corrosion proceeds apace. Cement and concrete, being non-porous, actually preserve iron; and ironwork is sometimes effectually preserved by being painted with a thin gruel of cement. Ironwork in reinforced concrete similarly remains uncorroded.

THE CHEMISTRY OF RUSTING.

The rusting of iron was at first, and for a long period, regarded as a simple process of oxidation. The explanation generally accepted for the past thirty or forty years is chiefly based on the experiments of the late Dr. Crace Calvert, F.R.S., as amplified and interpreted by Professor Crum Brown, F.R.S., of Edinburgh. Iron is supposed to rust through the combined action of the oxygen and carbon dioxide of the air in the presence of water; the carbonate and bi-carbonate of iron first formed being gradually converted by the further action of atmospheric oxygen into a ferric hydroxide. Professor Crum Brown summarized these charges into the following equations:—



The carbon dioxide thus liberated is then able, in the presence of water, to attack a fresh surface of iron under the porous coating of rust, and start the same cycle of changes again. The well-known action of alkalies in inhibiting the rusting of iron was thus explained by their power of absorbing carbon dioxide, without which rusting could not occur.

These conclusions, though probable and apparently adequate, have not received universal and unreserved acceptance, and other workers have strongly differed among themselves as to the accuracy and validity of the fundamental experiments—doubts having been often expressed as to whether other experiments had not proved the possibility of rusting under conditions which excluded all carbon dioxide. It is striking how often the common phenomena of every-day life and their chemical explanation remain not fully understood. Nature still seems to put under our very noses the things she wishes to hide from us, and is too often successful in so doing. Flame is still a subject fraught with possibilities of further discovery; and most of us remember the general incredulity that greeted the preliminary announcement, in 1894, that Lord Rayleigh and Professor Wm. Ramsay had discovered a new constituent of the atmosphere amounting to 1 per cent. of its volume. As Professor Armstrong recently said concerning the explanation of rust formation, "It is not creditable to chemists that problems of fundamental importance should have been so long neglected in favour of work of no particular value to anyone, and that it should still be possible to dispute on such questions."

The most valuable and convincing work of recent years has been that carried out by Dr. G. T. Moody at the Central Technical College, South Kensington. Professor Armstrong, who saw the work during its progress, testifies to Dr. Moody's extreme patience, care, and absence of bias, and considers the result beyond question. Dr. Moody's experiments prove that in the absolute absence of carbon dioxide iron can remain in contact with water and oxygen without rusting, but that such entire exclusion of carbon dioxide from the gas and liquid needs most minute precautions, and has been probably the fatal flaw in many experiments yielding contrary results. He further shows that iron is remarkably sensitive to the attack of carbon dioxide—a definite weight of this gas in the presence of moist air exerting an even greater corrosive action than an equivalent quantity of hydrochloric or sulphuric acid. Let me quote one of his experiments.

Distilled water which has been shaken with, or left in contact with, air is poured on a perfectly clean, polished surface of iron. At the end of forty seconds, when the water is seen to be clear and the metal perfectly bright, the water is allowed to run into a porcelain basin containing a drop of a dilute solution of potassium ferricyanide. A marked blue coloration immediately results. If a similar experiment be made with rain water instead of distilled water, the iron is found to be even more readily attacked, ferrous salt in solution being detected after thirty seconds' contact. The ferrous salt found in solution in these experiments is obviously formed by the interaction of a very dilute solution of carbonic acid and water, for recently-boiled distilled water does not dissolve the metal.

The colour of rust is somewhat variable, being mostly a rather bright yellowish red when newly formed, and passing, with age and increasing thickness, into dark red-brown, or even blackish-brown. Very old rust is mostly blackish-brown, and exhibits a more or less lustrous, almost crystalline appearance. When powdered, rust is bright yellow-red like the fresh product.

Various analyses of rust have been published, whose differences point to the specimens being of varying age and degrees of alteration subsequent to the original formation. Evidence being lacking of the composition of specimens representative of the material in course of comparatively rapid formation, Dr. Moody collected it from the unpainted interiors of iron flushing tanks in constant use. Every sample gave off carbon dioxide when placed in hydrochloric acid, and the condition of the iron present in each is given in the following table:—

Percentage of iron as ferric oxide . . .	55.73	51.12	64.60	65.13	68.89	67.46
" " " ferrous oxide . . .	32.86	36.57	25.74	25.66	23.18	24.40
" " " carbonate . . .	11.40	12.31	9.66	9.21	7.93	8.14

Clean iron kept in a flask completely filled with a saturated solution of carbon dioxide, gave off hydrogen for weeks; but the solution remained perfectly clear and colourless. On boiling, a green precipitate settled out, which effervesced with acids, turned red on exposure to air, and gave all the reactions of ferrous carbonate, so that the iron in solution must have existed as ferrous bicarbonate. Another part of the solution was readily decomposed by atmospheric oxygen, yielding a mixture of ferrous carbonate and ferrous and ferric hydroxides, part of the carbon dioxide being simultaneously regenerated. The mechanism of rusting hence seems to be the formation of a soluble ferrous salt and liberation of hydrogen as a result of the combined action of water and carbon dioxide on iron, and the subsequent oxidation of this soluble ferrous salt by atmospheric oxygen into ferrous carbonate and hydroxide and ferric hydroxide.

Dr. Moody examined the effect of leaving recently formed rust fully exposed to air. One of his samples was roughly powdered and spread on a porcelain dish. After eight days, when the whole surface had changed to a rich brown colour, it was analyzed again. The percentage of iron as ferrous oxide had been reduced from 32.86 to 14.11 per cent., and the ferrous carbonate from 11.4 to 5.62 per cent.—slightly more than 50 per cent. in each case. This rapid oxidation accounts for the low percentages of ferrous iron in most published analyses of rust.

The persistence of ferrous iron in the rust of iron where rusting is still progressing, is explained by the material being partly surrounded by a reducing atmosphere of hydrogen which is constantly being liberated on the surface of the metal.

It is known that iron and iron-rust can act as a voltaic couple, and that when iron is impure (as all commercial specimens are), or when another metal is present, electrolytic action is liable to take place. Such action may be not without a potent influence in accentuating rusting; but it is easy to attach undue importance to it. In any case, all the precautions and treatments mentioned subsequently apply with equal force whatever the mechanism of rusting may be. Recent investigation is dealing with the probable action of impurities in accelerating the formation of rust; and sulphur appears to be a harmful impurity in this as in other connections. To its presence has been traced the internal corrosion of some boilers where the water was alkaline and ordinary rusting impossible.

OXIDATION OF IRON COMPOUNDS IN NATURE.

This process of the oxidation of iron compounds is one of the universally occurring chemical changes of the world, important and ubiquitous, even if slow and little thought of. Iron compounds exist in all rocks and soils, in practically all waters, and in all animal and vegetable matters. The oldest rocks of the world are those known as igneous rock, of which granite may be regarded as a typical example; and all these igneous rocks contain iron compounds. How they have got these, we can hardly explain. But, in passing, it may be mentioned that the great disparity between the density of the earth as a whole and the average density of its crust points to enormous masses of matter having a density of at least more than six times that of water, situated in the earth's interior. If not metallic ores these are likely to be masses of metals in a free state, and of this a number of confirmatory indications exist. In the course of the weathering of these igneous rocks, some constituents—e.g., feldspar—are chemically attacked by the carbon dioxide charged rain-water, partly dissolved, and thus disintegrated. The remainder of the feldspar is washed down and deposited as clay (aluminium silicate), and the quartz as sand. The iron compounds are thus liberated, and some are dissolved. In both processes oxidation proceeds, with the formation of hydrated iron oxide and carbonate—water thus playing an important part as a carrier and disperser of iron. To this iron oxide is chiefly owing the colour of the soil; to it and to other iron compounds most of the colours of clays are due; while the natural earthy pigments—the ochres, siennas, and umbers—are all largely iron compounds. We have seen how iron salts in solution are oxidized and deposited as insoluble ones; and this is going on more or less in most running water, and causes the colouring of the stones in the beds of streams which has made "The Red Beck" so common a name here in the West Riding. To this cause may be attributed the red and brown stains in ordinary sandstones, and the colour of the wholly red sandstones. Indeed, some of these red sandstones are so plainly only a surface coating of iron oxide on sand grains that a few minutes' boiling with strong hydrochloric acid is sufficient to decolorize the sand grains, as in the case of the natural and treated samples of the very loosely coherent Penrith sandstone.

It is worthy of note that most iron ores are either oxide or carbonate of iron; and though the origin and mode of formation of metallic deposits are surrounded with much obscurity and uncertainty, it is most probable that water has had a large share in their assemblage into veins and lodes. So far, therefore, from thinking of the wide diffusion of iron compounds in small quantities as having originated from ore deposits, it is precisely the reverse which is the most probable. We are beginning to realize also that bacteria (whose action—beneficent and otherwise—seems to be universal and contributory to so many chemical changes) are not without their share in precipitating iron oxide from solutions, and deposits in trunk water-mains have in a few cases been traced to them.

FORMATION OF BOG ORE.

The formation of our familiar "natural oxide" or "bog ore" is another instance of iron oxidation. This is essentially peat on

which hydrated iron oxide has been deposited. In some lake, pool, or backwater in far distant times, peat moss began to grow and accumulate. From year to year this would spread, and dying at the bottom while it continued to grow upwards, would, in the course of centuries, form a peat bog. If, now, the water passing through this bog happened to be highly impregnated with iron compounds, these would oxidize and deposit in a fine and ultimately porous condition all over the organic remains. If ultimately the amount of deposited oxide is sufficient, this chalybeated peat is eligible for use in gas purification; and the percentage of peat and the consequent porous condition of the oxide is what settles its value for this purpose. It is usually too poor in iron and too valuable for gas-works purposes to be smelted, though the lake ores of Sweden and Lower Canada which are smelted for iron are practically "bog ores."

IRON PYRITES.

While discussing iron deposits, iron pyrites will come to mind with any one interested in coal. While no conclusive evidence of its formation has yet been adduced, or any generally accepted explanation put forward, yet it is obvious that its formation has been subsequent to the original deposition of the vegetable matter that has finally become coal; and therefore water has probably been an important factor.

Iron pyrites in its turn affords interesting instances of the oxidation of iron compounds. The danger of the spontaneous combustion of stacked coal originates with the heat produced by the oxidation of the finely-divided pyrites in the coal. This oxidation tends to break or weather the coal, exposes more pyrites surface to the influence of the air, while the rising temperature begins to set up destructive distillation of the coal itself. So powerful is this oxidation under favourable circumstances that a cargo of pyrites is notoriously one of the most dangerous cargoes a ship can carry—more so even than coal; and many a slab of polished granite that happened to be rich in iron compounds and was exposed to the weather, has undergone such rapid and extensive corrosion as to shake the owner's belief in the imperishability of granite.

Another instance of the oxidation of pyrites is seen in the natural formation of ferrous sulphate crystals—copperas or green vitriol. These large, glassy looking crystals suggested the designation of "vitriolites," from which the name vitriol is derived. While their distillation was the original method of preparing sulphuric acid, and, with suitable modifications, still supplies us with Nordhausen or fuming sulphuric acid.

The oxidation of the two other iron sulphides produced by the action of sulphuretted hydrogen on gas-works oxide, though of supreme importance to us, is so familiar and well understood that any further reference to it here may be excused.

IRON OXIDE PAINTS.

The iron oxide paints so familiar in gas-works usage—to which later reference will be made—are not prepared from the burnt oxide residue from vitriol works (which unfortunately is quite unsuitable), or as a rule from natural oxides. They are mainly produced from the many waste liquids containing iron compounds that modern metallurgical processes afford us, especially in galvanizing and tinning iron goods, and in the wet processes for the recovery of copper from the burnt oxide left behind when Spanish cupreous pyrites are used in the manufacture of vitriol. The iron in these liquids is precipitated by an alkali (generally lime), the oxide collected, dried, and calcined till it reaches the desired depth of colour. Some of these waste liquors are also worked up in the production of artificial oxides for gas purification.

CORROSION OF IRON BY ACIDS.

So far we have been mainly concerned with the natural oxidation of iron, and have seen that in such cases the first step is the attacking of iron by an acid—the carbonic acid gas dissolved in water. Other acids in varying degrees act similarly on iron, producing salts, which in their turn oxidize. Even if the amount of such acid is small and its supply not continuous, still when the attack has once been opened, and the surface of the iron gets decomposed and rusted, we have seen how effectually the ordinary atmospheric conditions can follow up the attack. Hence the need for protective covering of iron otherwise exposed to such acids is obvious. Instances that suggest themselves are sulphur dioxide and sulphuric acid in the air and rain-water; various sulphur acids and others in the refuse-made ground where gas-services have often to be laid; carbonic and humic acids in the ground and its water, urine acids in the subsoil of our roads, and sulphuretted hydrogen, acetic, and carbolic acids in any raw tar used in making tar paints.

The sulphur dioxide emitted from fires, which plays a not inconsiderable part in intensifying town fogs, is also a powerful factor in atmospheric corrosion in towns; and Professor Church's discoveries of the amount of calcium sulphate in deposits found on the exterior of St. Paul's Cathedral is an unmistakeable proof of this. As gasholders are often pretty well exposed to the influence of chimney smoke, this consideration adds some force to their claims for watchful guarding. Again, owing to the usual stagnant condition of the air during fogs, its various layers do not get sufficiently quickly intermixed as to equalize its composition, and smoke and chimney gases cannot rise far. At such times, even in fairly open and favoured situations, the amount of atmospheric carbonic acid which ordinarily is practically constant often rises to double—a fact I have found it important to remember when carrying out ventilation investigations. It is

evident again how a gasholder directly exposed to chimney smoke will suffer in any corroded parts under such atmospheric conditions, and the more as condensed moisture to dissolve this excess of acid gases is then also abundant.

CORROSION OF IRON BY CYANIDES.

Iron corrosion plays an important part in the puzzles and worries of a sulphate of ammonia plant. Blue salt is caused by the formation of a small amount of Prussian blue (ferric ferrocyanide) among the sulphate. So powerful a pigment is it, that in the bluest of blue salts the amount is so small that its estimation is extremely difficult; and yet it causes a drop in the price out of all proportion to the amount of this impurity or any disadvantages attaching to the use of the sulphate as a fertilizer. Various cyanides are inevitably present in the liquor undergoing distillation and in the gases passing through the saturator; when blue salt is produced these have re-acted with iron compounds present in the saturator liquor. So that for our present purpose we may regard as the source of the whole trouble the corrosion of the iron pipes by the sulphuric acid and the sulphuretted hydrogen. Iron must be present in both the ferrous and the ferric condition before blue salt can be produced; and this suggests a somewhat common and interesting case of oxidation. Salts of quite a good colour when first fished sometimes develop the blue on standing. This is due to the formation of ammonium ferrous ferro-cyanide—a white, insoluble salt which settles out among the sulphate crystals. On exposure to the air oxidation takes place, and the familiar blue tinge appears. At some works, so as to place the blame on the right shoulders, a freshly-drawn sample from the saturator is tested, either with an acid solution of a ferric salt or with a few drops of hydrogen peroxide solution, to see if the objectionable white salt had already been formed, lest it should develop the blue only on the salt being subsequently fished out when another man is in charge. This testing with hydrogen peroxide is especially valuable when the salt is bagged immediately after drying in a centrifugal machine.

Corrosion of iron by the various cyanides themselves is forcing itself upon our attention from several directions. In some forms of sulphate of ammonia stills, the ironwork is found to become coated over with a deposit which is largely Prussian blue, under which the iron itself gets thinner and thinner. Those who have any experience of the recovery of cyanides in the form of ammonium sulpho-cyanide by the Chance and Hunt process, know that the action of this liquor is positively phenomenal in its avidity for steel and wrought iron. At present, all steel and wrought iron in the washer-scrubbers used is, as far as possible, cased with cast iron, as this has a longer life, and evidently resists the corrosion better.

I have not had an opportunity of investigating the matter, but the unexpectedly rapid corrosion of the iron base and the bars at the bottom of suction-gas scrubbers seems to suggest cyanide as well as sulphurous action, especially as steel is found to suffer so much more rapidly than cast iron. Where a steel base is now being supplied, it is mainly because it is cheaper than cast iron would be, with its necessary jointing arrangements. Similar rapid corrosion takes place at the exhaust valves of a gas-engine using suction gas, just where the gases in passing through the valve impinge upon the spindle. These were first made of solid steel with a thin head; then, owing to rapid corrosion, a cast-iron head with a steel spindle was introduced; and in the best practice now both the head and the spindle are made of cast iron in one piece. Whatever the exact explanation of this unexpected corrosion of the valves may be, it is interesting to know that it has been coincident with the use of suction gas, and was hardly noticed, if at all, with town gas. Anyhow, these are additions to the growing "*per contra*" side of the balance-sheet of suction gas working.

PAINTS AND PROTECTIVE COVERINGS FOR IRON.

We have now to consider our most important section—viz., how to prevent the corrosion which is inevitable to exposed iron. For gas-works' purposes, the only method is to coat it with some liquid substance capable of drying hard so as to form a solid and fairly durable skin that will prevent access of moisture and air.

LACQUERING.

If no special regard is paid to permanence, or if the iron will receive no rough usage or external atmospheric exposure, this object can be attained by simply painting with a lacquer. Lacquers are a kind of spirit varnish made from shellac or some other lac, and sometimes coloured with an aniline dye; &c. The Far East is the source of all our lacs; and a notable use of lacquering was its adoption for protecting the hulls of the Japanese warships prior to the late war. The coating consisted of pure lacquer, with an admixture of mica or kaolin—a perfectly inert material added to give more body to the lacquer and to increase its binding power.

GREASING.

For temporary protection, and especially if the iron is to be stored and not handled, fats and oils afford a good protection. These fall into two great classes, drying and non-drying oils. In the main, the former contain the elements carbon, hydrogen, and oxygen, and in drying absorb oxygen from the air, becoming converted into a resinous and partly acid substance which forms a coherent film. The non-drying oils which are, in the main, hydrocarbons, either evaporate wholly or remain more or less fluid, and do not absorb oxygen. In greasing iron for prolonged

storage, fats which absorb oxygen and develop free fatty acids are to be avoided, as these acids themselves attack the iron. Tallow is often used, but is very inadvisable, as it soon becomes converted into a rusty brown mass and allows the iron to rust. Better results are obtained from mixtures of vaseline and paraffin wax dissolved and thinned, if necessary, with petroleum oils or turpentine.

BOTTOMING.

For "bottoming" ironwork or giving it a first protective coat (often in a contractor's yard, and until erection is sufficiently advanced to warrant formal painting), boiled linseed oil is often used. As to the efficiency of this, strongly divergent views have been held; the objections to it being its well-ascertained meagreness of any lasting protection, and its violation of the rule that to secure adherence and durability of successive coats of paint, one rich in pigment must not be put on top of one with a greater proportion of oil and less pigment. However, providing that the subsequent painting is not long delayed, and that the oil is laid on in a very thin layer as hot as possible, its use seems not only permissible but advantageous.

OIL PAINTS.

For complete and durable protection, oil paint is the one adequate covering. This consists of boiled linseed oil mixed with some pigment. It dries by combining with a large proportion of atmospheric oxygen, forming a cohesive skin whose solidity and durability depend largely on the purity of the oil and the nature of the pigment. Eventually, however, sundry changes in the paint skin are induced, originating largely in the inevitable chemical change in the acids of the linseed oil and the formation from them of a more brittle substance. The mass then gradually attains a condition in which, though still hard, it can easily be removed by scraping. Further decomposition goes on, the combination between pigment and vehicle is destroyed, and the latter is gradually removed by the action of rain, wind, and the sharp dust blown against it. Whatever the exact changes may be, and whatever the composition of the original paint, this destruction is inevitable; and it is all-important to realize the need of a sufficiently speedy re-painting, and to be alert to detect the signs of this need.

Raw linseed oil dries but slowly. By a preliminary heating to between 400° and 500° Fahr. for a few hours, its oxygen absorbing properties are increased, and still more so by the addition of driers. These are mainly lead or manganese compounds (litharge and red lead being the commonest), and are added in the proportion of $\frac{1}{4}$ lb. to 1 lb. per cwt. of oil. Their drying action is unmistakable, though the exact chemical explanation is not quite certain.

THE USE OF OIL PAINTS ON IRON.

Oil cannot penetrate iron as it can wood, so the connection between paint and metal rests solely on adhesion; and the most important part of the painting is the application of the first coat, as the adhesion of all later coats depends on the security of the coats already there. The metallic surface must be clean, dry, and free from grease. Any trace of rust or other adherent matter must be removed with steel scrapers or steel wire brushes. A slightly rough surface assists paint adhesion. The bluish layer generally found on rolled plates is good for a protection against rust; but this must be scraped off before painting, or else it will afterwards shell off, carrying the paint with it. If petroleum oils have been used to assist in the removal of rust, the surface must be entirely cleansed, as the merest film of oil will prevent the paint from sticking, and will give rise to bubbles or retard drying. Turpentine is sometimes used instead of these oils, as, though a hydrocarbon, it is yet a drying oil. Many failures of paint can be traced back to a damp surface. On a wet surface of iron paint absolutely refuses to adhere; but labourers often fail to understand the meaning of absolute dryness. Paint will lie on a damp iron surface, only when dry it flakes off. The painting of external iron should never be begun early on a spring morning or at any time when condensed moisture may be on the iron, nor continued late on a day when the metal is rapidly radiating away its heat and incurring the risk of condensing moisture out of the air. Moisture on wet paint is also to be deprecated. Consequently, a very fluid and quickly-drying paint must be used in a uniform thin layer. All rebates, rivet heads, grooves, &c., where water could lodge and penetrate must be thoroughly painted; while the rivets and their holes should have received, if possible, some treatment before having been inserted—the thinnest coating of hot boiled oil being sufficient if allowed to get thoroughly dry.

For the "bottoming" coat of paint, either with or without previous oiling, red lead or iron oxide is used. The former is often prescribed to be done in the contractor's yard, and in most circumstances is undoubtedly the best. White and red lead alone among the pigments actually enter into chemical combination with the oil, forming with it a quick-drying layer of good adhesive power. They cover remarkably well and, most important of all perhaps, have been definitely proved to be the most rust-resisting of all paints—red lead being rather better than white. In fact, they are the only true rust preventatives. Their blackening with sulphuretted hydrogen is, however, a gas-works contingency that affects the question of their availability.

Red lead paints have not quite the same degree of firmness as good oxide paints, which will stand rough usage when once perfectly dry; and this tough and elastic coat has much to do with

their popularity for outdoor work. Their colours also are less harsh and crude than red lead. Red-lead paint needs a lower percentage of oil than any other. Hence it soon perishes if used as an outside coat. It needs covering with a more durable paint with a higher proportion of oil. An upper coat should always thus contain more oil in proportion to pigment than the lower coat; otherwise it will tend to harden before the lower one and produce cracking. This happens in any case if the lower layer is covered before being perfectly hard (a later stage than mere drying), and then sunshine raises blisters in the under layer.

On the whole, for general ironwork, the treatment that most commends itself consists of:

1. Thorough scraping in the shops or yards and a coat of hot linseed oil.
2. Two coats of red-lead paint.
3. Two coats of an iron-oxide paint.

Among other important instances, this was the plan followed, and with notable success, on the Forth Bridge. There any place subsequently showing signs of rusting is well scabbed, scrubbed with wire brushes, coated with boiled oil, a coat of mixed red lead and iron oxide (the latter added to approximate the colour to the rest), and a top layer of the oxide paint.

IMPORTANCE OF PURE MATERIALS.

Much of the durability of paints depends on the purity of oils and pigments; and the inclusion of foreign materials is very prevalent. It is but fair to say that this is not so much deliberate adulteration as a course almost necessitated by the craze for cheapness, though high-sounding names and great claims for exceptional properties are often allied with inferior and inert materials and small preservative value, &c. Linseed oil is often admixed with resin oil; and this causes what would otherwise be a durable layer to become cracked and brittle within a short time of drying. Red and white lead often contain barytes, which impair their value, covering power, and durability. Do not be misled by the assertion that it comes from one of the best houses in the trade, &c. This is the kind of retort I have met when condemning samples. Admixture with inferior ingredients in order to get grades of various prices is universal, and much of it is perfectly open and above board. Painters who buy white lead know perfectly well what the grades mean. [By the bye, the designation Grade No. 1 might possibly catch an unwary outsider (just as the term 90 per cent. benzol might), and make him think it was the highest grade. He will find "Best" a purer article, though it is admixed with barytes. The only pure grade is "Genuine."]

Fine grinding is essential for the production of a good paint; and the perfunctory stirring up of the dry colour with oil in the paint pot, by means of a brush, and in any proportion is only good for daubs. Paint insufficiently ground, or not ground at all (common with red lead "bottoming" paint), is apt to separate out into pigment and vehicle and give a friable uneven surface.

Where several coats of paint are to be given, each has sometimes a different shade to the others, so as the better to show if each covering has been complete.

Whatever else may afford a suitable field for economizing expenditure on gas-works, paints and painting should not be so marked out. Begrudge paint to woodwork if you will, but to make iron painting last as long as it possibly can, and to say when signs of extensive paint decay show themselves that it must get worse before it will be worth while re-painting, is but false economy.

RE-PAINTING AND PATCHING.

The actual life of a paint surface varies, depending on the amount and quality of the paint, the method of painting, and the exposure to which it has been subjected. All paints finally perish, either as the result of cracking or in consequence of progressive oxidation of the oil, which leaves the paint in a friable condition only loosely adherent. The cracks may admit water and engender rust, while the damaged and permeable coat of paint takes up and retains water, and thus aids rust formation at any exposed points. If general deterioration of surface is showing in friability and loss of lustre, a coat of linseed varnish should be at once applied. This is eagerly absorbed by the paint, which again becomes impregnated, and will now be able to resist atmospheric action for an additional period. This is much preferable to waiting till corrosion has become serious and then preparing the surface and re-painting. For such large surfaces as holders varnish is too expensive, and a fresh coat of paint is on the whole more advisable than plain oil.

If cracks have shown themselves, these may reappear after an oil coating; while if the smallest particle of rust has formed, the destruction of the coat of paint proceeds rapidly—rust spreading under the covering and making it shell off.

TESTING PAINTS.

The methods of adequately testing oils are intricate and expensive, and oil-faking is skilful and elusive, so that frequent testing is out of the question. The simpler tests by which resin and fish oils can be detected and unsaponifiable matter estimated should, however, be carried out on all bulk deliveries. Pigments can be much more easily examined. So much, too, depends on the grinding of the paint, the boiling of the oil, &c., that laboratory tests are not wholly adequate. Very few particulars of any large scale testings have been made public, though such large users as

railway companies employ this method. In the main, such testing consists of large painted surfaces exposed on fences and closely watched to see how the paint stands. North Dakota has gone far ahead of us, as it has officially instituted such tests, and passed draconic laws obliging manufacturers to state on the tin in which paint is sold the proportions of ingredients other than the recognized pure materials. In the main, our experience must guide us. Dealing with firms of good standing, being willing to pay the price at which alone a good and genuine article can be sold, and remaining faithful to goods of proved excellence, is the wisest and cheapest course in the long run.

INFLUENCE OF SULPHURETTED HYDROGEN.

The extent to which lead paints are permissible on a gas-works is partly a question of local conditions. Some engineers rule lead paints out altogether, because of their blackening with sulphuretted hydrogen, and the risk of entire spoiling if the wet surface be suddenly swept by an exceptional amount of the gas. Iron oxide paints alone may be used very well. They afford less protection against rusting, and additional watchfulness is called for. Some insist on no white lead being added to paints. Zinc white can be used; it has nearly as much body and covering power, and is a really good rust-preventative. This is largely used in mixing with other pigments for colours other than black or red, and is highly to be commended. It is non-poisonous; and, though of not quite equal value to white lead in some respects, it is all right on gas-works where utility rather than decorative effect is the chief end of paint. In this same connection, some object to the litharge in boiled oil. Seeing how small is its quantity ($\frac{1}{2}$ lb. in 1 cwt. of oil), this is carrying refinement rather far, though oil can easily be prepared with manganese instead of lead driers—a slight extra darkening of the oil making no difference in gas-works paints.

On the whole, it is easy to attach too much importance to the question of escaping sulphuretted hydrogen. If no sulphided lime has to be dealt with, the amount of the gas in the air should not be great, and will come only from a few sources, which should be closely watched.

TAR PAINTS.

Oil paints are rather expensive for some cases of iron protection, and tar paints are largely employed. For coating service-pipes, a composition which is mainly pitch and tar melted together, or a solution of pitch in petroleum or tar oils, is used. In these cases raw tar will contain traces of liquor and acids, both of which will lead to corrosion, so that adequately treated tar oils are better and not really much dearer. The pipe-ends are plugged, and the previously heated pipes painted with the mixture, or, better still, immersed in the hot preparation for a few minutes and then allowed to drain. An extensively used American preparation consists of raw tar boiled down with slaked lime (to neutralize any acids present). A little tallow and powdered resin are added and incorporated. This mixture is stored when cool, and when wanted for use has a small amount of a thick solution of crude rubber in turpentine added. The hot pipes are then immersed in the hot liquid.

Dr. Angus Smith's composition of tar and pitch is perhaps the best known; and ironfounders generally give their pipes a coating with it.

Steel pipes, being more susceptible of corrosion than cast iron, must not only be thus coated, but wrapped in canvas, jute, or some other suitable material.

Tar has one incidental advantage of great value. Several references have been made to the danger of rivets rusting, and the need of protecting them. The use of oil paint is precluded in hot riveting; but tar can be employed. The momentary charring of the tar does no damage; the residual matter between the plates and round the rivet heads being resinous matter and carbon.

Gas-holders are on some works painted with tar paints. Some contain asphalt, and some graphite; while others are composed of pitch dissolved in light petroleum oils, or even tar oils. These have the advantages of being unaffected by sulphuretted hydrogen, acids, and dirt stains. Two dissimilar dangers accompany their use. The paint may never become completely hard, and some of its solid constituents may break away quickly.

This part of my subject I have been able to deal with but meagrely, and I hope that subsequent speakers at the meeting will supply what is lacking.

[For the discussion on the above paper, see p. 451.]

Manchester District Institution of Gas Engineers.—The 156th quarterly meeting of the Institution will be held at Bamford (Derbyshire) next Saturday. The agenda includes a paper on the "Slot-Meter System," by Mr. E. A. Harman, of Huddersfield; and a description (which will be taken as read) by the President, Mr. J. W. Morrison, of Sheffield, of the "Derwent Valley Water-Works." After the business meeting, by kind permission of the Chairman of the Derwent Valley Water Board (Alderman T. R. Gainsford, J.P.), the members will be permitted to inspect the extensive reservoirs and dams in the Derwent Valley that are being constructed for supplying Sheffield, Leicester, Derby, and Nottingham with water, for which purpose the Board have granted the use of their private railway. When the party return to Bamford, they will have tea together at the Marquis of Granby Hotel (where the earlier meeting is also to take place).

CONSTRUCTION OF COIN-FREED MECHANISM AS APPLIED TO GAS-METERS.

By THOS. S. F. GIBSON, Assoc.M.Inst.C.E.

[A Paper read before the Junior Institution of Engineers, May 12.]

The idea of applying coin-freed mechanism to the gas-meter can, in the author's opinion, be justly assigned to the late Mr. Brownhill, who, in May, 1887, filed a patent (No. 7012), "to provide a gas-meter which, after the insertion of one or more coins, will automatically supply an equivalent quantity of gas." It has been stated that the priority should be given to Mr. Wallace; but though this gentleman patented several coin-freed apparatus, he does not claim their particular application to gas-meters.

Mr. W. E. Price read a paper in November, 1888, in which he described an apparatus he had patented in 1887 (patent No. 15,161). About this time several papers were read by various gas managers, who wished to increase the sale of gas but could not see their way to reach the working class on the old deposit system. The coin-freed gas-meter, therefore, made its appearance at a very opportune time, and, consequently, was largely adopted. As to who was actually the first to take up this method of selling gas, it would be very difficult to say. The late Mr. Frank Livesey (then Chief Engineer of the South Metropolitan Gas Company) ordered several of the original Brownhill meters; and an early patentee, Mr. Marsh, writing to the "JOURNAL OF GAS LIGHTING," in December, 1898, gives the credit to that gentleman, together with Colonel Robinson, of Liverpool.

With a view to showing how popular this method of selling gas became, the author would like to quote the following information from some articles in the "JOURNAL OF GAS LIGHTING," on "Slot Cookers and All About Them," by the late Mr. E. W. T. Richmond, the first of which appeared on Nov. 15, 1898. "The first South Metropolitan public reference," Mr. George Livesey writes me [Mr. Richmond] under date Sept. 20, 1898, "was in the report ending June, 1893; and then at the meeting on Aug. 22. We began in 1892 with a boiling-ring, which never approved itself to me; and in 1893 we discarded it in favour of a stove." In December, 1898, six years from the start, there were 90,000 meters on this Company's district. In the period 1877-1883, there were only about eleven patents applied for, for general coin-freed apparatus. From 1884 to 1888, there were 460 applications. The effect on the coinage of the country of using the system in connection with gas-meters, coming on the top of the growing desire of the public to purchase small articles in this way, was such that for the year ending March, 1897, more than three times the number of bronze coins had to be minted to meet the shortage due to the number locked up in various machines. [It may be added that the 90,000 meters mentioned as being in the district of the South Metropolitan Gas Company would alone have the effect of locking up about 60 tons.]

There is no doubt that the advent of the slot-meter must have had a good effect on the reduction of the fire risk in houses in which, until then, only paraffin lamps or candles had been used. But from the gas manager's point of view, the most satisfactory effect of the introduction of coin-freed meters is the increased sales, as the system has done more to popularize cooking by gas than any appliance other than the stove itself, for the reason that slot-meters obtain an entrance into houses where otherwise there would be no gas at all, and where time for cooking is very limited. The effect of gas cooking is such that the dinner preparation period consumption on a Sunday is now the heaviest of the whole week—night or day.

It is surprising that, in connection with a machine having so many patented and patentable parts as a coin-freed meter, there has been so little litigation; for, with the exception of the threatened action by Mr. Brownhill against Messrs. Sawyer and Purves, disputes appear to be conspicuous by their absence. Considerable work and trouble have, however, been given to the police by that fraternity whose business it is not to pay for anything, and to whom this machine seems to be a standing challenge.

The Patent Office naturally has been well (or otherwise) employed in registering the ideas of various inventors. No fewer than 320 patents were taken out previous to 1907; and in 1896 alone, the record year, there were 35. These patents read in sequence suggest the nature of the troubles met with as the use of the apparatus developed. They include, stopping the meter without using a valve on the inlet-pipe, form of valve, stuffing-box for valve, valve-seat, clock mechanism to move valve, provision for leaking valves, checks instead of coins, using the coin on the flat, on edge, as a gag, as a weight, crown-wheel gears, epicyclic gears, worm-gears, electro-magnets for moving valves, money-boxes, sealing and fastening money-boxes, locks, mechanism for various coins, and mechanism to attach to existing gas-meters. In fact, almost every part seems at one time or another to have received attention from inventors. In a good many cases the patent is simply to remedy some defect found from actual use of the meter in every day life—e.g., the patents relating to the valve.

Having somewhat cursorily run over the origin and effects of the applications of the coin-freed mechanism to gas-meters, it may be asked: What are the essentials of the machine itself? It must be a simple, strong, accurate, and compact machine which cannot be easily tampered with. Fraud prevention in the apparatus as applied to gas-meters does not strike the author as such

an essential as it would be in any other coin-freed mechanism, because the amount of gas passed is always registered on the index of the meter. Should the coins in the box not be the equivalent of the gas shown by the index, the consumer can be called upon by the gas company to make up the difference, and *vice versa* the gas company returns any cash over that which the index shows should be in the box. This latter is usually the case when the cash does not tally with the gas used; and it is not an unusual occurrence to find even two-shilling pieces used for pennies, so that consumers make the meter a sort of bank. It will be observed that the coin-freed apparatus on a gas-meter differs from that on a sweetstuff machine in that the actual use of the machine can always be found. The apparatus must be simple and strong, as at times it receives very rough treatment; accurate, so that, although the gas company has the right to ask for the difference in value between the cash-box and index to be made up, they shall not be required to exercise it; compact, because it has to be fitted to the already bulky gas-meter and erected in very small houses.

The design of a slot-meter generally works out somewhat as follows: There is a valve on the inlet to the meter which can be opened by gearing actuated by a handle outside the meter on the insertion of a coin, in such a manner as to form an integral part of the gear. Having opened the valve a definite amount, the mechanism frees itself of the coin. The gas having thus been turned on, it continues to flow through the meter until the valve is shut again, generally by the first motion spindle of the registration gear, which moves the valve gear in a contrary direction to that in which the coin action had moved it.

Many slot-meters have been put on the market in which the flow of gas has to be stopped by holding the meter registration mechanism and relying on the meter valves for tightness. This is not desirable, as it tends to strain the meter as a measuring apparatus. There are several meters in which the coin has not been used as a gag, but simply as a weight on the end of a lever. This movement does not appear to the author as positive enough for the purpose.

In the design of a coin-freed mechanism for a gas-meter, the following details should receive attention: First, there must be some arrangement of fraud prevention to deal with such devices as a coin on a string, a piece of wire inserted through the slot, stopping the mechanism half-way and turning it backwards and forwards; also the slot must be of such a size that coins, which are bent so much that they would not work the gear but only jamb, are rejected. Provision must be made so that when the coin has done its work in moving the gear, it can be discharged only into the money-box.

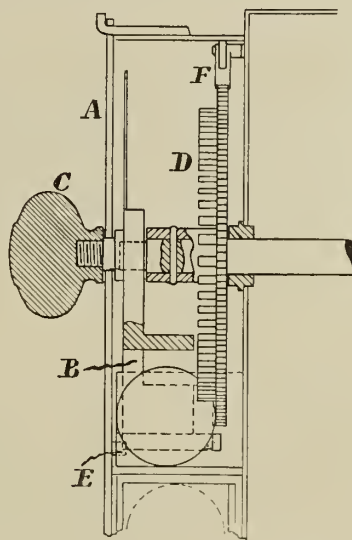


Fig. 1.

Referring to fig. 1, the coin is inserted through a slot in the plate A into the slotted chamber B, and so forms a connection between the handle C and wheel D. When the handle has been

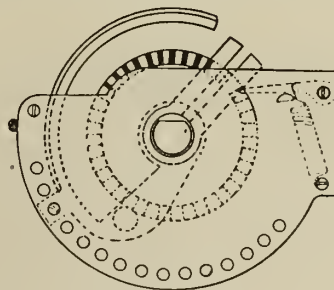


Fig. 2.

turned to its fullest extent, the coin drops free, owing to the arm B coming into contact with a stop E. The arm B carries with it a covering plate; so that until it is returned to its normal position,

no other coin can be inserted. The handle cannot be turned in the reverse direction when the coin is in, owing to the action of a ratchet-pawl F acting on the wheel D, nor can it be turned right round, owing to the stop. The plate A is removable, and contains holes round its periphery, so that the angle swept by the arm B is variable, thus giving the necessary adjustment for variation of volume of gas supplied per coin. Fig. 2 illustrates a similar idea, but worked out somewhat differently.

There are two distinct motions to be considered for the actuation of the valve; one, the action of the coin, and the other the action of the meter. These two motions have to be allowed for in such a manner that, though they are contrary to each other, they may go on either separately, together, or alternately.

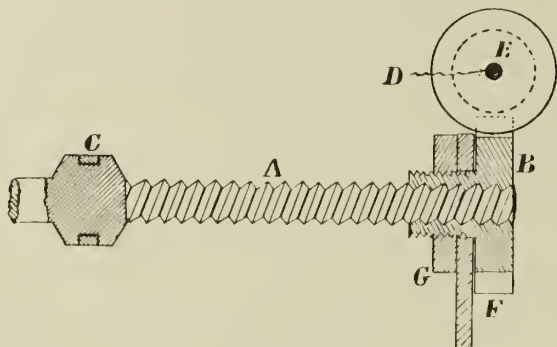


Fig. 3.

Fig. 3 shows a solution by means of a tied nut. The spindle A is rotated by the coin mechanism, and in so doing gets rectilinear motion from the nut B, and carries forward a fork C, which opens the valve. This is returned to its seat by the action of the meter through the spindle D and worm E acting on the worm-wheel F, which is cut on the outside of the nut B. This nut is held by the screwed and pinned collar G from moving laterally; consequently the spindle A is returned to its original position, carrying back the fork C and closing the valve.

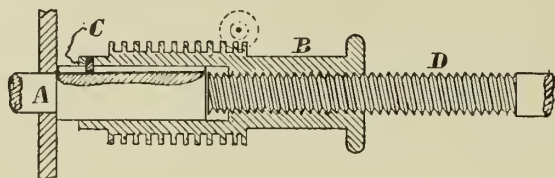


Fig. 4.

In fig. 4, the spindle A is rotated by the coin action, and so rotates and advances the long sleeve nut B, which can slide on the spindle, but cannot rotate owing to the feather and feather-way C. The movement of the sleeve nut opens a valve by means of a lever (not shown in the diagram), and the reverse motion is by the rotation of the spindle D, which is revolved by the meter, but cannot move longitudinally. Consequently, the long sleeve nut B has to slide back upon the spindle A and so closes the valve. The small wheel on the top of the sleeve nut is for actuating a register showing the amount of gas paid for.

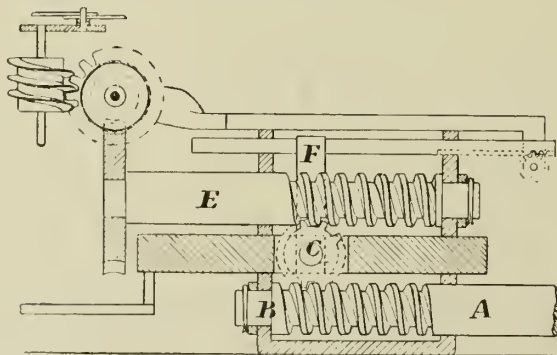


Fig. 5.

Another, and somewhat more complicated, method is shown in fig. 5. A represents a spindle, moved by the coin action, which, when rotated, moves the worm B, which is in gear with the worm-wheel C. This wheel is also in gear with the worm D, which thus becomes a rack and imparts lateral motion to C. C carries a link F, which is attached to the valve, which is thereby opened. As soon as the meter starts, the spindle E revolves and the worm D rotates the worm-wheel C in the reverse direction, and the worm B, working as a rack in this motion, reverses the lateral position of C and closes the valve. It is apparent that both spindles A and E can revolve together or alternately without damage to the gear, and neither can produce motion in the other. When the gas purchased has been nearly all delivered, the gear for shutting-down the valve should do this operation slowly enough to give the consumer reasonable warning that the supply is about to cease, and it is time he again fed the meter. In the

case of the gears illustrated in figs. 3 and 4, this is done by the shape of the lever actuated. In both these mechanisms the valve is practically open to its full extent by the inserting of the first coin, and is kept in this position by the lever while the whole of the gas paid for is passing through.

It must be possible for the consumer to insert a definite number of coins not less than twelve; and there should be a register showing clearly how many coins have been passed into the meter but for which the meter has made no return—i.e., how much gas has been paid for but not delivered.

This is very important, not only from the consumer's point of view, of knowing just where he stands, but also from the fact that it is not desirable to work a slot-meter always on the first coin, as it is seldom that the meter passes the same amount of gas for the first coin as it does per coin for (say) six coins put in all at once, the reason being that the backlash of the gear and the compression of the valve face (the valve faces are generally made of soft material so as to ensure tightness) have to be taken up before the motion starts, and this must be always done by the first coin. Should a consumer always work on the first coin, it will be found that the amount of cash in the box is above the value of the gas shown by the index of the meter; and though consumers are always very pleased to have a return from the meter, it is not desirable to be knowingly inaccurate.

The arrangement for changing the volume of gas delivered for the coin must be of such simple construction that it can be easily reached and operated when the meter is in position, and on no account should it be necessary to break the connections to do so. One simple arrangement has been referred to in fig. 1; another, and very popular method, is to change the gear-wheels themselves. It is advisable to always seal the arrangements, so that no one can alter the volume except the specially appointed officers of the company.

The mechanism should preferably be attached to the side rather than the top of the meter, as the largest dimension of the gas-meter proper is its vertical one, and it is generally easier to find positions when there is room laterally and where the head-room cannot be got. There can be no rule laid down here, as the positions in which these meters are fixed vary a great deal.

The whole apparatus must work smoothly and without any tendency to bind or slip, as although the meter is powerful enough without much loss of pressure between the inlet and outlet to move a most refractory mechanism, still there is always a danger of jumping lights. The gear for closing the valve when the gas paid for has been delivered, generally the reverse of the coin-freed gear, must be so attached to the registration gear of the meter that it will not interfere with it in the event of the valve not being tight when home, and so allowing gas to pass and drive the meter. It is desirable that a weak place should be left in the coin-freed mechanism, so that in the case of a breakdown the registration shall continue uninterruptedly. It must be remembered that a gas-meter (dry) is nothing more than a double-acting two-cylinder engine having, in the three-light size, pistons of a diameter of about 8 inches, and, consequently, even at low pressure at which gas is distributed (2 or 3 inches of water), a very powerful machine, and that should the gear jamb when the power is being supplied something has to break, and it is most important that it shall not be anything in the meter itself as a measuring machine.

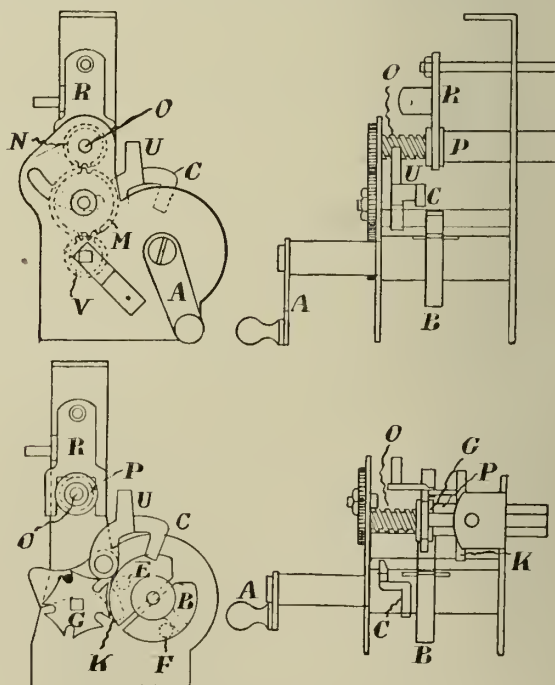


Fig. 6.

From inquiries, the author finds that nearly all the mechanical troubles of slot-meters are due to leaky valves. Many inventors have recognized this, and have brought out ingenious devices, by means of which they hope to make the valves always absolutely tight.

Fig. 6 illustrates a complete compact mechanism which is attached to the side of the meter. The handle A turns the coin-carrier B, which receives the coin through a slot. The coin-carrier has a limited stroke between two stops E and F, and works in the scoops of a scolloped wheel G, so that the wheel G cannot turn except when the coin-carrier is at a predetermined position of its stroke. When the coin-carrier receives the coin, the first movement causes the coin to lift a pawl C; and, immediately the coin passes, the pawl drops and the carrier cannot return to the slot position. The pawl also serves the purpose of making it impossible to introduce more coins than the meter is designed to take; for when the total number of coins are in the meter, an arm U comes in contact with the portion of the nut P (to be described later), so that the pawl cannot lift, and, therefore, the coin-carrier cannot revolve.

When the coin-carrier has passed this pawl, the edge of the coin lifts another pawl K, the object of which is to prevent the wheel G from being revolved when the coin-carrier is in such a position that it could otherwise be made to do so (say) with a wire inserted through the slot or such means. Having lifted this second pawl, the arm of which is long enough to ensure its being held up during the rest of the stroke, the coin engages in a slot in the scolloped wheel G; and as at this time the high points of the scoops in G are opposite a depression in the coin-carrier wheel, it can revolve by the further movement of the handle until just before the coin-carrier comes in contact with the stop F the coin frees itself and drops into the money-box. The weight of the handle then brings the coin-carrier back under the slot to receive another coin.

The wheel G is mounted on a spindle having a square end which carries a pinion V. This pinion is used as a change-wheel, and is held on the spindle by a pivoted Z piece, and gears with a spur-wheel M, the axis of which it is possible to slide backwards and forwards in a curved slot about the centre of the wheel N into which it gears, so as to allow larger or smaller pinions to be fitted on the square end of the spindle carrying the wheel G, and yet keep the gearing in proper mesh. The wheel N is mounted on the end of the spindle O, which is chased with a multiple square thread so as to give the nut P a convenient travel. This nut carries with it a fork R, which has two arms, one of which opens the valve through a lever, and the other moves a register of the coins, showing the number for which gas has not been supplied. The nut P also has a long sleeve which enters the meter; and this sleeve is slotted throughout its length, so that a spindle driven through gear by the meter can be coupled to it by means of a small pin. The meter motion is so designed that, in revolving the nut by means of the sleeve, it travels along the spindle O to its original position, and so closes the valve.

Owing to the number of robberies from slot-meters lately, the money-boxes have received a great deal of attention. In the author's opinion, though it is very important to have a strong box on the meter, its limit of strength must depend almost entirely on the cost considered allowable for this item; and it is not at all desirable to have a first-class safe fixed up against a tin gas-meter. In fact, the cost must be regarded as an insurance premium against robbery, and should be worked out on this basis. Another way to consider the matter is to make the box just strong enough to give the would-be thief sufficient trouble to make him come to the conclusion that it is not worth his while working hard to steal a problematic amount. It is important the mechanism be so attached to the meter that the authorities for stamping are able to stamp, &c., the meter as a measuring instrument, and yet to leave the coin-freed mechanism so that it can be afterwards opened and adjusted, and even small repairs made by the company, without breaking the official seal.

The author has, as far as possible, refrained from describing any particular meter, as it is most difficult to select one; and he feels that members of the Institution will be able to judge for themselves how far the models which, by the courtesy of Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, he is able to exhibit to them, comply with the conditions laid down in the present paper as to the essentials of a good application of coin-freed mechanism to gas-meters.

Points from the Discussion.

The numerous models of the meter on exhibition were of great interest to the members, as well as the large test holder which Mr. Gibson had on view. On the invitation of the Chairman (Mr. Frank R. Durham), the author of the paper demonstrated the action of the different mechanisms. There was a brief discussion, in which Mr. Walter Fendick, Gas Engineer, of Hemel Hempstead, Mr. Cecil Evans (South Metropolitan Gas Company), Mr. W. Ballantyne, Mr. N. Trustrum, Mr. C. H. Smith, Mr. J. W. Hunter, Mr. A. W. Marshall, Mr. S. V. Cooke, and Mr. J. W. Nisbet, took part. Generally the discussion was more of an interrogative nature (except Mr. Fendick's contribution), with a view of eliciting information well known to those engaged in the practical operations of a gas-works.

Mr. Fendick's experience with slot meters had extended over a considerable time; and he related a few of the weaknesses of the early forms of mechanisms, particularly condemning the use of springs, as was originally the case. These used to soon wear out and break; and the gear jammed, and caused a great deal of trouble. Another fault was the complicated gearing, in which several wheels were employed; and with these he had known cases where two, three, or four coins had, to be introduced into

the meter before gas would pass. This was a very serious fault as a consumer might have a penny, but not several, in the house. He also spoke of the defects of the early form of plunger. The slot meter, he said, must be something simple in construction, easy to understand, and accurate. If it was not accurate, it was very difficult to get the money that was short of the meter registration; although the consumers were quite ready to take back the surplus money in the meter-box. With regard to the valves of the meter, it was necessary to make sure that the pressure of the gas was on the top of the valves. The pressure the valves worked at was very small; and so it would be seen that the valve must be an efficient one. If the gas was cut off from the under side of the valve, a little piece of dust would be sufficient to allow the gas to by-pass. He pointed out other constructions, whereby leakage might occur at the valves. He had seen it recommended that consumers should know how much money was put into the box. He was opposed to this, and thought it much better to show a consumer how much gas he had to his credit, so that he could tell when to put in a fresh coin. As to the use of strong money-boxes, he preferred the frequent collection. With regard to modern slot meters, he had tried several mechanisms; and they worked with wonderful accuracy—in fact, more than half his consumers were on the slot system, and few troubles were experienced. This was a case in which the ingenuity of man had discovered a most useful instrument, and one that filled a long-felt want. Mr. Cecil Evans asked whether a multi-coin meter was in use. Mr. C. H. Smith, of the Marylebone Electricity Department, remarked that they found electrical coin meters very useful, especially for the use of people residing in flats, many of whom were inclined to move somewhat frequently. A great advantage was that the slot meter did away with the necessity of asking for a deposit. The chief difficulty with electrical slot meters had been that sometimes when a shilling would not go in easily, some people were inclined to accelerate its entrance by the application of a hammer. This had been a real source of failure with electrical slot meters. Sometimes, too, the mechanism stuck, and then the consumer obtained his electricity for nothing, until the collector found that something was amiss by the registration dial. They had 200 to 300 slot electrical meters in use in Marylebone, and there was comparatively little trouble with them. No rent was charged for slot meters, although they cost a great deal more. The consumer, however, had to sign an agreement in which he made himself responsible for payment of the consumption as shown on the registration dial. He thought the signing of the agreement was important, because the consumer was likely to take more care of his meter if he knew he was responsible for the consumption, as shown by the dial. Referring to the large amount of money locked up in slot-meter money-boxes, Mr. Marshall thought the use of checks would keep the money-boxes free from burglary, though the employment of such checks would cut at the root of the system. Mr. S. V. Cooke asked whether the quantity of gas obtainable varied with the pressure in the various parts of the district. As to the slide-valves, were they affected by deposits from the gas, and was any lubricant necessary?

In reply, the author stated that he agreed with Mr. Fendick's remarks as to doing away with backlash in the gear. Frequent collections were no doubt desirable; and the frequency should be settled by the requirements of the particular district in which the meters were fixed. Answering Mr. Evans, he said that there were several multi-coin meters on the market; but he did not consider them desirable, owing to the extra complication making them more liable to become inaccurate. He was not surprised to hear from Mr. Smith that the experience of electrical engineers as to slot mechanisms was similar to that of gas engineers, in finding that the system was a useful adjunct for the sale of their product, although they did not seem, from the figures given, to have found so large a field for it. In answer to Mr. Cooke, the pressure would not affect the registration of the meter, as the difference between inlet and outlet was only that caused by the friction of the meter, and was practically negligible; and the density of the gas would be little affected owing to the possible difference being so small a percentage of the total absolute pressure. The material of which the valves were made, and the light pressure at which they work, rendered lubrication unnecessary; and there was little trouble from deposit in the meter.

A special vote of thanks was passed to the South Metropolitan Gas Company for the splendid collection of models and meters they had sent for elucidating the subject.

Midland Association of Gas Managers.—The spring meeting of the Association will be held on Thursday of this week at Longton, on the invitation of the Corporation Gas and Electricity Committee, whose Engineer (Mr. W. Langford) is President. After being welcomed by the Mayor and the Chairman and members of the Gas and Electricity Committee at the Town Hall, the members will inspect the gas and electricity works. In the afternoon a special train will be provided by the Committee to convey the members to the Apedale coal and iron works of the Midland Coal and Iron Company, to inspect the modern recovery plant. Subsequently the members will have dinner in the Longton Town Hall, on the invitation of the Mayor (Alderman A. Edwards, J.P.); and at the conclusion of this, a presentation will be made to Mr. C. Meiklejohn, in recognition of his long and faithful services as Hon. Secretary to the Association.

WEST'S COMBINED DISCHARGING AND CHARGING MACHINE FOR GAS-RETORTS.

Among the specifications issued by the Patent Office last week was one descriptive of an invention by Mr. John West, of Manchester, for discharging the coke from gas-retorts by pushing it through the retort by a ram, to which is connected an apparatus for conveying the coal into the retort at the same time that the coke is being discharged; the coal being deposited and left in the retort when the ram and charging apparatus are withdrawn.

The patentee refers to patent No. 7288 of 1904 (granted to him) for a discharging machine for gas-retorts employing a telescopic ram which enters the retort and pushes the coke forward until it is discharged. But the apparatus there described was solely for the purpose of discharging the coke. In the present invention,

he incorporates with the ram a means for conveying the coal into the retort and depositing it therein—for this purpose providing two or more scoops or troughs of a cross section adapted to suit the profile of the retort, the number of scoops or troughs employed depending on the length of the retort and the available space for the machine in the retort-house.

The scoops are made to telescope into each other; the outer or first scoop being attached to the end of the telescopic ram of the discharging machine. By this means, when the telescopic ram enters the retort, it carries with it the scoop to which it is attached. Each scoop is provided with stops, which engage with stops on its adjacent scoop, and thus carry it forward. In this way, the whole of the scoops in turn are carried forward into the retort; coal being fed into them by a mechanical feeding arrange-

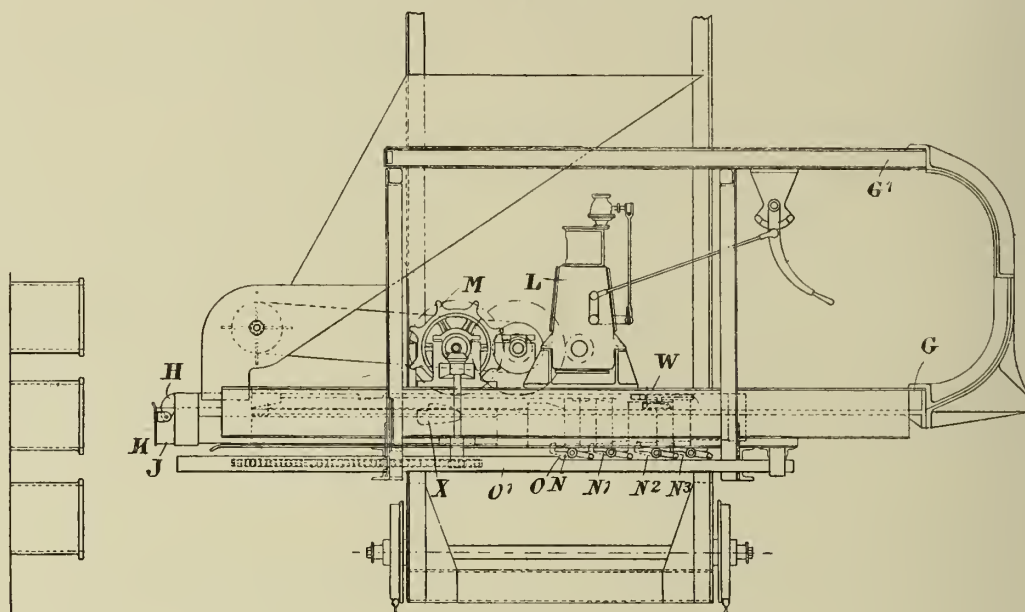


Fig. 1.

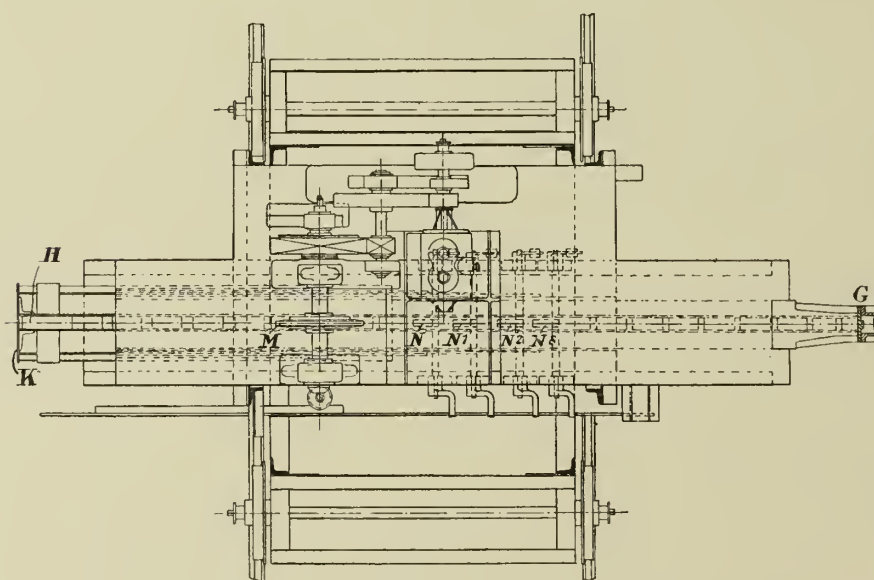


Fig. 2.

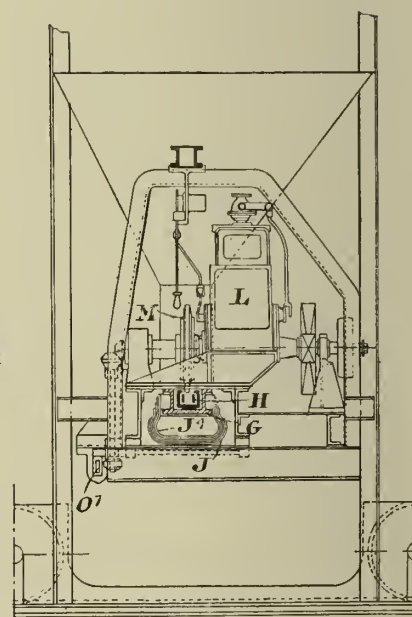


Fig. 3.

ment before they enter the retort. At one end of the scoop which last enters the retort, a stop-plate is inserted; and this scoop, with its stop-plate, is arranged to remain stationary while the other scoops in turn are being withdrawn from the retort and telescoped into each other—the object of the stop-plate being to prevent the coal returning with the scoops.

The ram-head, which is attached to the foremost scoop, is so hinged as to lift and allow the coal to leave the scoop or scoops when the latter are being withdrawn from the retort. Thus the coal which was carried into the retort by the scoops is pushed out on to the floor of the retort as the scoops are withdrawn from it and telescoped into each other. When all the coal is deposited on the floor of the retort, the whole of the scoops (together with that to which the stop-plate is attached) are withdrawn clear of the retort into the framework of the machine; and the machine is travelled along to the next retort to be operated upon.

The scoops, in suitable sections, telescope into each other as described; and it is arranged that, in extending for discharging

the coke and carrying the coal into the retort and in closing up for depositing the coal on the floor of the retort, each of the sections is caused to perform the operations in succession. To ensure this happening, stops and pawl-catches are provided; the latter being arranged, by rack and gearing, to release the scoops in turn when the coke is being discharged and the coal carried into the retort. By an arrangement of pawls the scoops are also prevented from telescoping up out of their turn; the returning scoop, when nearly home, releasing a pawl and allowing the next scoop to return. This operation is continued until the whole of the coal is deposited on to the floor of the retort and the scoops are housed in the machine framework—the last section, to which the stop-plate is fixed, being the last to return.

The machine is mounted on framework provided with travelling and hoisting gear for adjusting the machine to the retorts to be operated upon; and a coal-supply hopper, with feeder gear for regulating the supply of coal to the charging apparatus, is also provided.

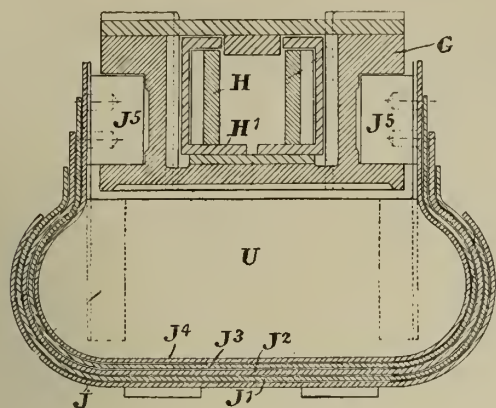


Fig. 4.

The illustrations show a side elevation of the machine, an elevation of the machine looking towards the retort-stack, a plan, and a cross section of the scoops and the discharging ram and casing.

G and G¹ show the discharger casing described in patent No. 7288 of 1904 [see "JOURNAL," Vol. LXXXVII., p. 889]; the end of the telescopic ram H being attached to the scoop J, which carries the hinged ram-head K. The discharging and charging apparatus operates by a reversing motor L controlled by a hand lever; the power being transmitted to the driving sprocket-wheel M by gearing. The scoop J is free to move forward or backward with the telescopic rams; but the scoops J¹, J², &c., are held in position in the hanging frame by means of pawl-catches N, N¹, &c. These catches are, in turn, released by the inclined path O on the rack-bar O¹ engaging with cranked lifting levers attached to the pawl-catches, thus releasing the catches from the scoops and allowing them to travel forward into the retorts in the proper order.

The rack-bar O¹ is operated from the driving sprocket-wheel shaft by bevel-and-spur gear-wheels and vertical shafts; and the ratio of the gear is so arranged that one section or scoop has made its full stroke before the adjacent scoop is released. The spindles carrying the pawl-catches N, N¹, &c., and the crank levers are weighted, in order that the scoops may again engage with the catch pawls on their return stroke into the hanging frame of the machine.

The scoops are provided with inclined paths or lifting wedges, which, when the scoops make their return stroke towards the framework of the machine, lift the hinged pawls in succession, and thus the scoops are, in turn, released and allowed to telescope into each other.

The last section J⁴, which is provided with a stop or push-plate U for pushing the coal out of the scoops on their return stroke, is provided with lifting catches or pawls W and W¹, which, on their outward stroke into the retort, drop into the catches X and X¹, carried on a fixed portion of the hanging frame; and the scoop J⁴ is then held fast on the return stroke of the scoops until all the scoops are telescoped into each other and the whole of the coal is deposited on the floor of the retort. The lifting catches or pawls are then released by means of inclined paths or wedge-pieces fixed on the scoop J³, and the scoops then return into the framework of the machine.

The action of discharging and charging a retort is as follows: The rams are driven into the retort to be operated upon by means of the sprocket-wheel M through the motor and gearing L, and carry with it the scoop J, to which the hinged ram-head K is attached. Coal is fed into the scoops as they travel towards the retort from the coal-hopper above by means of a feeder drum driven by a chain or belt from a shaft of the driving gear. The scoops J¹, J², and J³ are in turn released from the catch pawls N, N¹, &c., as described, until the scoops are fully extended in the retort, when the whole of the coke is discharged. The direction of rotation of the sprocket-wheel M is then reversed, and the scoop J is brought back towards the machine by the discharging ram, and telescoped on to the scoop J¹, when the inclined path or wedge-piece on the scoop J releases the lifting pawl on the scoop J², and the scoops J and J¹ continue their return stroke towards the machine. The coal during this time is being forced out and distributed on to the floor of the retort by means of the stop-plate U on the section J⁴, and the ram-head K hinges upwards and rides over the coal which is deposited into the retort by the receding scoops returning to the machine. The coal is at the same time prevented from returning with them by the stop-plate U. When the whole of the coal is distributed on the floor of the retort, the lifting pawls W and W¹ on the last section J⁴ are released from the fixed stops on the hanging frame, and the scoops are brought back into the framework of the machine.

Co-Partnership and Profit-Sharing.—An address on this subject will be delivered by Mr. L. W. S. Rostron, at Caxton Hall, Westminster, to-morrow evening, under the auspices of the National Union of Conservative Associations and the London Municipal Society. The lecture, it has been arranged, will be followed by a discussion.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Discussion on Mr. Cranfield's Paper.

The closing meeting of the present session of the above Association was held on Saturday, at the Mechanics' Institute, Bradford—the PRESIDENT (Mr. H. Butterfield) occupying the chair. It was announced that the anonymous contribution, on "Gas Pressure," promised for the meeting had, by request, been postponed till next session, so as to leave the whole time of the meeting available for Mr. Cranfield's paper, which appears on p. 443.

The PRESIDENT, in opening the discussion, referred to the vital importance of a gas manager preventing the spread, and, as far as possible, the commencement, of rusting. Personally, he believed in frequent painting, done promptly when the need was perceived, and done thoroughly, especially as regards the actual laying on and working in of the paint. A most noticeable feature about rusting was that, when once begun, it was difficult of arrest. He believed Mr. Charles Wood, of Bradford, had even tried a sand-blast on rusted places without being able permanently to stay the corrosion there.

Mr. EDWARDS, who was unable to be present, had sent a communication, which was then read. He thought that occasionally the painting of holders was directed mainly by the cost at the time and its relation to the current financial situation. He considered this should be done regularly every second year, at least in the West Riding towns. To his mind, the question of preserving ironwork from corrosion resolved itself into the following commonsense conditions: Sound workmanship in cleaning the surfaces and brushing the paint in; good quality of materials—particularly the boiled oil; pigments of a basic nature if possible; and sufficient time allowed for the paint film to set or harden in air. He did not agree with using solely iron oxide paints. If paint films were absolutely non-porous, the matter would be extremely simple; but they were not. Sulphur dioxide, carbon dioxide, oxygen, and water would ultimately find their way through and work their will on the surface of the metal. If they could be stopped on the way, the surface would be protected much longer; hence the necessity for a basic pigment—e.g., white lead or zinc white. The usual oxide of iron had no such chemical action whatever, nor had many other materials vended under sundry protected names. White lead or zinc white also formed a much better film surface, because, to some extent, it entered into combination with the products of oxidation of the linseed oil, forming a kind of soap, which must have a tendency to hold the mass together and possibly form a colloidal membrane in addition to the true paint film itself. Neither oxide of iron nor graphite paints had any such action. It was important to use only the pure boiled oil when mixing up paints. When extracting the oils from samples, some weird and wonderful decoctions were often found in what was submitted as "boiled oil" at more or less ridiculous prices. He examined all consignments, determining the "constants"—e.g., specific gravity, acidity, saponification value, iodine value, and, if found to be necessary, the unsaponifiable matter. Frequently, in order to get "in," a dealer will submit a cheap oil as "pure," which contains 15 per cent. of unsaponifiable matter, partly resin, nicely blended to the correct specific gravity; and he had known it as high as 25 per cent. This, of course, told against the film setting to a satisfactory and hard surface. New metal goods should always be examined and painted as soon as possible after their delivery by the makers. There were paints in use for protecting the metal during delivery, which mainly consisted of blown semi-drying oils and resins. These dried to a protecting skin when applied, but it would crack off after three months or so.

Mr. T. HAINSWORTH, Teacher of the Painters' and Decorators' Classes at the Halifax and Huddersfield Technical Colleges, being invited to join in the discussion, said that he should confine his remarks to the practical side of the question, and mainly to his own experiences. The basis of the problem was simply the putting of a protecting film between the iron and the air; but when the choice of the material for this film, and the method of forming it, was reached, they found themselves on debatable ground. Some engineers objected to lead paints; but painters had found them eminently satisfactory in their general work, and more especially red lead for covering iron. Acid gases and other corrosive chemicals on gas-works might complicate the issue; but even in very trying situations, a lead paint topped with a zinc one would be very hard to better. He would remind them how important a factor in the case was the expansion of the iron. The paint must dry on the iron; but what was wanted was a coat not too brittle and unresisting—one that would accommodate itself somewhat to the expansion and contraction of the metal. If they painted a piece of elastic, allowed it to dry, and then stretched it, they had an exaggerated illustration of what might happen with an unsuitable layer of paint on iron. Red lead (so much used as a bottoming coat) dried the hardest; hence he strongly advocated the use of raw and not boiled linseed oil with it. With boiled oil it would set too readily and too hard, and even with raw oil it set so readily that it was sent out dry by the dealers and not ready ground with oil as other pigments were. With raw oil, the red lead was easier to put on, and the addition of a little white lead still more facilitated its proper application and improved its final condition. Red lead as a bottoming coat had the further

great advantage that, setting so readily, painters were under no temptation to use "patent driers" with it; and as these were usually of very doubtful qualities—often containing much lime and water (the latter because ground in "oil foots")—they were likely to be inimical in a first coat on iron. The question of fine grinding was intimately concerned with that of the durability of a painted surface. If the particles were large, or even when small, if not thoroughly ground until every particle was impregnated with the oil, the life of the paint would be short. In an important series of tests carried out for the Philadelphia and Reading Railway, three paints of very similar composition varied so strikingly in their durability that microscopic examination was instituted, and the least successful was found to consist of comparatively large particles, separated, therefore, by proportionally larger stretches of oil. He concurred in the need of a perfectly dry surface of iron if the paint was to be expected to remain adhering to it. He once saw a lot of iron railings being painted on a bright October morning. As the night had been frosty, he warned the men that they were making a mistake in painting when they were. Next spring all had to be repainted, and the old paint could be taken off in slips nearly as long as the railings. There had been no visible moisture on the iron; but a film of frost had been there and spoiled the job. He, too, had found cement covering effective; and special cement paints for iron had been patented in America. Resin oil added to linseed oil would speedily yield a hard surface; but it would remain softer underneath, and this would result in wrinkling and fracture of the top surface. In a case he knew of, resin oil in a mixture of red and white leads for jointing hot-water pipes, led to disastrous results, both for the building and the paint dealer. The references in the paper to the need of a rapidly-drying paint were vague. Too rapid drying made a brittle paint surface. Red lead (without driers) would dry in eight hours in the summer and in twenty-four hours in the spring. The latter was a reasonable time in which a paint should dry naturally; and it enabled the next coat to be applied some time on the following day. He had dealt with thousands of blisters in paint. On wood he invariably found water or resin (the latter from knots), and on iron water, or more often rust. A blister was an excessive expansion of a part of the paint surface—originating in nearly every case, he believed, from the presence of water under the paint. The expansion by heat of an excess of oil still liquid under a hardened surface might conceivably cause blisters, but more usually wrinkling. In preparing an old painted iron surface for repainting, all blisters and wrinkles must be scraped off.

Mr. E. J. SUTCLIFFE would have liked to have heard some explanation of the powerful corrosive action on iron of ammoniacal solutions. He had used zinc white in a place where the paint was exposed to the vapours from gas liquor, and to his surprise the paint gradually went brown. He believed that the electrolysis theory of rusting was gaining favour, and, personally, thought it had to do with the greater liability to corrosion of steel compared with wrought iron and of that with cast iron. He believed that many failures of paint were mainly due to the workmen employed. They were often casual labourers, or those employed during the winter as stokers; and the work suffered from their incomplete understanding of its conditions and their forgetfulness of instructions. He had found them running for shelter from a shower and leaving the paint pots in the rain, and getting water into the paint, also from letting their brushes dip into the water in holder cups and purifier lutes; while the final stage often was to stand the brushes in water at the end of the painting season so that they might be soft for the following year. At Bradford, they never painted after a fall of rain or if rain was threatening. When any rusting occurred, their plan was to scrape all blisters and rust away with steel scrapers, and then use steel wire brushes; polish with these till all rust, &c., has gone and the metal is bright; coat with red lead; paint with a graphite paint; and, finally, paint with a tar varnish, which they got locally, and which was free from water and ammonia. This gave them a good surface, and it answered satisfactorily.

Mr. T. HAINSWORTH, answering the query as to the discolouring of zinc white, said that it should not be the fault of the pigment, as that could not discolour if pure, and it would not be at all likely to contain white lead. It might arise from some action on the oil, or its driers, especially as while white lead only required $7\frac{1}{2}$ per cent. of oil in grinding, zinc white needed 22 per cent.

Mr. J. H. HILL had been amused with the naming of the grades of white lead. He had found that some "genuine" white lead had not been good enough for them, and had wondered if there were a "Genuine-genuine" grade, like the "Best-best" in iron. For long they had had difficulty in getting a zinc white to stand; but now they had one that answered splendidly about the works when used as a wood paint. On the interior of lanterns it did not answer so well—after a while discolouring, getting crumbly, and coming off when the lanterns were cleaned. Their oldest holder at York dated to 1837; and he believed it had never been entirely scraped since. Latterly, in scraping down to the metal in various places, they had found the original red-lead bottoming coat in thoroughly good condition. They had always used tar on their holders; and it had answered well. With regard to the American preparation for coating service-pipes, they had long used a very similar one; and his Works Manager had confidently claimed it as a York speciality and secret.

Mr. M'NAB inquired about the coating used to prevent corrosion in meters.

Mr. TETLEY, a visitor having special acquaintance with paints,

agreed in the condemnation given to resin oil and dissolved resin. If much were present, the brittle broken surface could all be rubbed off in a few weeks. Cheap varnishes were often made containing them. They might do for inside work not exposed to friction, but were unsuitable for anything else. Barytes was not wholly a bad thing in paint. It was inert to oil, and insoluble, and did no active harm. He should like to know if the carbon dioxide in the calcium carbonate, which was always present in oxide paints, could, after liberation by such acid gases as sulphur dioxide, in its turn rust iron as the atmospheric carbon dioxide did. There was some action in them that he had not yet bottomed, for he noticed how frequently such paints began to show white. He thought the reference in the paper to quick-drying paint was rather misleading, as the quicker the drying the poorer the paint and the shorter its life, whether terebene or patent driers had been used to secure the rapid drying. As regards the interiors of new meters, egg-shell varnish, or a varnish paint, had probably been used for the sake of speedy work. In a gas-works' meter-shop, a good paint followed by a good varnish was best.

Mr. W. N. BOOTH said they were rather at a disadvantage in not having had the paper circulated for previous reading. He thought it at least a debatable point whether pyrites oxidation was the main cause of spontaneous combustion in coal, or even if it was of prime importance. Speaking from memory, he thought it was the New South Wales Government who, some years ago, instituted an inquiry into the matter, in the course of which other important causes of this combustion were laid bare. He should have liked to have heard more importance attached to electrolytic action in rusting. Agreeing with the statement that concrete was a good protection for iron, he had found a 2-inch layer of it to afford the only efficient protection of iron when alternately exposed to ammoniacal liquor and the vapours arising from it. As moisture, oxygen, and carbon dioxide were the essentials for rusting iron, it gave rise to the wonder how the interior of gas-holders would be affected now that one can generally rely on finding all three in the gas. Some holders had been found, after years of use, to be devoid of paint inside and evenly rusted over. He would have liked the paper to have dealt with the question of protecting pipes by galvanizing. Iron service-pipes were often galvanized, and steel ones were not. He should be glad to hear members' experiences. Reference had been made to the coating of iron with hot oil in the contractor's yard. The great question was how it was to be applied. Hot oil applied to cold iron was not going to accomplish much good. What was wanted was to place the metal in heated oil, and to let it stay there till its heat was constant. This would be effective; but perfunctory painting would give a coat easily chipped off. Anyone who had dealt with holders containing carburetted water gas, &c., from which oil settled out on to the tank water and finally got into the cups, would be able to substantiate the assertion that all trace of oil must be removed if paint was to be expected to adhere to the iron.

Mr. F. SCHOLEFIELD said that they had been very conservative at his works, and for many years had remained faithful to one make of oxide paint. On one occasion they had gone in for a cheaper article, only to find the paint surface soon after so badly decayed that they could rub the stuff off, and the powder looked like brick dust. Their holders were cleaned and painted every second year. As a rule, their only difficulty was at the lutes; and last year, when alterations were in progress, the dips were thoroughly scraped, treated with good oil, painted with red lead, and then with iron oxide. Some of the painting then carried out in broken weather had evidently been done on a wet surface; and the paint from whole sheets could be removed in one piece. With reference to Mr. Booth's remark about rusted interiors, he might say that after 35 years' use their two holders were particularly good inside and practically free from any sign of rust; while the colour of the original blue paint was plainly visible on the inlet and outlet pipes. As to the method of oiling the sheets of the new lifts inserted, these were steeped in hot oil, as Mr. Booth suggested, and allowed to dry under cover.

Mr. E. J. SUTCLIFFE spoke of opening out a large holder after 25 years' constant use and finding very little corrosion in its interior.

Mr. ROPER said that their experience of galvanized services at Bradford was that they afforded no effective protection; and it was a long time since any new ones had been put in.

Mr. BUTTERFIELD mentioned that on his way to the meeting he had been looking over an engineering periodical, and had come across a paint recommended especially for putting on galvanized iron, which did not look very reassuring as to the benefit of so treating service-pipes.

Mr. CRANFIELD, in replying, said his purpose in writing the paper had been partly to supply the younger members with a summary of a good many points that they might not otherwise have very accessible. But chiefly he had aimed at awakening their interest on a variety of topics, so as to lead to offers of papers dealing with some of them in ampler detail and with fuller knowledge. He especially thanked their two visitors. He would not detain the meeting with any lengthy remarks, and in the main must let the written paper stand as it was and answer for itself. His chief answer to those who pointed out inadequate treatment of certain parts (which he admitted) was that the paper was already almost unduly long. In reply to two inquiries about discoloured zinc white paint, he could give no definite explanation. It had been suggested during the meeting

that the paint was probably lithophane; but neither this, nor pure zinc white (oxide or sulphide), or any likely addition to, or adulterant of, these would go black with air or acids. The lead of the driers in the oil had been suggested; and, as Mr. Hainsworth had pointed out, zinc white needed a large amount of oil. Mr. Hill mentioned that this soon rubbed off. If at all deficient in oil, this was exactly what would happen. In his case, where the trouble was in lantern interiors, the daily continued heating might possibly have charred the oil somewhat, and thus have both darkened it and weakened its cohesion; while the dust from the large volumes of air passing through the lantern might have had something to do with the discoloration. Mr. Scholefield, who said he rubbed something like brick dust from damaged oxide paint, would be interested to know that paints had been found with this actual ingredient in them. Mr. Tetley's suggestion about the decomposition of the calcium carbonate in oxide paints seemed to be unlikely. If sulphur dioxide and rain water were able to reach and attack this part of the pigment, it would show that the paint film was already damaged, that the paint was therefore getting porous, and that the way was opening up for ordinary atmospheric corrosion, especially as calcium carbonate was itself a weak safeguard and a source of weakness in paint as regards rust prevention. His statement as to the paint developing a white colour was hard to understand. It might indicate the fading of a lake—i.e., a colour stained on to a white base. Nothing in the normal constitution of many oxide paints would cause any reaction or separating out that would bring about this whitening. It suggested to him that the paint had in some way got water in it. He admitted that barytes as an addition to paints (and even to white lead) was not to be wholly condemned; and among other good points might be mentioned that it really was fairly high in the scale of pigments as a rust preventative. The reference in the paper to quick-drying paint was not intended as a plea for what was technically known as quick-drying paint, whose disadvantages had been fully described by some of the speakers, but as a more general and perhaps ill-defined term. He would leave one thing with them as a final problem for which he could suggest no explanation. If a number of vertical railings were left unpainted, or allowed to fall into entire neglect after painting, the most rapid rusting occurred about two-thirds of the way down. Why was this part the most rapidly attacked?

AMERICAN REGULATION OF THE AMOUNT OF SULPHUR IN GAS.

[From "Progressive Age."]

Only in four States of the Union and in the District of Columbia are there regulations in regard to the amount of sulphur permissible in gas. In all of these, with the exception of Wisconsin, the limit is substantially 20 grains. In the latter State, it has been increased to 30 grains. Massachusetts is now struggling with the proposition to make a similar increase in the limit. At a recent legislative hearing, Mr. Arthur D. Little, chemical expert and engineer, of Boston, presented in brief the results of some most exhaustive experiments recently conducted to determine the influence of sulphur in gas on the air in rooms. He showed that the present local restrictions are the outgrowth of ignorant legislation in England, where, under the Metropolis Gas Act, 1860, Parliament limited the sulphur content of the gas supply in the City of London to 20 grains per 100 cubic feet.

The present Bill before the Massachusetts Legislature provides that "the Board of Gas and Electric Light Commissioners shall from time to time ascertain and prescribe what degree of purity may reasonably be required." At the hearing, the Board recommended that the amount of sulphur allowed in illuminating gas be specifically increased from 20 to 30 grains. This recommendation was adopted at the hearing by the Counsel for the Massachusetts Association of Gas Companies, who declared that the extra sulphur would help the companies to operate cheaper; would prevent their violating the law against their will; and would injure no one. But the Board stated their decision to be that the question of purity is a question of such breadth of public policy that it is fitting for the Legislature to decide it. They say that it has been fixed by the Legislature before, and has been satisfactory; and they therefore see no reason why this policy should not be continued.

The evidence presented by Mr. Little, and based on his experiments, showed that he had been unable to discover any possibility of injurious effects resulting from raising the limit to 30 grains. He presented a summary of the results of the careful investigation made in Wisconsin, which led to a corresponding increase. It was shown that a lower sulphur restriction in gas would greatly limit the gas companies in the coal they could use, and make it necessary for them to pay a much higher price for coals of lower sulphur content. The Wisconsin Commission was quoted as authority for the statement that they could not find that it had ever been well demonstrated that the difference of a few grains in the sulphur content of gas had any appreciable effect upon the air of rooms in which gas was burned, or effects that were otherwise harmful to health or property. It seemed to them that most of the gas restrictions were not founded upon inaccurate knowledge, but rather upon a blind following of precedent set in other places. Mr. Little's experiments, which cover a

period of some months, were conducted in a house set aside for the purpose, and include a study of the possible effect of gas under varied conditions. It was shown fundamentally that the sulphur gases formed on the combustion of illuminating gas are removed from the air in three ways: By changing air in the ordinary course of ventilation; by condensation along with water vapours on the cold walls and closets; and through absorption by the alkaline constituents of the walls and ceilings. Mr. Little's experiments show that only within narrow limits does an increase in the sulphur content of the gas, or of the rate at which the gas is burned, cause a relative increase in the sulphur content of the room. In other words, that the disappearance of the sulphur gases increases with the concentration at which they exist in the air. Analysis of the plaster of the experimental room showed that there had been a natural increase in the amount of sulphur which it contained; but calculations showed that the plaster of a ceiling would serve to absorb sulphur gases from 20-grain gas burning 25 cubic feet per day during the probable existence of a house. When the plaster was covered with paper, the absorption was but moderately reduced.

The outside air was found to always contain considerable amounts of sulphur—at times, from one-third to one-quarter as much as in the air of the room in which gas was being burned. It was impossible within the ordinary range of conditions to discover any odour due to the sulphur in the gas. Samples of dyed goods were exposed in the room without discovery of any perceptible fading, and bright metals were in some cases tarnished more by the outside air than that within the room. The analysis of sulphur matches showed that they would liberate as much sulphur into the room as would ordinarily be liberated by 20-grain gas burning for 22 minutes.

In connection with the hearing above referred to, the Chairman (Mr. Forrest E. Barker) spoke as follows:—

In regard to the contention of the companies that they should not be fined if the excess of sulphur is due to an unavoidable cause or accident, I assume that if the Committee inserts such a clause in the Bill it will do so only after it has become fully satisfied as to what such a clause means. I doubt if we know what such a clause would mean. I say what I do with respect to the construing of this clause after what has been said in favour of removing the restrictions on gas. I think that we have the impression that the companies think occasionally that sulphur will suddenly appear in gas from unavoidable cause, coming as a complete surprise to the company. If this is true, I wonder if it is fair to say that such a provision in the law might nullify any restrictions which were made.

Now, in respect to the question of removing all restriction on the amount of sulphur which gas may contain, I want to explain the reference made by the Board to the removal of an obstruction to the reduction in the price of gas. The cost of purification per cubic foot is too small to affect greatly the selling price of gas; but any reduction in the cost of manufacture under proper regulation will eventually work to the advantage of the public, either in making the price cheaper or in giving better service.

I ought to state what you may expect if all restriction is removed. It has been said that about 40 grains of sulphur in the gas would be all that would be found. That is not the opinion of the Board. We should expect to find the same amount here as is found in London. In some extreme cases, 90 grains have been found. That is an extraordinary amount; but there have been a number of times when tests have shown that there were 70 grains present. It is said that the coal used in London contains more sulphur than that used here. If all restrictions are removed, we should expect that the companies here would use coal with a great deal of sulphur in it.

Mr. Barker also stated that he did not believe that anyone knew whether a large amount of sulphur in gas was injurious. In investigating the matter, the Board had had the assistance from the Harvard Medical School and the Institute of Technology; and the recommendations of the Board that the limit be placed at 30 grains was the result of the Board's inquiry. Until the presence of sulphur in gas is shown to be harmless, the Board will not recommend the removal of all restrictions.

Annual Meeting of the Italian Gas Society.

The thirty-eighth annual conference of members of the Italian Gas Society will this year be held in Venice, from Monday, June 7, to Thursday, June 10. The Manager of the Venice gas undertaking, Sig. Ing. Verneau, not being at present a member of the Society, the Editor of our contemporary, "Il Gaz," Sig. Cap. Vittorio Calzavara, has accepted the direction of the necessary arrangements. The meeting in June will be of more than usual importance, as it is proposed to submit to members a scheme for the formation of a new Society under the name of "Associazione fra Gazisti ed Acquedottisti d'Italia"—or, as we should say, Association of Gas and Water Engineers. The suggested articles of the Association, which will be an amalgamation of two formerly separate bodies, have been circulated among the members. There will be four classes of membership—ordinary, collective (i.e., for gas undertakings), associated (i.e., for allied persons and firms), and honorary. Gas apparatus contractors, it is noted, can be elected to the ordinary class. A uniform annual subscription of Lire 20 will be made; but entrance fees for new members will vary according to class—from Lire 20 for an ordinary member to Lire 100 for a gas company. The new amalgamated Association will, we doubt not, bring increased financial and numerical strength into the body of gas and water engineers of Italy. An interesting excursion will be made, at the invitation of Sig. Cav. Sospiso, the Engineer and Manager at Trieste, to the municipal gas-works there, where will be seen the Bolz bed of vertical retorts recently described in the "JOURNAL." Altogether, the forthcoming meeting should prove full of interest and profit; and we wish it, and the new Association when formed, all success.

REGISTER OF PATENTS.

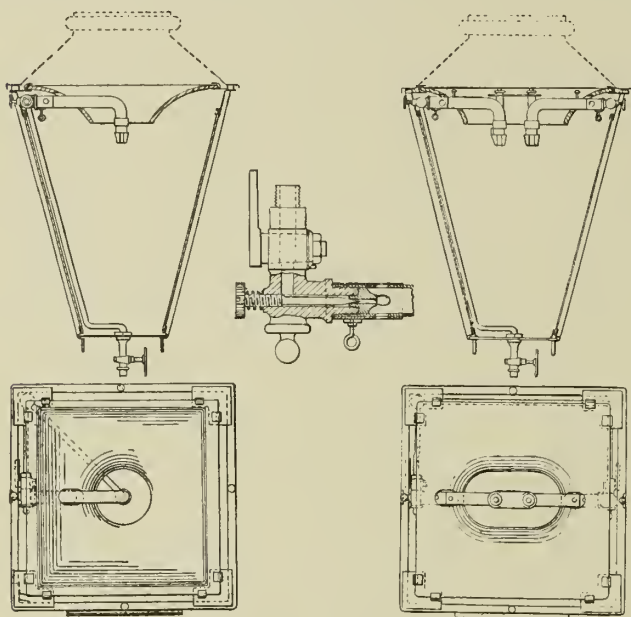
Inverted Incandescent Gas-Lamps.

PODMORE, A. E., of Herne Hill, S.E., and THOMAS, J., of Hanley Road, N.

No 7791; April 8, 1908.

This invention, of "improvements in fittings for inverted incandescent gas burners and lamps," has for its object "to provide improved means for adapting inverted incandescent gas-burners for use in lanterns for street-lighting."

The patentees propose to use, in combination with one or more bent-tube inverted incandescent gas-burners, a reflector formed with a central aperture, around which is a depending lip-part; the reflector gradually curving down from its outer edge to the depending lip-part and being perforated at one or more places to receive the horizontal limbs of the burners. In connection with such an arrangement (the burners of which have each a separate air-regulating sleeve held in the adjusted position by a set-screw), the improvements provide a special form of set-screw to facilitate manipulation. A separate exteriorly projecting gas-regulator for each burner is also provided, which, being accessible from the exterior of the lantern, permits of controlling the gas supply without having to first open the lantern. A separate stop-cock may also be arranged in connection with each of the burners in addition to the supply cock common to all of them, so as to permit of extinguishing any desired burner. In practice, the gas-regulators and stop-cocks may be combined in one fitting.



Podmore and Thomas's Inverted Burner Street-Lantern.

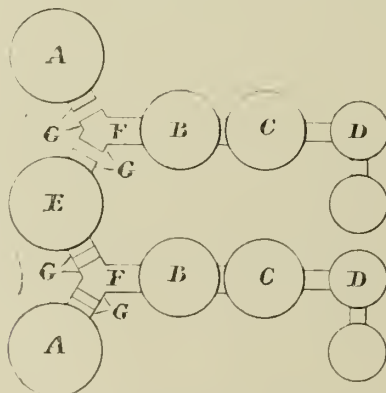
The illustration shows a street-lantern fitted with a reflector, a single burner, and gas and air control devices according to this invention; also a lantern having two burners. The regulating cock employed is shown apart to a larger scale.

Gas-Generating Plants.

BOTLEY, C. F., of Hastings, and CUTLER, SAMUEL, Jun., of Millwall.

No. 8525; April 16, 1908.

As the patentees point out, in plant used for the production of water gas, it is usual to arrange the apparatus in sets—each consisting of a generator wherein the gas is produced, and several subsequent vessels wherein it is carburetted or enriched for illuminating purposes and cleansed. In such sets the generator is subjected to much greater wear



Botley and Cutler's Arrangement of Water-Gas Plant.

and tear than are the subsequent vessels; and hitherto it has been necessary to periodically suspend the operation of the entire set of vessels while the fire-brick linings and other wearable parts of the generator are repaired or renewed. Accordingly, they propose to employ an additional generator, with branches and connections by

means of which it can be coupled up to the carburetting and purifying apparatus, usually working in connection with its own proper generator and be temporarily used in place of the working generator which can be disconnected, and is thus released from duty and can be repaired without shutting down the entire plant. The invention is limited to water-gas apparatus in which the generator is subjected to two distinct operations—namely, the blowing through of air to heat-up the fuel, and the injection of steam through the incandescent fuel to give off water gas.

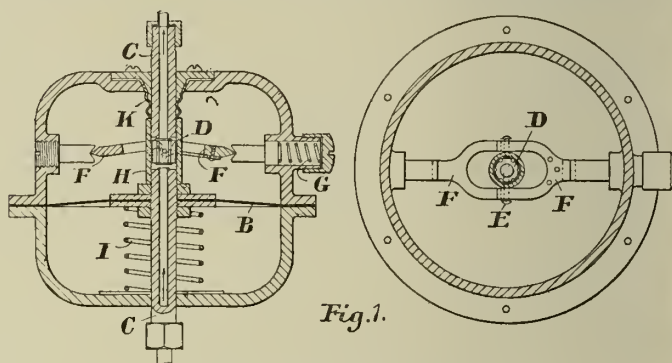
The illustration shows a duplicate gas-plant arranged according to the invention. The plant consists of two or more sets of working vessels each comprising the generator A, and the subsequent carburetting and cleansing vessels B, C, D. An additional generator E is provided between each pair of working generators that communicate with the carburetting and cleansing vessels on either side through pipes F fitted with stop-plates G. Either of the generators A or the generator E can be isolated for repairs while the others are kept working and in communication with the purifying apparatus. In some cases sluice-valves would be used instead of stop-plates or any other equivalent means of closing the aperture. The generator E serves as a reserve for either of the two working generators A, and is used with either one or other of vessels B, C, D, as occasion may require.

Intermittently Supplying Gas to Lamps.

VON POST, G., of Stockholm.

No. 8720; April 21, 1908.

This invention has for its object to obtain sudden interruptions in a current of gas used (for instance) for feeding lamps in flash-lights.



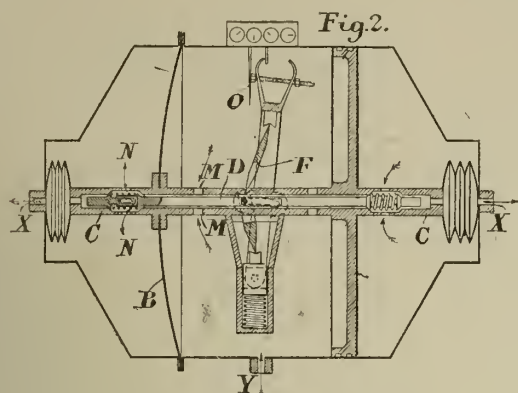
Von Post's Flash-Light Apparatus.

The casing shown in fig. 1 is divided in two chambers by an elastic diaphragm B, through which passes a hollow shaft C, in three parts—two spindles, each provided with a central passage and a connecting screw-collar H, which forms a valve casing, in which a two-sided valve D is enclosed. The valve casing is secured to the diaphragm B; while the valve D, by a transverse pin E, is movably connected to a toggle-joint F, supported by the casing, the stroke of which can be regulated by a spring I acting upon one of its levers or by lengthening or shortening the shaft by turning the screw-collar H in either direction—the two spindles engaged in the collar thereby being moved closer to each other or *vice versa*.

The valve does not engage tightly with the collar over the whole of its circumference, but only so as to ensure its guidance—thus providing an open space, which communicates with the surrounding space in the casing through the apertures in the collar that serve to guide the pin when the latter actuates the toggle-joint. The pin is loosely inserted in the valve, to facilitate the removing of the latter. By adjusting the screw-collar H, the space in which the valve member D moves may be adjusted.

When, for instance, a gas current is introduced through the hollow shaft in the direction of the arrow, the gas passes around the valve member D and out through the apertures in the collar, and fills the space between the diaphragm and the casing and an elastic collar K, which fits tight around the shaft and is secured to the casing by a washer. The gas in this space presses the diaphragm and shaft in a direction opposite to that of the gas current through the shaft; and the valve member and toggle-joint are thus moved in the same direction. When the motion has proceeded so far as to carry the toggle-joint past its middle position, the action of the diaphragm ceases; and then, instead of the diaphragm, the toggle-joint comes into action, and instantaneously moves the valve member D from contact with the upper spindle of the shaft to the contact with the lower spindle, whereby the gas contained in the chamber above the diaphragm can pass away to the burner through the apertures in the collar and the bore in the upper spindle, as the upper arrow illustrates. When the pressure from above on the diaphragm ceases, a spring I, actuating the opposite side of the diaphragm, forces it back again, in which motion the shaft and the valve member will participate, until the toggle-joint again has passed its central position, when the valve member shuts off the passage through the upper spindle and the motions are repeated.

The apparatus described is especially adapted for lighthouses, buoys, and the like, for obtaining intermittent light. It may also be used for gas and liquid meters, and also for obtaining reciprocating motion by fluid pressure. Its application to gas and liquid meters is illustrated in fig. 2. Here the two-sided valve member D is movable in the hollow shaft C, which is connected to the outlet openings X of the casing by flexible connections. The interior of the casing is divided in three chambers by two diaphragms or pistons B, or by one diaphragm and one piston. F is the toggle-joint and Y the inlet opening for the gas or liquid to be measured. In the position shown, the fluid entering through Y passes through the ports M into the hollow shaft, and, further, through the ports N to the chamber on the left side of the diaphragm—filling that chamber and pressing the diaphragm to the



Von Post's Gas and Liquid Meter.

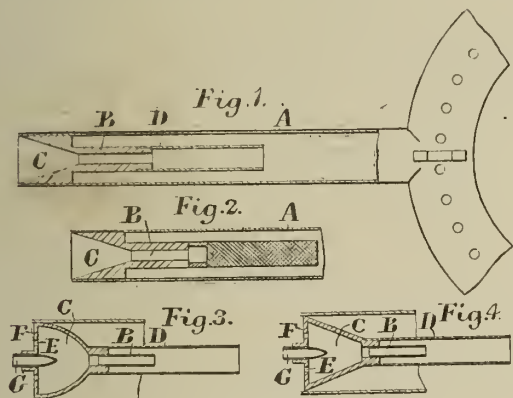
right. The hollow shaft participates in the movement, carrying with it the toggle-joint; and in a certain position of the shaft the toggle-joint is pushed over to its other position, also causing the valve member D to be instantly pushed over in such a position that the fluid from the chamber between the diaphragm and the piston can pass through the hollow shaft to the chamber at the right side of the piston. At each time the toggle-joint is thus thrown over from one position to the other, the valve is immediately opened at one side and closed at the other; so that always the same quantity of fluid is introduced in the chamber before the position of the valve is changed. The toggle-joint in its movement acts upon a lever O, which is connected to a shaft in a dial-train.

Atmospheric Burners.

VAN PRAAG, D. J., of Grosvenor Road, Canonbury, N.

No. 8613; April 18, 1908.

In atmospheric burners of the type in which the gas on being discharged from the service-nozzle passes through a conical mixing-nozzle attached to a supply-pipe of less diameter than the burner-pipe, it has been proposed to provide in a perforated extension of the supply-pipe a tube of wire gauze of substantially the same diameter as the supply pipe. According to the present invention, however, the extension of the supply pipe is formed either of wire gauze or of tubing and of a larger diameter than the supply pipe, and thereby increased economy in consumption is secured, while at the same time this arrangement is said to prevent "burning back."



Van Praag's Atmospheric Burners.

Fig. 1 shows a sectional elevation of the burner; and figs. 3, 4, and 5 show modifications.

In fig. 1, the burner-pipe A is provided with a supply-pipe B, the end C of which (opposite to the service-nozzle) is of a conical convergent character. The diameter of the parallel portion of the supply pipe is considerably smaller than that of the pipe D, which forms an extension of it; while the pipe D is of considerably less diameter than that of the burner-pipe A.

Where the pressure of gas is low, there may be attached a tube of wire gauze (shown in fig. 2) formed of one or more thicknesses, so that the gas, after leaving the supply pipe, passes through it on its way to the burner-pipe.

In figs. 3 and 4 are illustrated forms of the invention in which the service-nozzle G is structurally connected with the burner-tube, the sides of the nozzle C of the supply pipe B in fig. 3 being curved instead of straight as in fig. 4. Holes E are pierced in the base F of the nozzle, in order to supply the necessary air for combustion.

The most important dimension to be determined is the smaller diameter of the conical nozzle of the supply pipe. This may be obtained for a given gas consumption by gradually increasing its cross section until the flame of the burner is perfectly non-luminous. The following proportions are said to give satisfactory results in a burner using about 15 cubic feet of gas per hour when the arrangements shown are adopted: Length of conical nozzle of supply pipe, $\frac{1}{2}$ inch; length of parallel portion of supply pipe, $1\frac{1}{2}$ inch; diameter of ditto, $\frac{1}{4}$ inch; length of extension pipe, 3 inches; diameter of ditto, $\frac{1}{4}$ inch. These proportions may be varied for different rates of consumption. For example, between the rates of consumption of 15 cubic feet and 54 cubic feet per hour, the above proportions may be varied in the following manner: Length of the conical nozzle of the supply pipe may vary from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches; length of parallel portion of supply pipe may remain constant; diameter of parallel portion of supply pipe may vary from $\frac{1}{4}$ inch

to $\frac{1}{2}$ inch; length of extension pipe may vary from 3 inches to $4\frac{1}{2}$ inches; diameter of enclosing tube may vary from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch. With a larger gas consumption the diameter and depth of the conical nozzle and the length and diameter of the supply and extension pipe would be correspondingly larger.

Discharging and Charging Machine for Gas-Retorts.

WEST, J., of Manchester.

No. 9673; May 4, 1908.

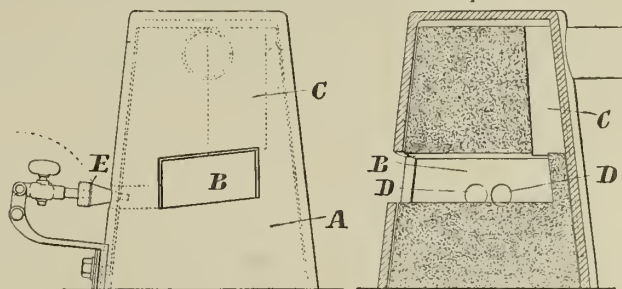
An illustrated abstract of this specification appears on p. 450 of to-day's issue of the "JOURNAL."

Gas-Heated Furnace.

GLOVER, T., of Queen Victoria Street, E.C.

No. 9965; May 7, 1908.

This gas-heated furnace, for soldering irons and other like articles, is formed from a block of fire-brick with a hole or chamber from one side or front (and leading to a flue or chimney) of such a shape and position that the higher or top soldering iron will drop to the bottom when the bottom soldering iron is removed. Thus the operator can manage either iron by one hand, without laying the hottest iron down, while positioning the other, or removing his hand from the work to be soldered. At the same time greater heat is imparted to the furnace by the employment of gas under high pressure.



Glover's Gas-Furnace for Heating Soldering Irons.

As shown, the block A, of fire-brick or like material, is made with a hole or chamber B from one side or the front, for the reception of the soldering irons or other appliances to be heated. This hole—preferably of greater length in one direction than the other—is arranged so that it has a sloping bottom, or is arranged vertically; so that the top iron inserted can roll or drop to the lowest part when the lowest one is removed. The hole B terminates in a flue or chimney C. At or near the base are formed one or more holes D, for receiving high-pressure atmospheric gas-nozzles E; and the block has a cover of cast or wrought iron, having a chimney leading from the flue or opening C of the block.

The gas-flames project against the soldering iron next the burners at the thick part away from the point, and at the same time have action on the walls of the chamber, so as to make it red hot and assist in heating the irons; and so soon as the iron next the burners is removed, the next one rolls into its place so as to be properly heated. The mechanic thus only requires one hand to manipulate the iron.

Extracting Tar, Dust, &c., from Gases.

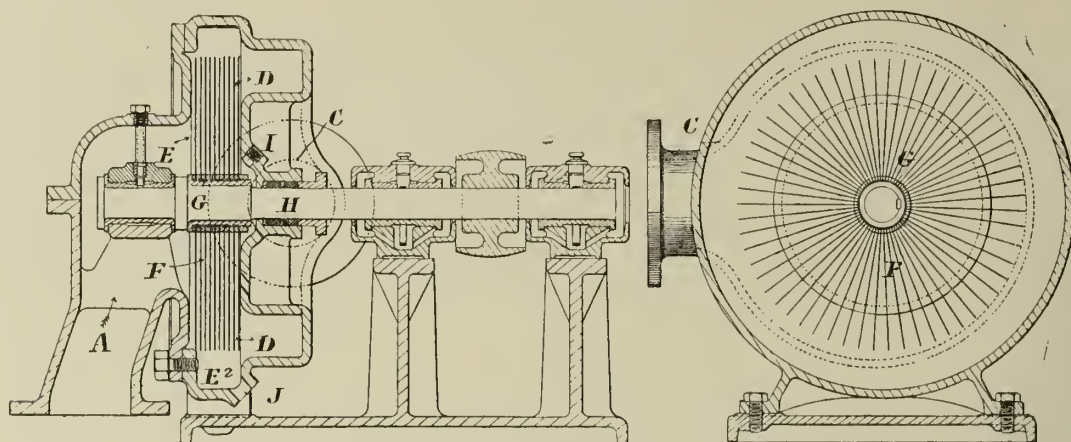
BURSTALL, F. W., of Birmingham University.

No. 10,442; May 14, 1908.

The distinguishing features of this invention (p. 456) are that within the casing through which the gases are made to flow is provided a "rotor" capable of being revolved at a given speed. The rotor is in greater part built up of numerous fine wires, distanced apart and combining during the revolution of the rotor to form "a constantly changing and centrifugally acting sieve and heater" through which the gases must pass, and by which matter in suspension is entrapped and beaten out into a collecting chamber. The flow of gas may be either from the centre of the rotor to near the circumference or parallel to the axis of the rotor; and the water supply may be fed into the centre of the rotor, and be taken off at the boundary collecting chamber. Preferably, the wires are radially disposed side by side and at the back of each other upon a central hub, so that in the thickness of the rotor a considerable number of wires are presented, and sideways the rotor is substantially built of them, with, however, sufficient space between each wire to form circuitous gas-ways. The hub is mounted upon a shaft which drives the rotor at a high rate of speed.

The gas inlet is at A; the outlet at C. An annular chamber communicates with the outlet at D, and with the rotor-chamber between the inlet and the outlet at E. The rotor (diagrammatically shown at F) is composed of the most part of wires mounted radially upon a hub G fixed upon a rotatable shaft or spindle H, supported in bearings. Axially of the rotor the wires are considerable in number, and radially most numerous. They are arranged so that they form a fine wire rotatable brush, each wire of which is distanced apart. The flow of gas is from the centre to near the circumference of the rotor; and thus all gas must flow between the wires in passing from the inlet to the outlet. A water supply is adapted to be brought into the rotor-chamber at I, near the centre, and be taken off at J, which is also the outlet for impurities.

In action, the rotor has a sieving and beating action upon the gas during its flow through the chamber, collecting the tar and other matters in suspension and whirling them into the collecting chamber. The tar particles cling to the wires, and by the centrifugal action are whirled along until they slide or are thrown off the outer extremities



Burstall's Centrifugal Tar Remover.

of the wires. The water is also beaten up and whirled outwardly to the collecting chamber and outlet J.

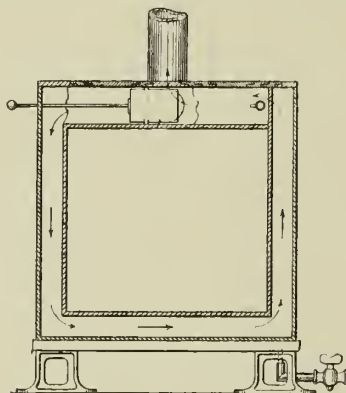
With regard to the object of the invention, the patentee states that no attempt is made to broadly claim the idea of removing tar and other impurities from gases by subjecting them to centrifugal action in an apparatus built with a rotor or impeller; and in the matter of the wires of the rotor, it has hitherto been proposed to replace the usual impeller of a fan by a metallic wire brush. The extractor according to the invention, however, in its operation upon the gases, is quite distinct from other proposed rotors for the same object; and with regard to the metallic wire brush of the fan, the same object is not in view.

Gas Cooking-Stoves.

CANNON, D. W., of West Hendon.

No. 21,016; Oct. 27, 1908.

This gas cooking-stove is of the class "in which the interior of the oven is inaccessible to the gases of combustion from the burners; the oven being enclosed in an outer casing forming a flue or flues, in which the gases of combustion circulate around the oven in an unbroken course and continuously in the same direction circumferentially before passing to the uptake." The inventor proposes to provide such



Cannon's Gas Cooking-Stove.

an oven (as shown) with a heating burner in the upper flue and with an auxiliary burner exteriorly of the stove, to heat the outer casing and thus impart preliminary heat to the air in the flues, or in one of such flues, for inducing a draught when starting the stove. This auxiliary burner may also be used to impart heat to the adjacent portion of the oven by radiation from the outer casing of the stove.

Gas-Cocks.

SPARKS, E., of Tufnell Park, N.

No. 27,005; Dec. 12, 1908.

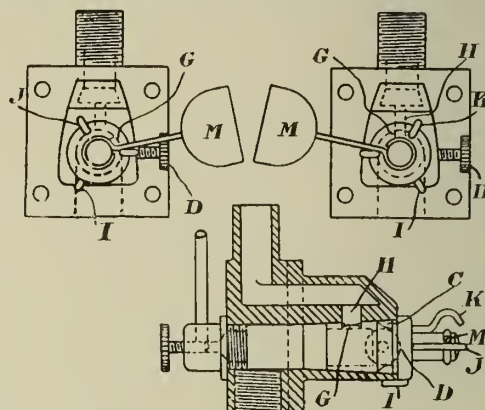
This improvement in gas-cocks, intended to be opened and closed automatically, consists in arranging two parallel chambers with a passage between and having a plug with a hollow bore fitted with a lateral hole adapted to register with the passage. The plug of the cock is both hollow and provided externally with a special form of stop comprising three claws, one of which engages the bracket of the plug to limit its movement, while the other two are struck by a suitable operating device.

The illustration shows, in front elevation, one form of the cock and a vertical section of the casing and plug.

The plug (a taper fit in its casing) is provided with a peripheral groove C into which fits the point of a set-screw D threaded through the casing, so that the plug is retained within the casing while, however, being free to turn therein. As shown, the cock is designed for use in conjunction with the mechanism described in patent No. 11,751 of 1902.

In the plug is a passage G, and with a fixed claw I bent under the lug-casin and serving to limit the rotation of the plug. The passage is adapted to register with another passage H in a partition in the casing. Claws or projecting arms J K are also fixed upon the plug in the positions shown, so that the weight of a lever arm M (loosely pivoted on the projecting end of the plug) falling on either arm will turn

the plug in that direction until the claw I stops its movement. When the lever is again tilted over through the vertical until it falls upon the opposite arm J or K, it will turn the plug in the opposite direction. These two positions of the plug correspond one with an open and the



Sparks' Automatic Lighting Cocks.

other with a closed position; so that in the one case gas passes, and in the other case gas cannot pass out through the passage G. The action of the falling lever arm is in a downward direction on to the projecting arms, which arms, it will be noticed, are arranged one on each side of the outlet or passage G.

APPLICATIONS FOR LETTERS PATENT.

- 10,417.—NEWHOUSE, W. A., "Supports for mantles." May 3.
 10,456.—PRALON, L., FRANCON, I., and FOURNIER, G., "Distributing gas, &c." May 3.
 10,473.—MÜCKE, J., "Burning-off mantles." May 3.
 10,518.—PROSSER, H. R., "Burners." May 4.
 10,562.—MURRIETA, C. DE, and TULLY, C. B., "Separating liquids from gases." May 4.
 10,603.—CUTLER, S., JUN., "Charging vertical retorts." May 4.
 10,648.—HONIG, A., "Meters, pumps, &c." May 5.
 10,664.—GLOVER, R. B. G., "Regenerative burners." May 5.
 10,672.—LOOMIS, O. P., "Indicating explosive pressures in gas-engines." May 5.
 10,706.—ANDERSON, D., "Controlling gas." May 5.
 10,723.—WHITEHEAD, H. F. C., "Reducing valves." May 6.
 10,743.—BRAY, A., "Supporting globes of inverted burners." May 6.
 10,745.—WEICKERT, M., "Mantles." May 6.
 10,765.—OTTO-HILGENSTOCK COKE-OVEN COMPANY, LTD., "Removing tar from hot gases prior to the recovery of ammonia." A communication from C. Otto and Co. May 6.
 10,903.—MÜCKE, J., "Mantles." May 8.
 10,906.—BARNETT, H., and BROWN, T., "Compressing gas, air, or vapour for gas-lighting purposes." May 8.
 10,934.—HANSFORD, J., and WRIGHT, J. F., "Prepayment apparatus for the supply of gas." May 8.
 10,941.—WADDELL, A., and BRYAN DONKIN COMPANY, LTD., "Gas-mains." May 8.
 10,945-6.—EHRICH AND GRAETZ, "Inverted lamps." May 8.

Birmingham Water Supply.—The report of the Birmingham Water Department for the twelve months ended March 31, shows an increase of £5903 in water-rents, including, for the second half of the year, £2500 received from Coventry in respect of the supply from Shustoke. The total increase is at the rate of 2.05 per cent., or 1.18 per cent. omitting the Coventry supply. The revenue shows a gross profit of £201,304, as against £198,552 a year ago. The charges on capital account amount to a net total of £281,962; and there is thus a deficiency for the year of £80,658. The deficiency has been covered by: Contribution from the borough fund and rate account, £65,000; transfer, to cover the balance, from capital account, under section 22 of the Birmingham Corporation Water Act, 1902, £15,658. As regards the estimate for the coming year, the Committee have requested the Finance Committee to provide from the rates the sum of £65,000; being the same amount as in the account now presented. The average daily distribution of water for the year, within the area of supply was 19,393 million gallons, compared with 18,549 millions the previous year.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Local Government Board Audits and the South Metropolitan Gas Company.

SIR,—We annex the Local Government Board Auditor's full judgment on the Gas Company's contention for a surcharge on the Bermondsey Borough Council. It will be seen that it exonerates us, and disposes of the Company's main contentions.

It is no easy task to trace, through the extended reports, the objections raised and reported in the "JOURNAL" and in all the local Press—involving in one instance a search of thirty-four paragraphs and reports. But the Company's points may be summarized in the following extracts from the newspaper reports.

That the whole or the greater part of the charges were included in the contract quinquennial commission. This is absolutely negated by the Auditor's first paragraph.

That we had taken advantage of our employment by all four parties to the appeal to charge each £5 5s. a day on work common to all—in fact, that we had "charged four times over for everything," and that we had charged "120 guineas for ten conferences," &c., &c. The Auditor, in the third and following paragraphs, disposes of this equally absolutely, and records that for joint work—i.e., for the benefit of the four separate litigants—our maximum was £10 16s. a day, and that we had also charged less than the time occupied. In fact, it was proved to the Joint Auditors that, pooling the accounts as if for one party, we had received in the whole districts nine guineas a day for the joint work—a sum exceeded in every other instance without objection where supporting witnesses had been acting for other bodies, but limited to two employers against our four-fold responsibility and as leaders.

The last paragraph, on the main question of letters, is the one exception. There the Auditor judged the scale for letters at 1s. 6d. less than our charge—reducing it to a solicitor's scale, whereas we had followed the admitted custom with surveyors.

To focus the results. The objectors claimed to surcharge our four sets of clients to a total of £2107. The actual results, after five months' tests before separate Auditors, are as follows: In two Unions, the payments have been confirmed; the Company in one case not putting in an appearance. In the third, as the Auditor confirms, we voluntarily allowed an abatement which we had offered in our first account.

One body only of the four is threatened with a surcharge to the amount of £143 16s. (the objectors claiming £846). There the Guardians protest that their payment is regular, and resist the surcharge.

As our last words on the subject, we and our employers have been exposed to great labour and risks by these unfounded objections. We shall, however, continue our duty fairly and without prejudice, with the hope that under the new auspices more peaceful counsels will prevail with the Company. We have confidence that differences will be narrowed in the future, to the advantage of both ratepayer and shareholder.

Seeing the wide circulation given to the Company's reflections on our alleged "exorbitant" charges, we venture to ask prominence for the annexed official refutation.

THOS. DINWIDDY AND SONS.

54, Parliament Street, S.W., May 14, 1909.

[ENCLOSURE.]

BERMONDSEY BOROUGH COUNCIL.

Report of the Local Government Board Auditor, E. Carson Roberts, Esq., on the South Metropolitan Gas Company's Objections to Messrs. Thomas Dinwiddy and Sons' Appeal Charges.

Objections based upon several grounds were raised against the payment of £775 15s. to the firm of Valuers, Thomas Dinwiddy and Sons, for their services and expenses in connection with the South Metropolitan Gas Company's rating appeals.

It was suggested that much (or some) of the work for which special charge was made at five guineas per day, was in fact covered by the previous payment of 15s. per cent. for the original valuation. I have examined the accounts of the special work, and do not find any items which are open to this objection.

A more important question was raised, as to whether the fact that three other authorities were also being charged for some of the days spent upon joint work was not one of which account should be taken in deciding as to the lawful and proper amount to be paid for this work. I have held that this fact, being known to the Council at the time when the bill was presented for their consideration, was one which should have been inquired into and dealt with before settling the payment.

On inquiry at audit, I found that the days for which charge was made at the full contract rate of five guineas in the Bermondsey bill, did not include all the days which had been spent upon joint work on behalf of the Bermondsey Council and other respondent authorities; and that the charges included in the bill in fact worked out at £10 14s. per day on the Bermondsey proportion of this joint work.

I have given what I think is reasonable weight to the argument that, on account of the added responsibility, something more than a fourth or a third of the day rate should be paid by an individual employer in respect of a day devoted to joint work on behalf of four or three employers; and in reducing the charges made in the Bermondsey bill, I have allowed on the basis of eight guineas a day for such work.

The charge at the rate of 5s. each for 121 letters has also been reduced by £10, on the ground that it was excessive—more particularly in view of the fact that some of these letters were practically identical communications to the several authorities.

The total amount which I have disallowed out of this bill is £115 17s. 9d.; and this disallowance has been fully satisfied by a refund of £122 17s. [N.B.—Messrs. Dinwiddy had, in May, 1907, offered a rebate of this amount, £122 17s., on condition that their account was promptly settled without contention.]

(Signed) E. CARSON ROBERTS.

The Clacton Flour Mills (among the oldest of their kind in Essex) were burnt to the ground on Saturday; and the loss is estimated at £8000. It is thought that the origin of the fire was an escape from the suction-gas plant in use at the mills.

PARLIAMENTARY INTELLIGENCE.

GASLIGHT AND COKE COMPANY BILL.

This Bill last Thursday came on for consideration in the House of Commons, "by order." On the formal motion being made,

Mr. W. THORNE, who for some weeks past has had a notice on the paper for its rejection, said it was his intention to detain the House for only a few moments. The Bill had a very far-reaching effect—it affected thousands of gas consumers in the borough of West Ham and district. The reason he had put down the resolution that stood in his name was because there had been some disagreement between the Gaslight and Coke Company and the West Ham Corporation. But he was under the impression that between now and the final stage of the third reading of the Bill, there was a possibility of an agreement being arrived at between the Company and the Corporation; and for this reason he did not intend to move his resolution.

The Bill was then formally considered, and ordered to be read the third time.

HARROGATE GAS BILL.

The Unopposed Bills Committee of the House of Commons presided over by Mr. ALFRED EMMOTT had again before them the above Bill (see *ante*, p. 381) last Thursday.

Mr. BROWN, on behalf of the Parliamentary Agents for the Bill, said it was before the Committee last week, but the further consideration was adjourned for a week for the purpose of considering a communication received from the Home Office, in which two points were raised—one in regard to the powers the promoters took in clause 28a of the Bill, which the Home Office said would enable them to supply power gas, and the second with regard to the exemption of fittings, in certain circumstances, from the law of distraint. On the first point, the promoters proposed to take power for the occupiers of certain premises to generate power gas on the premises. The Speaker's Counsel thought the promoters ought on this point to insert the clause suggested by the Home Office. This clause he proposed to insert in the Bill. The clause was for the purpose of protecting persons occupying premises in which power gas was used. On the second point, clause 29 of the Bill proposed to exempt gas-fittings let on hire from being taken in distress. There was also a special clause only exempting the Company, after the passing of the Act, if the fittings were marked. The Company's fittings on hire were of the total value of £7000; and the Company wished to prevent their being taken in distress or under bankruptcy proceedings. The practice of letting fittings on hire was common.

Mr. CALDWELL (Vice-Chairman of the Committee) asked what was to hinder the promoters from putting their mark on fittings which were their property?

Mr. BROWN: Nothing at all, if we can get access to them.

It was subsequently arranged to strike out from sub-clause 3 of the Bill the words "in the case of any fittings which the Company may let on hire after the passing of this Act." Subject to this arrangement, the Bill was ordered for reporting.

OLDHAM CORPORATION BILL.

Local Legislation Committee—Wednesday, May 12.

(Before Sir FRANCIS LAYLAND-BARRATT, Chairman, Mr. HARRISON BROADLEY, Mr. J. S. FLETCHER, Mr. E. GARDNER, and Mr. HALL.)

The Bill promoted by the Oldham Corporation (see *ante*, p. 388) was again under consideration to-day, for the purpose of adjusting clauses in regard to gas and water.

Mr. JEEVES (who appeared with Mr. BALFOUR BROWNE, K.C., and Mr. WEDDERBURN, K.C., for the promoters) stated that there were two sets of clauses now before the Committee—one with regard to water, the other with regard to gas. He proposed to deal first with the water clauses, because it was recognized that there had been a decision of the Committee there. First of all, by reason of the arrangement with regard to the gas, they were able to absolutely repeal both section 96 of the Act of 1865 and section 55 of the Act of 1880. The decision of the Committee only went to the repeal of these two sections so far as the water was concerned; but they got rid of them for both purposes by reason of the agreements. Also, part of the gas agreement involved the repeal of section 30 of the Act of 1886, which prescribed a certain limitation of profits. It would be more convenient for them to deal with this when they came to the gas. Then there were certain consequential alterations as to omitting clause 64a. This was on gas. The first new clause was the application of water revenue. There they had followed, to a very considerable extent, the clause as it was settled in Bolton, and as it had been settled in many other cases where the application of water revenue was dealt with. The only thing was that they had had to provide for the exceptional cases of the Oldham Corporation, because part of the consideration that they paid for their undertaking was in the shape of permanent annuities, or, at all events, irredeemable annuities; and they had to provide for them. Then there was a question with regard to the reserve fund; and the arrangement that was come to there was this—that there should be a limit to the reserve fund of £80,000, and that not more than $\frac{1}{3}$ per cent. on the aggregate capital expenditure should be paid to the reserve fund in any one year, except in such years as the amount in the reserve fund was less than 25 per cent. In such cases the Corporation were to be entitled to have the whole of the amount of the profits they made. The reason for this was that a provision was made for using the amount in the reserve fund in the management and general purposes of the water undertaking. But while this was done, they had to pay 3 per cent. from the revenue

to the reserve fund. The intention was that, by means of the reserve fund being utilized in this way, there should be found the necessary working capital; and this working capital for the water was a matter of £25,000. That abolished "carried forward." The way this would work was that any profits they made up to £25,000 would have to be put into the reserve until it became £25,000. The alternative would be to keep them in "carry forward," and have a reserve in addition, because they must have a sum of £25,000 to carry on with. In the next sub-section, they provided as to the transfer to this new reserve fund of any money that might be standing to the credit of the old reserve fund—they provided that it should be transferred. This money, as a matter of fact, might, instead of being applied to the reserve fund of the Corporation and pass under their powers, have been transferred to the borough fund; but they had agreed that the proper way to deal with it was to transfer any money in this reserve fund to the new reserve fund. In the first sub-section, they had dealt with the purposes for which this reserve fund might be applied. They were: "Meeting expenses caused by accidents and other contingencies, or to answer any deficiency at any time happening in the income of the Corporation from the water undertaking, or to meet any extraordinary claim, demand, or expenditure in respect of the water undertaking, or to the renewal of works or mains." In the clause they repealed, they had a power for utilizing the old reserve fund for the purposes of enlarging or improving the works. Sub-section 3 merely dealt with the provision that, when the annual proceeds of the annuity redemption fund should be equal to the amount they had to pay for annuities, then the whole of the income should be transferred to the revenue of the water undertaking for the benefit of the consumer. Then there was the question of inspection; and they had agreed with the authorities that they should be entitled to inspect once in each year, each authority, and that the inspection should not go more than three years back. The next new clause was a limitation for water-rent for other than domestic purposes beyond the borough. By this clause the rent payable to the Corporation for a supply of water other than for domestic purposes outside the borough should not exceed the additional rate already paid in respect of domestic supply. This was in exact accordance with the decision of the Committee. Counsel proceeded to deal briefly with other new clauses concerning water.

In the course of discussion,

Mr. BOYCE (representing the Local Government Board) suggested, with regard to the provisions concerning using the reserve fund for the purpose of working capital, that it would be much better to take borrowing power for working capital instead of taking the income from the reserve fund or the *corpus*, as he understood they might take, of the reserve fund.

Mr. JEEVES said they could utilize the *corpus*, but they could not take it—it was always there. What they had to consider with regard to the reserve fund was that it was money which they were not bound to set aside for this purpose. It was money set aside for special purposes of the undertaking; and one of these special purposes—both the Corporation and the petitioners agreed with regard to it—was essentially working capital. What it meant was that, to the extent that they utilized it for the time being for working capital, they had reduced their "carry forward." The effect of this would be that there would be no need for any carry forward. Whenever, after they had got their reserve fund to a given state, there was a sum sufficient to allow a reasonable reduction of water-rent, it would be applied automatically.

The CHAIRMAN: If we grant this clause, it is not to be taken as a precedent in any way for dealing with any other water authority. The Oldham Corporation had certain rather large out-of-the-common powers with regard to their water revenues; and what we are dealing with now is that we are modifying their powers on the application of the people in the outside area. Any decision we give is based only on the special circumstances of the case, and the rights and legal position of the Corporation and of the opponents.

Mr. JEEVES said there was another factor of distinction on the top of those mentioned—namely, that the clauses, as here, were the clauses the petitioners, as well as the Corporation, asked them to put in.

The CHAIRMAN said that was right.

Clause 18a, dealing with the application of water revenue, was passed, as also were clauses 18b [limitation for water-rent for other than domestic purposes beyond the borough] and 18c [gratuitous supply of gas and water to hospitals], the latter with a slight amendment.

Clause 64a was next brought up and considered. It was as follows:

Application of Gas Revenue.

(1) As from the commencement of the financial year next after the passing of this Act, the Corporation shall keep accounts in respect of their gas undertaking separate from all their other accounts, distinguishing therein capital from income, and shall apply the revenue of such undertaking as follows—that is to say: Firstly, in payment of the costs charges and expenses of, and incidental to, the collecting and recovering of the revenue of the gas undertaking; secondly, in payment of the working and establishment expenses and costs of management and maintenance of the gas undertaking; thirdly, in providing the moneys required to pay the annual sum for the time being payable by way of annuities created for the purchase of the gas and water undertakings and apportioned to the gas undertaking, and the interest on the moneys borrowed or reborrowed by them in respect of their gas undertaking; fourthly, in providing such portion of the annuity redemption fund provided in pursuance of the provisions of the Oldham Corporation Gas and Water Act, 1853, as is applicable to the annuities apportioned to the gas undertaking and the requisite appropriations, instalments, or sinking funds for the repayment of the moneys borrowed for the purposes of the gas undertaking; fifthly, in payment to the borough fund of an annual sum of £7500; sixthly, in making good to the borough fund any deficiency in the revenues of the Corporation in respect of the gas undertaking which may at any time hereafter have been provided out of the borough rate or borough fund; seventhly, in providing a reserve fund for the gas undertaking, if they think fit, by setting aside in any one year such sum not exceeding an amount equal to 1 per cent. of the aggregate capital expenditure on the undertaking, or, if the amount standing to the credit of the fund shall be not less than £50,000, such sum, not exceeding £1000, as they shall think reasonable, and (subject as in this section hereinafter provided) investing the same, together with the sum hereinafter in this section directed to be transferred to the said fund, and the resulting income thereof, in statutory securities, and accumulating the same at compound interest until the fund so formed shall amount to a sum equal to one-tenth

of the said aggregate capital expenditure, which fund shall be applicable as the Corporation think fit in meeting expenses caused by accidents and other contingencies, or to answer any deficiency at any time happening in the income of the Corporation from the gas undertaking, or to meet any extraordinary claim, demand, or expenditure in respect of the gas undertaking, or to the renewal of works or mains, and so that, if the fund shall at any time be reduced, it may thereafter be again restored to the limit hereinbefore prescribed, and so often as such reduction shall happen. Provided that the Corporation may resort to the said reserve fund for the above purposes, notwithstanding that the same may not at any time amount to the limit hereinbefore prescribed. Provided also that the Corporation may use any moneys for the time being standing to the credit of the said reserve fund for and in the management and general purposes of the gas undertaking, and in such event they shall pay to the credit of the fund, out of the revenue of the gas undertaking, interest at the rate of £3 per cent. per annum during the period of use on so much of the fund as shall be so utilized. And any balance remaining in any year shall be carried forward to the revenue account of such undertaking for the next succeeding year, and shall, whenever and so soon as there shall be an amount sufficient for the purpose, be applied to the reduction of the gas charges equally throughout the limits of supply.

(2) Any sum standing to the credit of the gas-works reserve fund formed in pursuance of the powers contained in section 55 [reserve funds to be set apart for gas and water purposes] of the Act of 1880, after deducting therefrom any payments in respect of liabilities incurred before the 25th day of March, 1910, and which but for the repeal by this Act of such section might have been, and which the Corporation shall direct to be made therefrom, shall be transferred to the reserve fund by this section authorized.

(3) The annual proceeds of the portion of the annuity redemption fund provided in pursuance of the provisions of the Oldham Corporation Gas and Water Act, 1853 (notwithstanding anything to the contrary in section 48 of that Act contained), in any year in which the same shall amount to a sum equal to, or greater than, the annual sum for the time being payable by way of annuities apportioned to the gas undertaking, and the annual proceeds of the reserve fund by this section authorized, when such fund shall for the time being amount to the limit in this section hereinbefore prescribed for such fund, be carried to the credit of the revenue of the gas undertaking.

(4) Each of the Local Authorities within the limits of supply of the Corporation may, once in each year, after giving reasonable notice to the Corporation, inspect such separate accounts by a person appointed by such local authority for that purpose, provided that any such inspection shall be limited to the accounts for the three complete years last preceding the inspection.

Mr. JEEVES explained that the same principles exactly applied to the gas revenue; but there was a different position. The position had been that in the past the gas charges of the Corporation had been altered from time to time by agreement or by Act of Parliament. Originally, the only limitation on the Corporation with regard to the charges for gas was a maximum price, as in the case of water. Then, under the Act of 1880, they heard that, incidentally to the water part of the Bill, there was an agreement come to whereby these extra charges were to be limited to 2d. per 1000 cubic feet. This, again, came up for review in 1886, and the extra 2d. was abolished. But as against this, the Corporation were to be entitled to charge 6 per cent. in respect of the capital moneys. Out of this 6 per cent. they, of course, had to pay the sinking fund and interest; but this defined the margin of profit they might make. Incidentally, also, with regard to the gas, there was the same position with regard to free gas and free water. In point of fact, they had the free gas as they had had the free water. The outside authorities in 1886 contested this before the Courts, up to the Court of Appeal; and it was held that the Corporation were entitled to have it in addition to what profits they could make out of the percentage allowed under the Act of 1886. On this percentage a profit had been made, in addition to whatever the year's supply was worth, of a certain number of thousands, varying according to the position of the capital account every year since 1886. The arrangement that had been come to with the petitioners was that they would abolish this 6 per cent. altogether, and determine once and for all, they hoped, the sum which, whether the undertaking got larger or remained as it was, should be transferred to the borough fund at the expense of the consumers—the expense, of course, of the consumers in the borough as well as in the outside districts. This had been agreed at a sum of £7500. With this exception, the clauses followed absolutely the clauses with regard to water. The only other difference from the water was that there was the differential charge for water for domestic purposes, and no differential charge for gas.

Mr. BOYCE: The £7500 a year you take for the public supply?

Mr. JEEVES: No; not for the public supply. It is the amount of profit which may be made from the gas undertaking by the borough fund of Oldham. With regard to the free supply, of course the clause we have already dealt with deals with that. We abolish the power of free supply; and we are to pay according to the rate we have talked about.

The CHAIRMAN: Your charges for gas are now equal throughout the whole of the area?

Mr. JEEVES: Yes; and they have been since 1886, both for public and private purposes.

Mr. FLEETWOOD PRITCHARD (who appeared with Mr. Honoratus Lloyd, K.C., in support of the petition of the Failsforth Urban District Council): The Corporation for public purposes took free gas.

The CHAIRMAN: But now they are obliged to pay for the gas they take.

Mr. JEEVES: That is to say, we conceded on the one hand what you had said was right with regard to the water.

Mr. BOYCE: What is your actual charge for gas now?

Mr. JEEVES: The lowest charge is 1s. 9d. per 1000 cubic feet—it is round about 2s. on the average. Our maximum charge is 4s. 6d.

Mr. HALL: What would be the value of the gas supplied free to the Corporation? What has it been estimated at?

Mr. JEEVES: If you worked it out at the 1s. 9d. rate—that is, the full rate without any 10 per cent.—it would be something like £7000 last year—I am speaking from memory. Since 1886, it comes to a sum of something like £50,000.

Mr. HALL: So that you are now going to pay for it and get £7500 back?

Mr. JEEVES: But, in addition to this, out of our 6 per cent. we made a profit of £7000 or £8000. We have practically agreed with our

opponents really to halve the profits that we have made in the past; and that portion in the past has been an increasing one.

Mr. BOYCE: Then there is the 10 per cent. which they can charge for public lighting.

The CHAIRMAN: But they have to do the same for the outside area. I think your position practically is this—that your gas profits, *plus* your free gas, were practically equivalent to £15,000 a year.

Mr. JEEVES assented.

Mr. PRITCHARD: We say it was rather more than that.

The CHAIRMAN: I am taking it on the basis on which the negotiations were carried out. The outside people said: "We will let you take half of the old charge for gas." The fact is that you are giving the borough fund the profits, excluding what they made by free gas.

Mr. JEEVES: That is really what it comes to. We retain the profits, and we give up free gas.

Mr. PRITCHARD: It is not quite as much profit, as a matter of fact.

Mr. BOYCE: Are they going to use this reserve fund for gas working capital? Does what you said as regards water apply to gas?

Mr. JEEVES: Exactly.

Mr. BAKER (who appeared as Parliamentary Agent for the Saddleworth Urban District Council, and the Springhead Urban District Council) said he had a point to raise on this clause. He understood it was agreed between the parties that the £7500 should be non-cumulative—that if the Corporation did not earn sufficient to pay the £7500, they should not pay it out of future profits, or build up a fund possibly which might amount to a very large amount, and pay it in some subsequent year; but that each year should stand on its own basis. If there was sufficient to pay the £7500 it should be paid, and not otherwise. This was not quite expressed in the clause as printed.

The CHAIRMAN: The clause reads: "Shall, out of the revenue of such undertaking," do as follows. And then it did certain things. It was out of the revenue of the undertaking.

Mr. JEEVES stated that Mr. Booth, who instructed Mr. Pritchard, and who had been very instrumental in all these negotiations, agreed that the position was a sum of £7500 per year. Of course, if in any year they did not happen to make their income, they would be entitled to go to the reserve fund for that as for any other purpose, just as in the old days they could get their full 6 per cent., whatever happened. But the position, as put here, absolutely carried out the arrangement that was agreed between the parties.

Mr. PRITCHARD agreed. This was the arrangement that was come to. He quite appreciated the fact that, as a matter of practice, at any rate they would get their £7500 a year regularly.

Mr. BOYCE: But would that be obtained under the alternative "sixthly"?

Mr. JEEVES: It comes under the words "deficiency of income." If the income was not sufficient without, then the £7500 would be made up out of the reserve fund.

The CHAIRMAN: Your position is this, that the Oldham Corporation own at present a profit-making undertaking, and under the new arrangement the outside area becomes a partner in the undertaking; but you get in exchange a fixed annuity for handing over your exclusive interest. That is what it comes to.

Mr. JEEVES said that was so. He was told that the profits of last year were £9000.

Clause 64A, with a slight amendment, was then passed and added to the Bill.

On clauses 55 and 56—"Appropriation of lands for storing gas, and power as to manufacture of residual products," &c., the Local Government Board made the following report:—

In connection with the proposed appropriation of lands under these clauses, the Board suggest that, unless the lands have been acquired, and are now held by the Corporation for purposes of the gas undertaking, the Committee should consider whether provision should not be made in the Bill for the payment to the fund out of which the lands were purchased of a reasonable sum, by way of rent or otherwise, as consideration for the appropriation to the purposes authorized of land acquired for other purposes. For precedent, see the proviso to sub-section (1) of section 25 of the Manchester Corporation Act, 1908. In this connection, it is to be observed that, according to the deposited estimate, the borrowing power of £200,000 referred to in paragraph (i) of clause 97 includes an item of £1800 for the purchase of lands and easements, although no express authority for such purchase is given by the Bill.

Mr. BOYCE inquired whether the estimate referred to in the report had been brought before the Committee.

Mr. JEEVES understood that the lands on which it was proposed to erect this new storage capacity were already lands appropriated to gas-works purposes. He was told they were only appropriated in this sense—that they had been purchased by the Corporation with this particular object, and they adjoined land actually used for this purpose. With regard to the question of the necessity of this storage, probably the better thing would be to put in a witness to tell the exact position. They had had a certain amount of this information; but they would hear that there was urgent need for the additional storage proposed to be provided under these clauses.

Mr. T. Duxbury, the Gas Engineer to the Corporation, gave evidence to the effect that the site proposed was suitable for the requirements, and the Corporation had exclusively purchased it for the purpose. The increased consumption urgently demanded additional provision in the way of storage capacity. At present they had only storage capacity of about twelve hours at the Hollinwood works, which had caused them to use the carburetted water-gas plant in the winter, in foggy weather, at its fullest extent. Should the water-gas plant break down, they would practically be without gas within twenty-four hours. The effect of the additional storage would be that they would probably use the water-gas plant simply as an emergency plant.

Clauses 55 and 56 were passed, after further discussion between the parties, as also was clause 57—"Anti-fluctuators for gas-engines," and other clauses.

Mr. Duxbury subsequently gave evidence as to the estimates of the works proposed to be carried out.

A long discussion ensued, in the course of which

The CHAIRMAN intimated that the Committee were very doubtful whether, in the absence of a plan, and in the absence of much more

carefully prepared estimates than they had before them, they were willing to absolutely give the borrowing powers asked for.

The new clause 18d was passed in the following form:—

The Corporation shall in each year credit the revenue account of the water undertaking, or the gas undertaking, as the case may be, with an amount for the water or gas consumed for public purposes or used by the Corporation for their own purposes, calculated in each case at such rate not being more than 10 per cent. below the rate chargeable and charged to private consumers for a corresponding supply as they shall determine. Provided that the same reduction (if any) shall be made in the rate charged for water or gas supplied for a like purpose to every local authority within the limits of supply of the Corporation. Provided also that the rate charged for all water supplied to public baths within such limits shall, if the same be situate within the borough, be at the rate of 5d. per 1000 gallons, and if situate outside the borough, at the rate of 6d. per 1000 gallons.

Mr. William Newbigging, recalled, testified that at the time the estimates were made out he satisfied himself that the amount that they had down as to the cost of the tar-works, as the cost of the residual works, was a right and proper sum. So far as the estimate was concerned for the other portion of the works, he also went through the Engineer's estimates and saw that they were right. But in the estimate he made, he put it in rather a different form. He first of all ascertained to what extent the works were deficient, and then he looked forward and endeavoured to ascertain what amount they would be likely to require during the coming ten years. In order to do this, he went back ten years to see what growth had taken place during that period. Roughly, this was the way in which he based an opinion as to the amount of capital that would be required by the Oldham Gas Department during the next ten years. This was in reference to both works and mains—new works. With regard to stoves and prepayment meters, the amount the Corporation were asking for (£60,000) was just about the figure that he would have asked for, not knowing what had been spent during the last ten years. They knew that the cost of works was so much per million cubic feet of gas sold, and that the cost of distributing plant was again so much per million cubic feet sold. Without any arrangement, it so happened that the amount of £60,000 which they were asking for was just about the figure. He handed in tables, and said he had divided the money up in the way suggested by the Committee. The new gasholder was £51,600. This was based on the capacity; and he had taken it at £10, the same way that Mr. Duxbury had done. He next gave evidence as to purifiers and buildings, and, with regard to new works, said that the Corporation had not asked quite as much money as they should have done. They should have asked for more. He would have advised them to do that had they not already settled the sum before he was called in. With regard to the division of the £60,000, £25,000 had been put down for mains, £30,000 for stoves, and £5000 for prepayment meters. For the purpose of the life, he would put together stoves and meters. With reference to the thirty years, the prepayment meters and the stoves had a short life; but the mains had a long one—40 or 50 years. As a matter of fact, they were taken out because they got too small. Say the average life as between the meters and the mains would be 30 years. When he saw this sum of money down at thirty years, he thought that they would have to go before the Local Government Board for the capital, and they would then apportion it out into its right parts. They always took the average life of a gas-works at 30 years.

Mr. A. Andrew, General Manager of the Oldham gas undertaking, stated that they put in a sum for mains which was equivalent to what they had spent in the last ten years. From his knowledge of extensions, he had no reason to suppose that the rate of increase in the requirements of new and enlarged mains the next ten years would be less than in the last ten years; on the contrary, he expected it to be more. He had applied the same reasoning with regard to meters and stoves for the purpose of getting at the estimate of £35,000. The gas authority had considered the question of the holders at Hollinwood, and had decided to proceed with the work subject to the necessary borrowing powers. They had also decided to proceed with the additional storage at Higginshaw, after the one at Hollinwood.

The CHAIRMAN said: After consideration, and in view of the evidence which has been given by Mr. Newbigging, the Committee are prepared to grant these sums; but at the same time I think they are unanimous in agreeing with me that it would have been much more satisfactory if some plans had been submitted with regard to the works that were carried out, and we had had more definite evidence as to the resolutions of the Council.

On the consideration of the question of the periods,

The CHAIRMAN inquired, after what had been said by the Committee, what it was asked they should give them thirty years for.

Mr. JEEVES said they would ask the Committee to give the thirty years for the gasholder at Hollinwood, £51,600; the boundary wall, £4600; additional gasholder storage, £33,000; and the distributing mains, £25,000.

The CHAIRMAN said the Committee were prepared to give the thirty years for the £51,600, the £4600, the £33,000, and the £25,000 for mains. With regard to the £30,000 and the £5000 for stoves and meters, ten years would be given. They were willing to give twenty years for the remainder of the items, which came to £49,000. The clause in the committed Bill in which the amounts would be mentioned in these terms would have to be amended.

Finance and other parts of the Bill were next dealt with.

A successful gas exhibition, promoted by the Great Grimsby Gas Company, was recently held in the King's Hall in the town. There was an excellent show of cookers, fires, &c.; while up-to-date gas lighting was demonstrated by means of an installation of Keith high-pressure inverted lamps. A series of practical cookery lectures by Mrs. Springthorpe added to the interest of the show. The exhibition was opened by Mr. William Bennett, J.P. (the Chairman of the Great Grimsby Gas Company); and in proposing a vote of thanks to him for performing the ceremony, Mr. David Smith (the Chairman of the Cleethorpes Gas Company) said he thought the Directors and the Engineer (Mr. John Terrace) were to be congratulated on the excellent display.

LEGAL INTELLIGENCE.

Charge for Coal-Trucks Left on Sidings.

In the King's Bench Division last Wednesday, Mr. Justice Channell and a Special Jury had before them a case in which the Midland Railway Company sought to recover from Messrs. Myers, Rose, and Co. certain sums arising out of a notice they had issued to the effect that after Aug. 1, 1905, they would charge 6d. per day per truck for coal-waggons kept on their "wait-order" sidings for more than three days after the day of arrival, waiting instructions from coal-factors as to their ultimate destination. It had been held by the House of Lords, in an appeal arising out of the same case, that the plaintiffs were limited to making a "reasonable" charge; and this therefore was the point which the Jury had to decide. The Railway Company admitted that the sidings were a convenience to themselves; but they urged that they were also a convenience to their customers, and constituted a service which the Company were under no obligation to render. The charge, it was stated, was necessary because in a number of cases the sidings had become congested through factors allowing their trucks to remain on them. The Jury found that a charge of 6d. per day per truck, after three clear days, was reasonable; and judgment was therefore entered for the Midland Railway Company.

Mantle and Burner Frauds at St. Helens.

Last Saturday week, the St. Helens Magistrates had before them George G. Wake and Frank Owens, of Liverpool, and described as travellers, who had been remanded on four charges of having obtained money by false pretences. Wake pleaded "Guilty," and Owens "Not guilty." The Chief Constable said prisoners represented that they were representatives of the British Economic Gaslight Company, of No. 12, Tabor Street, Seacombe, which only existed on paper; that they were selling a new patent burner of English make, which happened to be of German manufacture; that the burner would reduce the amount of gas used by seven-eighths of the usual quantity; and that the mantles were unbreakable, and would last at least five years. The charges against them had been selected from a large number of cases which had been brought to light. The system the prisoners had adopted was similar to that of the shoddy clothing dealers and flash jewellers. They had issued circulars which set forth the advantages claimed for their supposed invention. With the aid of a very plausible tongue, they succeeded in convincing people of the advantages they claimed for the mantle, and then charged an exorbitant price for the outfit. It could be bought on the market for 1s. 6d.; and they sold it for 8s. 6d. A receipt-book in Wake's possession showed that he had made £10 5s. since April 18; and prisoner had admitted that, "if he put his shoulder to the wheel," he could make £15 a week. Hyman Bieber, Manager for Messrs. Dazieger and Co., gas-mantle dealers, of Liverpool, spoke to having supplied Wake with burners and mantles for three months. For the former, he paid 1s. 6d. for each outfit; and he bought mantles at 1s. 6d. and 2s. 6d. per dozen. The mantles were made in Germany. Wake gave him a cheque for £1 4s., but it was dishonoured; and prisoner had not yet settled up as he promised to do. Wake said Owens had nothing to do with his (Wake's) business, and received no advantage or benefits from it. He had simply carried a bag and distributed circulars. Wake was sentenced to six months' imprisonment, and Owens was placed under the probationer's officer for three years. The Bench censured the witness Bieber for the way he conducted his business; the Clerk adding that he was almost as bad as a receiver in a larceny case.

Charge of Stealing Gas Dismissed.

At the Witney Petty Sessions, last Thursday, Henry W. Smith, a printer, was summoned by the Witney Gas Company for stealing (by disconnecting the inlet and outlet pipes of the meter and coupling them together, so that the gas was consumed without passing through the meter) a quantity of gas between Jan. 1 and March 9 last. Walter Mason, a fitter in the employ of the Company, stated that defendant had resided at No. 55a, High Street, for about three years, up till March. Witness fitted a penny-in-the-slot gas-meter in defendant's house, and called each quarter to collect the money. He also kept account in a book of the various amounts received from defendant. In 1908, the figures were: March, 3s. 3d.; June, 2s. 2d.; September, 5s. 2d.; and December, 3s. 7d. From Dec. 31 to March 7, 1909, the day he left the house, 6d. only was in the meter. On March 10, witness called at the house and examined the meter, and found the inlet and outlet pipes were twisted, and the leather washers were gone. On March 23, witness went to defendant's house in the Woodstock Road. Acting under instructions, he tightened up the unions of the meter there. On April 17, he again called at the house. Mrs. Smith opened the door, but refused witness admission. Later he again went to the house with Mr. Arthur Leigh, the Managing-Director of the Company, and was again refused admission. Subsequently, on a third call, they were admitted, and found the unions loose. He opened the box in the meter, and found only 2d., although 24 days had elapsed. Mr. Leigh corroborated this evidence. Defendant denied having touched either of the meters. The Magistrates said they were of opinion that the case was a suspicious one; but as there was not sufficient evidence to convict, it would be dismissed.

Messrs. A. Roux and Co., of Temple Bar House, E.C., and of Montbéliard, Doubs, France, manufacturers of gas-meter indices and accessories, inform us that they have converted the English part of their business into a limited liability company, under the style of A. Roux and Co., Limited, with registered offices at No. 9, Southampton Street, Holborn. They are now opening works at No. 140, Finch Road, Handsworth, Birmingham, in order to manufacture the articles indicated above, by means of modern machinery, from British material and with British labour.

MISCELLANEOUS NEWS.

THE QUESTION OF SALARIES AT BIRMINGHAM.

Gas Committee's Proposal Not Agreed To.

At a Meeting of the Birmingham City Council last Tuesday, under the chairmanship of the LORD MAYOR (Alderman G. H. Kenrick), the report of the Gas Committee for the past year, together with certain recommendations of the Committee regarding the fixing of salaries, &c., was submitted. The report and the recommendations were noticed fully in the "JOURNAL" for the 4th inst. (p. 320).

Alderman Sir HALLEWELL ROGERS, the Chairman of the Gas Committee, in presenting the report, first moved—"That the Committee be authorized in special cases to make special terms for the supply of gas, the charge to be such as will be applicable to all consumers whose conditions of supply are similar; such terms to be submitted to and approved by a Joint Committee of the Gas and Electric Supply Committees."

After a short discussion this was carried.

Alderman Sir HALLEWELL ROGERS then proposed—"That the maximum salary to be paid to each of the Engineers-in-Charge at the Saltley, Nechells, and Windsor Street works be fixed at £1000 per annum, and that the Committee be authorized from time to time to advance such salaries up to such maximum figure."

Mr. DAVID DAVIS rose to a point of order. He contended that, if the resolution were passed, it would be directly in conflict with the first of the general instructions to committees, which required the Committees to report to the Council any proposal to increase salaries to their officials by £50 or more. The resolution moved by Sir Hallelwell Rogers fixed a certain figure which might or might not be reached; but the Committee by the resolution were endeavouring to take power to increase the salaries of certain persons when they thought fit to do so. If they did this, they would be in conflict with the first general instruction to committees.

The LORD MAYOR said the Committee were asking for authority to advance salaries from time to time up to a maximum figure. They did not say they should do it without coming to the Council; all they asked was that the Council should fix the maximum—the idea being that advances would be made from time to time.

Mr. DAVIS: With the consent of the Council?

The LORD MAYOR: It does not say with the consent of the Council. If you raise the point when it comes up, you will be in order.

Mr. DAVIS said it would be too late to raise a point of order when the Committee had already done it. The resolution gave power to the Committee to raise the salaries without coming to the Council again; and he submitted this was in conflict with the general instruction. If the Committee wanted the power, they must put an end, first of all, to the general instruction.

The LORD MAYOR, after further discussion, said there was an essential difference between a standing order and an instruction to a Committee. This was the Town Clerk's view. It seemed to him that the resolution was strictly in order.

Alderman Sir HALLEWELL ROGERS, speaking in support of the resolution, said that many points he should have to deal with applied to the next resolution, which referred to the salary of Mr. Barber. He did not minimize the importance of the resolution. They were associated with a scheme which the Committee were bringing forward respecting the future management of what was the largest Corporation undertaking in the city, and the largest business of any kind within the city. They contained, as Mr. Davis had said, to some extent a new principle—at all events as far as the present practice of the Council was concerned—for they fixed the maximum salaries of four important officers of the department, and gave the Committee discretion to raise the salaries from time to time, within the maximum named, without the sanction of the Council. At the same time, he submitted the resolutions with the greatest confidence. They would appeal to business men in the Council; and they had the support of every member of the Gas Committee. An increase in the salaries paid to the officers of a trading department did not necessarily mean an increased charge on the rates; and it would not be so in this instance. If the best possible men were obtained for the management of a corporation business, and they were paid proper salaries, they made, as a rule, larger profits; and this meant a decrease, and not an increase, in the rates. If the ratepayers wished to receive, as they were receiving, large cash contributions from the Gas Department, they must support the Gas Committee in their endeavour to obtain and retain the best possible officials for the working of the department. It was necessary to attract thoroughly reliable officers for the chief positions; and in order to retain their services, a maximum salary must be decided upon, so that they might be able to look forward to an increase without debate in the Council every time a proposal was made to give them an advance of £50. The Gas Committee were empowered to purchase and sell materials having a value of not less than £600,000 in any one year; and surely they could be entrusted within the maximum to advance the salaries of their officers from time to time at their discretion. In neither of the resolutions was it proposed to advance the salaries to the maximum at the present time, nor, indeed, for some time. The policy of the department should be to preserve intact an organization which was working with such excellent results to the ratepayers and the consumers. Sir Hallelwell spoke of the admirable business qualities of the Engineers, and reminded the Council that these officers, together with the Chief Chemist and the Secretary of the department, formed an Advisory Committee, whose work during the last twelve months had been invaluable. The department had a capital of nearly three millions, and an income of nearly one million. It was the largest gas undertaking outside London. At one time they had a monopoly for the supply of artificial light for heating and motive power; but this was not the case now, for they had to compete with suction gas and electricity. This rendered it necessary that the department should be kept on a thoroughly business footing,

so that it might continue to be profit-earning for the ratepayers. The new scheme promoted by the Committee was less costly than the old one; it was more efficient, and more advantageous in every way. The salaries included in the two resolutions were in the aggregate less than were paid ten years ago, although the output of gas had increased 25 per cent. The undertaking had constantly been making records by reducing the price of gas and by increasing the contributions to the rates. He, therefore, asked the Council to accept the recommendations of the Committee. By doing so, they would retain the services and encourage the men who were now the responsible heads of departments, and in the future they would always attract the best men to serve under the Corporation.

The resolution having been seconded,

Mr. WALTHALL opposed the fixing of the maximum, although he was in favour of the increase to the Gas Engineers.

Mr. BROOKS said that Sir Hallelwell Rogers had made it clear that the intention of the Committee was to ask the Council to fix the maximum up to which limit they might advance the salaries without consulting the Council. The Committee were asking the Council to depart from a long-established practice; and if such a precedent were approved that day, then every other Committee might ask that maximum salaries should be fixed for their officials. The Council ought not to give the Gas Committee authority which they would not be prepared to give to other Committees. The present system with regard to increases of salary was very unsatisfactory. It was not in the best interests of the ratepayers every time a Committee wished to increase a salary by £50 or more that they should have to ask the Council's consent. He thought discussions in public on such matters should be avoided as far as possible, and that some means should be devised whereby the salaries of officials might be considered by a specially-appointed committee. He therefore moved, as an amendment, "That the General Purposes Committee be requested to consider the desirability of revising or altering the present system of dealing with increases of salaries to Corporation officers and servants, and to report their recommendations; and that in the meantime the further consideration of the proposed increases of salaries as set out in the Gas Committee's report be deferred."

Mr. E. MARTINEAU seconded the amendment.

Mr. STEPHENSON said it would be very unwise to give all Committees a free hand in the matter of advancing salaries.

Alderman Sir JAMES SMITH could not conceive that any Committee, however constituted, would be able to judge of the value of the services of officials so well as the Committee under whom they worked. Each case had to be considered on its own merits. If the concession the Gas Committee asked for were granted, then it did not follow that other Committees would ask for the same thing. The business of the Gas Committee was run on lines somewhat different from that of other Committees. The Gas Department was a purely commercial undertaking conducted on very keen business lines; and he regarded it as he would the affairs of a successful company in which he was a shareholder. If the chairman of a board of directors brought up a report showing a successful year, good dividends, and the provision of ample reserves, he would be satisfied to allow the directors a very liberal margin for the internal arrangements of the business. The Committee were so much trusted, and were doing so well, that the Council should give them perhaps larger powers than were given to other Committees. He, however, asked Sir Hallelwell Rogers to say in what length of time the Engineers should be entitled to the proposed maximum salary.

Alderman HUNT urged that the principle contained in the resolution was a new one, and had been sprung upon the Council somewhat suddenly. He did not think it fair to ask the Council to reverse what they had been doing for years. Moreover, if the principle were granted to the Gas Committee, the Tramways Committee and the Electric Lighting Committee should be allowed to fix the maximum salaries of their managers at £2000. He urged that the Council should always be in the position to say how far the Committee might go in the way of salaries.

Mr. J. S. NETTLEFOLD, who appealed to the Council to consider an important business question in a business way, said that men who wanted to make a living were only too pleased to give a little bit of a large profit to those who made it for them. The Council were presented with a large profit; and he was somewhat astonished to find an atmosphere of criticism. He contended that the resolution protected the Council in fixing a maximum. He added that he did not see why the power of increasing salaries to fixed maxima should not be given to every other Committee besides the Gas Committee.

Alderman the Right Hon. WILLIAM KENRICK, who supported the resolution, said that, when the city acquired the gas undertaking, Mr. Chamberlain warned the Council that they must not treat the Gas Committee like one of the ordinary Committees of the Corporation, but must give them greater freedom, and repose in them greater confidence, or the gas enterprise could not possibly be managed. The Council, as a rule, had been very generous to the Committee, and had trusted them; but there had been occasions when small questions of salary occupied members a whole afternoon, though often matters of hundreds and thousands of pounds slipped through without any question whatever. It showed that for business matters they must have a business committee, who could come to a decision on the merits of a subject without the fear of their arguments appearing in the Daily Press. These were matters on which the ordinary ratepayer neither had nor could have any opinion. The system on which the Council acted in regard to salaries was a bad one; for they started with a small salary, and did not in consequence get the best man. Then, by the automatic principle, they increased his salary until he reached the point at which he was not worth the remuneration. The better method was to fix a maximum, as the Government did; for a man then knew what he had to expect if he did his duty well. But there was no man who would not shudder at the thought that, after he had done his best, the question of an increase of his salary by £50 would have to be discussed in the Council. They would not get the best men on these terms. If they could not trust the Gas Committee and be generous to their officers, let them give up trading and confine themselves to sewers, health, public lighting, and matters of that kind, in which they could not do a great deal of harm, and certainly would not make a great loss. He had faith in the Gas

Committee; and he thought that their proposal was quite reasonable and moderate.

Mr. FREEMAN, who thought that Alderman Kenrick and Mr. Nettlefold had obscured the issue, said the Council had to decide whether they should give the Gas Committee a power which had not been entrusted to any Committee up to the present. If the Council now fixed the maxima the Gas Committee could, if they liked, raised the salary of each of the Engineers to £1000, and that of Mr. Hampton Barber to £2000, in one year without having again to consult the Council. He hoped Mr. Brooks would withdraw his motion.

Mr. DAVIS submitted that the resolution was not a proper one, and ought never to have been brought before the Council. The first of the general instructions to Committees, which, he took it, were laid down seriously, and were to be obeyed, required them to recommend to the Council for appointment any officers who might be required in their respective departments, and the salaries of such officers, and "to report to the Council any proposal for the increase of the salaries of such officers, when such proposed increase amounts to £50 and upwards."

The LORD MAYOR said Mr. Davis's quotation was a condensation of the actual minute which was passed in 1889. The minute stated "that it be an instruction to all such Committees as have been in the habit of increasing salaries of officials in their employment without obtaining the sanction of the Council, that they shall henceforward report to the Council any proposal for the increase of the salaries of such officers when such proposed increase shall amount to £50 and upwards." He called attention to the words "without obtaining the sanction of the Council," and contended that the Gas Committee were not endeavouring to obtain the Council's sanction to increases.

Mr. DAVIS said he disagreed with his Lordship. The Committee were not asking for the increase of anybody's salary; but they were asking that a maximum should be fixed. At present there was no proposition before the Council for the increase of any individual's salary. If the general instructions meant anything at all, they were instructions to every Committee of the Council; but the Gas Committee asked for power to increase the salaries of the Gas Engineers and Gas Manager to any extent so long as they came within the proposed maxima. He submitted that the resolution ought to be divided into two parts. The first, which dealt with the fixing of the Gas Engineers' salaries at a maximum of £1000 a year, the Committee need not trouble about, because they could fix their maximum at any time they liked. But the second part gave them power to increase the salaries from time to time; and he would utterly oppose this so long as the "general instructions" remained on the books. He therefore proposed, as an amendment to the motion, that all the words following "£1000 per annum" be omitted from the resolution. This would give the Committee power to fix the maximum salary, but would not give them authority to advance to the maximum without first bringing the matter before the Council.

Mr. JEPHCOTT seconded the amendment.

Alderman J. H. LLOYD said there were at least two Committees who had the power to fix salaries; and it had always seemed to him an anomaly that this power was denied to the large Trading Committees of the Council. He quoted the General Standing Orders to show that all the powers of the Council in regard to the gas undertaking were conferred upon the Gas Committee, with the exception of the issue of annuities, and went on to say that the Committee thought that, instead of haggling continually over increases of salary, the Council would have been glad to accept the proposal submitted to them. He reminded the Council that a year ago Sir Hallelwell Rogers told them that a scheme of the kind now proposed would be brought forward in twelve months.

Alderman CLAYTON said that in the early days of the Council, on the appointment of the Gas and Water Committees, there was an absolute delegation to them of all the powers of the Council except as to borrowing money, with the addition of the words "reporting to the Council from time to time thereon." But they did not report; and that was how the trouble came. It came out that while other Committees had to bring their proposals before the Council, the Gas and Water Committees had been giving increases on the quiet. Accordingly, in 1888, they were instructed to report on the salaries they had been giving for the past year. In the report there appeared a whole page of increases which had not been reported to the Council. At that time there was so much feeling in the Council about the matter that the restriction about £50 was imposed on every Committee. In addition to the Committees mentioned by Alderman Lloyd, the Education Committee was freed from the stipulation—though the instruction to the Education Committee, if read carefully, read both ways. He should support the recommendation of the Committee.

Mr. MURRAY remarked that anyone who knew anything about a business like the gas undertaking knew that those whom they employed rendered themselves liable by their ability to be approached by other authorities. It had been their bitter experience to lose valuable men in this way. The knowledge that there was a maximum fixed, to which they had a right to look forward played an important part in the consideration of offers made to their employees from outside authorities.

Alderman TONKS said two questions had been introduced, and had caused the difficulty. He thought it would be unfair to refuse the salaries by a vote which, he considered, would be taken under a misunderstanding; on the other hand, he felt sure many of them were of the opinion that a resolution so far-reaching in its effect should not be voted on through a side-issue. This would be contrary to the wise conduct of public business.

Mr. TOLLER pointed out that twelve months ago the Chairman of the Gas Committee said a new system was to be given a trial. All the Committee now asked was for powers to carry out the principle, as it had been found to work satisfactorily. They had in their employ some of the best engineers in the country; but they would not remain unless some inducement were offered them.

The LORD MAYOR said this was an important question of principle. Alderman Clayton had called attention to the fact that on the construction of the Education Committee one of the first things they did was to apply to be freed from the restriction referred to, because they felt the necessity of being able to increase salaries in a different way. The Council very generously removed the restriction. The first thing

the Committee did was to fix the maximum salary of their Secretary, and, as far as possible, they fixed the maximum of salaries all through. The object of mentioning the most they were prepared to give when applying to the public was so obvious that he wondered it had not occurred to other people on the Council before. As to Mr. Brooks's amendment, he suggested the matter was already before the Council. He was glad the Gas Committee had had the courage to bring it forward, thereby intimating to other Committees that they should do the same if they thought proper. He should vote for the adoption of the recommendation.

Alderman Sir HALLEWELL ROGERS said he did not think it would be well to accept either amendment. He was convinced they would not be able to retain the services of their Engineers unless they gave them something to look forward to. He was equally convinced that £1000 was a fair average to fix the maximum at. He pointed out that during the past twelve months they had got 287 cubic feet more out of every ton of coal carbonized. This meant a saving of 15,500 tons of coal, and no less than 165 million cubic feet of gas. This had been done under the new scheme. Putting it at the lowest, it meant £7000. The position was due in great measure to the Engineers mentioned.

The amendments were then put and lost; and the original resolution was also lost.

Alderman Sir HALLEWELL ROGERS then said the recommendation as to the appointment of the Secretary, which was part of the general scheme, would be withdrawn. The matter would have to be again considered by the Committee.

The Annual Accounts.

Alderman Sir HALLEWELL ROGERS, moving the adoption of the report of the Gas Committee, referring to the accounts, said their profits for the year under review had been affected by two important factors. They experienced a period of bad trade and bad weather. As a consequence, their business had been adversely affected. It was, therefore exceedingly satisfactory to note that there was an increased credit balance to contribute to the rates this year. Their income for the past year was £935,636, or £44,000 less than the previous year. The quantity of gas sold was 7000 million cubic feet, or 64½ millions less than in 1908. The price was reduced in October last; and had it not been for this, the income would have been £28,000 more than at present. The residual products—coke and breeze—realized £142,000, against £149,000. This was due to the fact that they carbonized 1550 tons of coal less than in the previous year. The cost of coal was £28,000 less. This was due to the fact that they got 287 cubic feet more gas out of every ton, and also that they had purchased at a cheaper price than in 1908. The amount paid in wages was less. This was not because the men had been receiving less, but because the amount of coal carbonized was less than last year. The amount to be contributed to the rates was £71,459, or £10,146 more than the previous year.

Mr. COOKE asked what the effect of the installation of a Fiddes-Aldridge machine would be on the Council's employees.

Mr. ARTER asked if the time had not now arrived when the consumers might reap a direct advantage from the profits of the undertaking.

Alderman Sir HALLEWELL ROGERS, in closing the discussion, said he could not say what would be the number of men employed when the Fiddes-Aldridge machine was fixed. Employment, however, had been found for all the men thrown out of work by the reconstruction of the retort-house. With regard to Mr. Arter's question, he pointed out that their prices for gas compared favourably with other towns; but he agreed that, in view of the amount contributed to the rates, the next person to be considered was the consumer.

The report was approved.

THE DEPLETING OF RESERVES.

Manchester "Economies" at the Expense of Trading Departments—Mortgaging the Future.

By the admitted "squeezing" of the trading departments, coupled with enforced retrenchment on the part of the spending Committees, the increased rate for Manchester has been reduced from a possible 8d. in the pound to 3½d. It will be remembered that, under pressure, the Gas Committee agreed to advance their contribution to the City Fund from £26,495 to £50,000; but this has only been done by the depletion of the department's reserves.

At a special meeting of the City Council last Wednesday, when the estimates were approved, Alderman Copeland, Chairman of the Finance Committee, referring to the trading departments, expressed the opinion that the promised contributions in aid of rates were made without injuring the soundness of their financial positions; but this was challenged by Mr. Billam, who characterized the Finance Committee's policy as "economic madness." The reduction of the probable advance in the rates had only been reached, he pointed out, by the depletion of reserve funds, by retrenchment on renewals, and by the mortgaging of prospective profits. It was Mr. Billam's conviction that the Finance Committee had placed an embargo on the trading Committees that would paralyze them; and cheapness had been secured at the cost of efficiency. Economies of the type now being effected might land the Council in a greater muddle than they were designed to mend. There was no getting away from the fact, he added, that the Gas Committee had absorbed the whole of their reserve fund.

In contributing to the discussion, the Lord Mayor (Alderman Holt) held that no trading Committee had been asked to contribute more than they could afford. He said there were reasons why the Gas Committee had increased their grant—and very substantial reasons, too. In this connection, he pointed out that the trading Committees of the Corporation were liable to the same vicissitudes as all other trading concerns in the city. The Tramways, the Electricity, and the Gas Departments had all felt the effect of the decline in trade. It was true that in one case the Committee had had to dip into their reserves; but this was what was done by most companies in bad times. What was more, in this particular case there were substantial reserves. It was his desire

to correct an erroneous impression which had got abroad that they had been "Robbing Peter to pay Paul." In no instance had saving been effected by the stopping of work that ought to go forward.

Dealing with the general question in a special article, "The Ratepayer," the organ of the Manchester Ratepayers' Association, published yesterday, says: "What is the cold truth? The printed estimates just issued along with the report of the Finance Committee, show that the entire difference between an advance of 3½d. and 6½d. is made up by the mortgage and depletion of the reserve funds and renewals accounts, on the strength of purely hypothetical profits to be made during the current year. The reserve fund of the Gas Committee, which four years ago stood at £147,608, is now completely gone; and the depreciation on renewals account is mortgaged to the extent of £23,000, so that this amount may be contributed in aid of rates. The sum of £15,000 has been obtained from the Tramways Committee by robbing the renewals account of this amount for the same purpose. Yet only last year the professional Auditors of the Corporation commented in their report on the fact that no provision was contained in this account for depreciation on buildings. A fund that was deemed inadequate before, has actually been further reduced to make a fictitious balance to be given in aid of rates! These two sums of £23,000 and £15,000 are more than enough to account for 3d. 'saved' in the rates. It was against this kind of so-called economy, as opposed to the real thing, that the resolutions passed at the citizens' meeting were directed."

The Position in Salford.

Faced with a possible advance in the rates by 1s. 1d. in the pound, the Finance Committee of the Salford Town Council have insisted on a revision of the estimates of the different departments, with the result that considerable reductions have been made. The Council will be recommended to advance the borough municipal rate by 6d. in the pound, bringing the levy for municipal purposes from 6s. 6d. to 7s. To this has to be added an increase of 4d. in the pound in the poor rate, bringing the total increase up to 10d. Since 1899, the rates have advanced from 6s. 7d. to 8s. in the pound. During the past year, there has been a falling off in the receipts of the trading departments of the Corporation. For instance, the Gas Committee's takings are £5000 less than was estimated, the water-works department £1250 less, and the tramways £2000 less.

GAS PROFITS AT ST. HELENS.

At the Meeting of the St. Helens Gas Committee last Wednesday the results of the past year's operations at the gas-works were submitted. The statement showed that, after providing for interest, sinking fund, and other charges, the net profits for the year amount to slightly over £9100. Out of this sum, the Committee decided to vote £5000 to the borough fund to be used as the Finance Committee may direct—that is, in relief of the rates. This is the fourth year in succession that this sum has been voted by the Gas Committee; and altogether £81,030 has thus been voted to the relief of the rates. In view of the depressed state of trade in the town, which has influenced the gas-works as well as every other manufacturing concern, the result was considered very satisfactory by the Committee who have charge of the department, especially considering the fact that during the last working year, after the new assessment of the gas estate had been made, the rateable value was considerably increased, which has raised the amount to be paid in rates by about £1500. Though the net profits are rather less than last year, taking this into consideration the results are really better. It is stated that the output of gas shows a small increase.

The "St. Helens Newspaper and Advertiser," in referring to the matter, says: "As we have pointed out in previous years, much of the success of the gas-works in St. Helens is due to the exceptional advantage which is taken of the opportunity of working up and marketing bye-products, which cover quite a wide range of commodities, and which have been found a source of considerable profit. Experiments have also been made in a new method of carbonizing the coal which is quite expected to lead to the realization of better results from any quality of coal used. One of the special features of the work at the St. Helens Gas-Works is the utilization of the cheapest forms of gas coals of the neighbourhood, which, being much more economical to buy, enable the Committee to realize such handsome profits, owing to the skilful way in which the materials are treated. The latest idea is one that we understand the Gas Engineer has been studying for many years—the question of using vertical instead of the usual horizontal retorts. This is a very important question, if the output at the present gas-works is to be increased to meet the ever-increasing demand, as if these retorts could not be used it would be necessary to at once erect new works on the site at Pocket Nook, at a very large capital outlay. This system is being tested in every possible way, and so far with very good results. In making these comments, it is well to remember, as will be seen from the monthly record of their work in the minutes of the Gas Committee, that steady progress has been made in improving the lighting of the borough. Incandescent lighting is gradually taking the place of the old method, to the great satisfaction of the townspeople. Then it may also be pointed out that gas consumers in St. Helens have several very exceptional advantages which are not enjoyed in most other towns—no charge being made for the use of cooking and heating stoves, which are now so generally employed. The Gas Committee, with a Chairman so full of enthusiasm as Mr. Crooks, and such an able Engineer as Mr. S. Glover, have evidently been animated with a desire to serve the public interest in the best manner possible; and they are once more to be congratulated on the results of a very successful year's work."

Lighting Lamps by Wireless Current.—According to the "Evening Standard," a telegram from Omaha (Nebraska) reports that 4000 incandescent lamps in the local exhibition there were lighted last Thursday night by a wireless current from a station 6 miles distant. This is stated to be the first public test of a lighting current sent without wires. Pending the grant of a patent, details are withheld.

WELSBACH INCANDESCENT GASLIGHT COMPANY.

The Effects of Depressed Trade and Competition.

There was a good attendance of shareholders at the meeting of the Welsbach Company yesterday, at Winchester House, to hear the statement of the Right Hon. Lord Weardale (the Chairman) on the working of the past year. Though there was no recommendation as to dividend for the ordinary shareholders, the meeting was harmonious, and entirely sympathetic with the Board.

In submitting the report and accounts, which were noticed last week (p. 404), the Chairman reminded shareholders that, when he addressed them a year ago, he mentioned that, as a Board, they would be disappointed if the results of the year's working now under review proved less favourable than the figures then under consideration, and also that probably only one thing would interfere with their calculations, and that was increased cost of raw material. They had certainly had to face unexpected increases in one or two important lines of raw material; but it was not this increase that had substantially influenced the trading figures now submitted. When they met a year ago, it was not possible to foresee the wave of depression that overtook not merely their business, but, he supposed, the business of practically every industrial company not only in this country but all over the world. It was true that they had contracts upon which, in his speech last year, he perhaps too confidently relied, and which practically assured to them an increased trade. But when the time came for the Company to enforce these contracts, they dared not do so. To have forced upon customers who had stood by them for twenty years goods that the state of the market prevented them selling, would have been suicidal on their part. Some of their largest customers told them frankly that they were in the Company's hands; and if the Directors forced the contracts upon them, they must take the goods and pay for them when and how they could. The situation in this respect was for some months exceedingly difficult; and he could assure the shareholders that the executive had passed through a most anxious and trying time in consequence. They were for some months, in what should have been the busiest part of the season in many of their important lines, merely marking time. He was glad, however, to say the difficult situation had improved; but it had left its mark on the figures of the year. In times of phenomenal bad trade, one suffered in many ways in business. In the first place, one's many competitors (who were almost all more or less short of money) were forced to sell their goods frequently below cost price so as to obtain cash. In the second place, it was a work of the greatest difficulty to collect outstanding accounts. In the third place, the public generally bought only the cheapest article, and the trade, knowing this, ordered accordingly. The Company had suffered from all these troubles; and though he was able to tell the shareholders that, in spite of everything, they had once more slightly increased their sales of mantles, he must also tell them that this business had been effected to the detriment of the better class of mantles, the sales of which showed a reduction. This, added to the fact that the cost of raw material had somewhat increased, accounted for the figures before the shareholders that day. He promised a year ago that he would exercise rigid supervision over any increase in working expenses; and he was now able to tell them that the Company's position in this respect was satisfactory, without any sacrifice of efficiency. With regard to the quality of the mantles, both Welsbach ramie and Plaissetty cotton, they had received gratifying reports throughout the year. So far as the Welsbach inverted ramie mantle was concerned, there was nothing equal to it on the market; and the constantly growing inverted mantle business was bound to be a great factor in the future situation.

The Chairman then directed attention to the lines upon which the accounts were now framed, and commented at length on what he described as the intangible and tangible assets of the Company. He then passed to the investment in the Austrian Company. Reverting to the commercial results of the half year, he said the balance of profit, after allowing for various trade charges, was £10,680 down. The decrease was not due to any increase of working expenses. On the contrary, they had been able to make fairly substantial savings. The drop was almost wholly due to the reduced trade and lower selling prices. Their great mantle business was in two divisions. It was divided between those—particularly gas companies and lighting authorities—who bought the best article, and relied upon its long life to repay them for their outlay, and those who used cheaper mantles, and renewed them constantly, relying upon the lower price to recoup them for the increased labour and greater number used. This latter class had materially increased during the year under review. There had been increased competition. Several of their large Continental competitors ran their factories full time from year's end to year's end; thus that ensuring the cheapest rate of production. They sold all the mantles that they could in their home markets; and the balance was available for England at any price they could get for them. [Voices: "Try tariff reform."] In addition to this, they had suffered from the competition of the metallic filament lamp. A large section of the public had been wrongly induced to believe that electricity was at last cheaper than gas, though the Company had over and over again challenged the misstatements. A great amount of mischief, however, had been done. Numerous propositions had been made to the Company to take up the manufacture of metallic filament lamps. Although the Board recognized it was their duty to examine these suggestions, nothing had so far been put before them to justify them making such a radical departure. He desired to say quite frankly that—while, having regard to the figure of good-will standing against the Company, the Board recognized the desirability of building up the reserve fund—they would have no hesitation in spending further money in advertising and propaganda work if the trade rendered it necessary. As a Board, they had had an anxious year; and the result was as good as was possible under the circumstances. Having regard to the deplorable showing made by some of the great industrial companies during the year, he did not consider the result was one of which they need be ashamed. The figures of the last six balance-sheets—from 1904 to 1909 inclusive—issued since the reorganization, showed that, in that period, assuming the recommendations of the Board were confirmed that day, £359,700

had been paid in dividends. The reserve fund had benefited to the extent of £110,000, and, in addition, the debenture debt of £110,000 had been paid off. He was pleased to say the Austrian Company had again declared a dividend of 20 per cent., so that the Company had received credit in the current year to the extent of £24,600. This represented the dividend on their holding in the Austrian Company, and would form part of the profits for the year ending March 31, 1910. The Austrian Company, like their own Company, had had a most difficult year; but nothing could exceed the devotion shown for the interests of the concern by the whole staff of the Austrian Company. The competition in all branches of the gas-lighting industry had never in Austria, as in England, been keener than during the past year. He must also acknowledge the activities of their own English staff. It was at periods of bad trade that the capacities and resources of the executive were subjected to the severest strain; and it would be idle to deny that the last twelve months had entailed exceptional anxieties upon those responsible for the conduct of the business. He was not only expressing his own individual opinion, but also that of the whole Board, when he said that their friend and colleague (Mr. L. Fletcher), whose knowledge of the mantle trade was unsurpassed, spared no pains, and spared no opportunity, for furthering the interests of the Company. In his arduous labours he had been efficiently aided by the whole staff.

Seconded by Mr. W. W. Wright, F.C.A., the report and accounts were adopted, and a final dividend at the rate of 6 per cent. was declared. Prior to the passing of the motion, however, there was some discussion, in the course of which from several quarters the action of the Directors in not recommending a dividend on the ordinary shares on this occasion was endorsed—it being recognized that the conditions of the year's trading, through the depression existing all round, had been abnormal. Certain shareholders also expressed the view that taxation on imported goods was what was wanted to improve not only the position of the Company but of other industrial home concerns.

The essential points raised in the discussion were dealt with by the Chairman; and, after formal business had been transacted, there was acknowledgment of the services of the Chairman and Directors and staff. To this the Managing Director (Mr. Fletcher) briefly responded.

THE MAIN-LAYING DISPUTE AT TAUNTON.

An Amicable Settlement.

At the Monthly Meeting of the Taunton Town Council last Tuesday, the question of the dispute with the Taunton Gas Company as to the laying of a new main in the roads of the northern part of the town, as reported in the "JOURNAL" last week (p. 399), again came up for discussion. A special meeting of the Council had been called the previous week to consider the subject; and the Town Clerk now read a supplemental report of the Main Drainage Committee, which stated that the Gas Company had undertaken to divert their main where it was laid in Kingston and Station Roads without the approval and contrary to the protests of the Council and their Surveyor. The Town Clerk presented the correspondence which had taken place between the Company's Solicitor and himself since the special meeting of the Council, from which it was seen that a week had been given to the Company before commencing the removal of the main from its present position, with a view to giving them an opportunity of submitting to the Council (for approval by the Borough Surveyor) a plan showing the proposed altered position of the main.

Alderman H. J. Spiller, the Chairman of the Main Drainage Committee, in moving the adoption of the report as now presented, said he was sure they would all be pleased that they had come to an amicable arrangement with the Company. The Council did not want any unpleasantness; and he hoped in the future that they would get on in a friendly way with the Company. Alderman A. J. Spiller seconded the adoption of the report, which was unanimously carried.

This will mean that what has been a little unpleasant incident will now be settled to the satisfaction of both parties.

Nottingham Gas Profits.—When the Nottingham City Council were considering the question of the rate to be imposed for the current year, it was stated by Mr. Ball that last year the Gas Committee gave £30,000 towards the rates; and this year they would be able to contribute £31,000. During the past year, the Committee had been careful in the buying of their coal; and had saved more than the £1000 he had mentioned.

Monte Video Gas Company, Limited.—In the report which they will present at the meeting next Thursday, the Directors state that the profit on the working for the year to Dec. 31 last, as shown by the revenue account, is £34,500. Adding interest and discount £1326, profit on exchange £481, Directors' fees waived £280, and the balance brought forward £11,311, the total is £47,898. After providing for interest on debenture stock, income-tax, bad and doubtful debts, and depreciation, reserving £4000 for renewals, &c., and adding £4000 to reserve account and £2000 to contingency account, the balance remaining at the credit of profit and loss available for dividend is £30,897. An interim dividend was paid, in respect of the half year to June 30, of 6s. per share, less income-tax; and the Board now recommend the payment of a further amount of 8s. per share, less income-tax, making together a dividend of 3s. per cent. for the year. This will absorb £18,907, and leave a balance of £11,930 to be carried forward. The balance at the credit of the reserve account is increased to £32,000, the contingency account will stand at £20,923, and the insurance fund remains at £12,500. As foreshadowed in the report for 1907, the price of gas for lighting, cooking, and industrial purposes was substantially reduced on Aug. 1, 1908. As a result of this policy, the gas sales are the largest on record; and the number of meters fixed was considerably above any of the previous eleven years. The revenue account shows an increase in receipts; but owing to the higher cost of coal delivered at Monte Video, and to the larger quantity carbonized to meet the increased sales of gas, as well as to a strike of the boiler-makers in the Dock Department in September last, the net revenue was £177 less than in 1907.

BURTON CORPORATION GAS SUPPLY.

In moving the adoption of the report of the Gas and Electricity Committee at last week's meeting of the Burton-upon-Trent Town Council, Alderman Lowe, the Chairman, said the working of both undertakings during the past year had been satisfactory. In regard to the gas-works, there was evidence of great care having been exercised to secure the best results. For the first time in the history of the gas-works, over 10,000 cubic feet of gas had been sold per ton of coal carbonized. It must, however, be borne in mind that a much larger sum had been spent on enrichment. For a number of years, the Committee had had to face a steady decrease in the amount of gas sold; and it was so this year, to the extent of $1\frac{1}{2}$ per cent. This arose notwithstanding the fact that there was an increase in the number of consumers by 328, which was another evidence that economy was being exercised owing to the state of trade. Their revenue from residuals was still satisfactory; and the total profit from the works was £8000, which was rather less than last year. It had, however, to be remembered that for three-quarters of the year they had been working with a reduced price of gas. A sum of £6000 had been paid to the relief of the rates, and £1500 had been added to the reserve fund and deterioration, the latter now standing at £34,000, which was only £7000 less than the actual outstanding debt on the undertaking. These figures showed that they had works of great and increasing value; and in these days of pessimism it was rather good to feel that they need have no anxiety as to the future. The last instalment on two loans—one of £20,000 and one of £3500—would soon be paid; and as a result of this, £1500 a year would be saved. The Council would be glad to know that they have made contracts for coal at a reduction of 9d. per ton, which meant a saving of about £1100.

The income of the Gas Department for the twelve months to March 31 was £57,183, and the expenditure £48,450—leaving a surplus of £8733. The make of gas per ton was 10,762 cubic feet, and the sale 10,052 feet; the unaccounted-for gas being 5·72 per cent. As from June 30 last, the price of gas to ordinary and prepayment consumers was reduced 3d. per 1000 cubic feet—the charges now ranging from 2s. 4d. per 1000 cubic feet for large consumers through ordinary meters (excluding those for gas used solely for motive power and other manufacturing purposes), to 3s. 4d. for prepayment supplies.

GOOD RESULTS AT BURSLEM.

The report for the year ending Dec. 31 last on the Burslem Corporation Gas-Works was presented by the Engineer and Manager (Mr. Edward Jones) to the Gas Committee on the 20th ult.; and Mr. T. Mitchell, the Chairman of the Committee, submitted it to the Council on Monday, the 10th inst.

The accounts showed a total expenditure of £21,285, made up as follows: Coals and expenses thereon, £10,807; wages carbonization, £1426; purification, £619; repairs to works and plant, £1396; repairs to mains and services, £376; meters and stoves (including repairs), £2265; public lighting, £778; rates, taxes, and insurance, £1935; inspectors, £302; salaries, £833; general establishment charges, £234; bad debts, £93; Wolstanton Gas Bill expenses, £216. The receipts amounted to £29,020. There was therefore a balance of gross profit of £7735; and of this sum £5414 was allocated to interest and sinking fund charges, leaving a net profit of £2321. The make of gas per ton of coal was 12,036 cubic feet; and the percentage unaccounted for was 9·3. There were 2412 ordinary meters in use, and 4835 slots; and the number of public lamps was 696. The quantity of gas made was 211,057,000 cubic feet; and the capital (£128,000) per million cubic feet sold amounted to £679. The following is the revised net schedule of charges: Ordinary consumers, 2s. per 1000 cubic feet. Motive power consumers, up to 20,000 cubic feet, 2s. per 1000 cubic feet; from 20,000 up to 100,000 cubic feet, 1s. 10d.; from 100,000 up to 250,000 cubic feet, 1s. 8d.; from 250,000 up to 500,000 cubic feet, 1s. 6d.; 500,000 to 1,000,000 cubic feet, 1s. 4d.; from 1,000,000 up to 1,500,000 cubic feet, 1s. 2d.; 1,500,000 cubic feet and upwards, 1s.

Mr. Mitchell said the results were again very gratifying, there being a net profit of £2321 on the year's working, notwithstanding the reduction of 6d. per 1000 cubic feet charged for gas, and that the Wolstanton district was severed on March 4, so that only two months were included in the year's accounts. Coal was responsible for £885 increase; and unfortunately the residual market had in no way compensated for the extra cost. As a matter of fact, tar and coke alone showed a decrease of over £1200. Every endeavour had been made to popularize the use of coke in the district, with much success. A fair quantity was now used for oven-firing and gave the utmost satisfaction. The Committee were hopeful that coke would be more generally used for both industrial and domestic purposes. Tar, almost a drug, had fallen from 24s. to 16s. a ton. This was disappointing, as hopes had been entertained of a more general use of it in the matter of road making and maintenance. Owing to depression in the foreign markets, and increased home and foreign production, sulphate of ammonia prices had declined over £1 per ton. He mentioned this not so much to complain, as to show that the price of gas depended, not only on the price of coal, but upon the products obtained other than gas. During the past year, the carbonizing plant had been brought thoroughly up to date at a cost of £4222; and the whole of the gas was now produced on the inclined system. The make per ton of coal—12,036 cubic feet—was a very high figure; and excluding works having carburetted water-gas plant, there was, according to published analyses, only one other works in the country that surpassed Burslem. Unaccounted-for gas was an item which was always a source of anxiety to authorities supplying gas in mining districts; and Burslem was no exception. It was gratifying to be able to report a reduction of 2·71 per cent. for the past year as a reward for the vigilance exercised in the detection of leakages. Some 66 escapes on mains and services had been located and repaired during the year. They had already 4835 slot-meters in use; and during the last year the slot-installation system had been

introduced—165 new consumers having been obtained by its means, most of whom had cookers and boiling burners fitted. Further development was to be expected in this direction. The recently revised scale of charges should induce and create new custom, and block the introduction of suction gas. Gas might now be economically employed for all purposes, industrial and domestic. It might be interesting to note that there were only six works in the country supplying gas to the ordinary consumer at a less rate than 2s. per 1000 cubic feet, and two only who supplied at less than 1s. per 1000 feet to power consumers. When they took into account the contribution of £1200 which the Committee had passed to the relief of rates, and also the reduction of 6d. per 1000 cubic feet, which amounted to over £4000 contribution to the consumers, they would see that the undertaking was very satisfactory. The Committee wished him to thank the Manager, Mr. Edward Jones, for the way he had helped the Committee and done his work. He also thanked every member of the staff.

Mr. Robinson, the Vice-Chairman of the Committee, in seconding the adoption of the report, referred to the ruinous competition that had been inaugurated by the Electric Light Committee, and said that if it did not stop, the ratepayers of Burslem would lose hundreds and thousands of pounds. He was sure the Council would appreciate the report the Gas Committee were presenting. When they had regard to the fact that they had an expenditure of £130,000, that 10 per cent. of their output had been taken away from them, and they had to provide for repayment of interest on the full amount, and that beyond all this they had a net profit of £2300, after supplying gas at 2s. per 1000 cubic feet, he thought the Council should congratulate themselves. He could see that in the future they were going to have a great demand for gas-firing of kilns and ovens. He would like to associate himself with all that the Chairman had said with regard to the Manager. He did not wish to see a better Manager than Mr. Jones.

The report was approved.

ROTHERHAM GAS-WORKS RESULTS.

Mr. J. S. Naylor, Engineer and Manager of the Rotherham Gas-Works, has issued his annual report, in which he says that the quantity of coal carbonized during the year ended March 31 was 24,302 tons, at a cost of £12,672, against 24,400 tons in the previous year, costing £12,474; being an increase of 98 tons, at an increased cost of £198. The quantity of gas made was 300,014,000 cubic feet, against 295,958,000 feet; being an increase of 4,056,000 cubic feet. The make of gas per ton of coal carbonized was 12,345 cubic feet, against 12,130 feet; an increase of 215 cubic feet. This constituted a record yield per ton for the department. The quantity of gas sold was 269,587,000 cubic feet, against 267,698,000 feet; an increase of 1,889,000 cubic feet, which is very satisfactory, considering the state of local trade during the past year. The unaccounted-for gas was 26,419,700 cubic feet, or 8·81 per cent. of the make, against 24,611,200 cubic feet, and 8·31 per cent. of the make.

A sum of £400 has again been provided out of this year's profits to defray the expenses of the extra examination of mains and services, which largely contributes to keeping down the leakage. Owing to the reduction in the price of gas by 3d. per 1000 cubic feet, the revenue derived from gas sold is about £2200 less. During the year, the market for residuals has fallen considerably, with the result that the revenue from coke, tar, and liquor is £500 less than in the preceding year. The cost of public gas lighting, including wages and maintenance of the lamps, amounts to £4428, against £4518; and the number of lamps lighted was 1325, against 1310 last year. The cost of gas for public lighting amounts to £2413, against £2338. A sum of £2704 has been allowed for depreciation, against £2625. The amount of gross profit is £14,768, compared with £16,926; and the net profit, after allowing for interest, redemption, and sinking fund, amounts to £5395, against £7431. If the gas for public lighting (£2413) is again given by the department, as in former years, there remains an available surplus profit of £2981. Gas-mains have been extended to the parish of Dalton during the past year, where upwards of 400 consumers are now supplied.

The Auditor's report on the undertaking shows that the income from the sale of gas through ordinary meters was £1148 less than in the previous year; this being due to the reduced price of gas. The income from sales of gas through automatic meters had, however, increased by £826, as compared with 1907-8. The manufacturing charges per 1000 feet sold amounted to 1s. 6·19d., as compared with 1s. 5·73d. in the previous year; and the total cost per 1000 cubic feet sold was 2s. 6·44d., against 2s. 5·86d. in 1907-8. The average sale price was 2s. 9·08d., as compared with 2s. 9·72d. in the previous year.

Reduction in Price at Cockermouth.—At Wednesday's meeting of the Cockermouth Urban District Council, Mr. Fleming submitted the balance-sheet of the gas-works, which showed, he said, a profit on the year's working of £1166. After deducting £504 for interest on loans and £489 for debt repaid, the net balance of profit was £171. This increased the working balance from £2249 to £2421. After careful consideration, the Gas Committee recommended that as from March 31 the price of gas to ordinary consumers be reduced by 2d., making it 2s. 9d. per 1000 cubic feet, and that for slot-meters the quantity of gas be increased from 25 to 27 cubic feet per penny. The cost of the reductions would be £233. The expenditure for the year had been very heavy; and as the increases were mainly on items which could be fairly charged to capital account, it was evident that no part of the concern was being starved. Owing to the policy of not paying for extensions and improvements from additional loans, the total indebtedness was only £14,430, or about £543 per million cubic feet of gas made. Mr. Fleming concluded by paying a warm tribute to the far-seeing, capable, and skilful management of Mr. A. F. Young. The Chairman (Mr. Stephenson) said he thought the Council would be satisfied with the report. The gas-works were in a very good position. The report and recommendations were unanimously adopted.

BOMBAY GAS COMPANY, LIMITED.

A Gratifying Report.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting; and the Directors' report and the accounts (a notice of which appeared in the "JOURNAL," April 27, p. 247) were taken as read.

The CHAIRMAN said the shareholders would see that the Board were able to report a further considerable expansion in the sale of gas. Last year they had a very sudden jump in the sales, which was due to an increase in the public lighting, not so much from extra lamps having been put up, but from an alteration in the methods of the Municipality, who ceased to shut down the lighting on certain nights in each month. This gave them what he might term an adventitious increase. On the present occasion, they had not a similar set of circumstances to deal with; but there was nevertheless a most satisfactory increase to record—one which showed vitality, growth, and progress extending through the Company. There was an increase in the sale of gas for public lighting of something like 20 per cent., and in that for private consumers of about 7½ per cent. Seeing that when he first joined the Board nearly half the income came from public lighting alone, it was very satisfactory for him to be able to tell the shareholders that the private consumption was now double what it was ten years ago. There had been as many as 700 additional supplies put in during the past year. This would show them how energetic were the new Engineer and his staff. In the revenue account, there was an increase in the income from gas, from both sources, of £5113. There was a small increase in the rental of meters, including fittings, of £110; and there was also a very small increase in residuals of £274—because coal had been cheaper, and coke naturally followed it. Then as against this it would be remembered that last year they had a sum of £325 of recovered "bad debts" which had not been expected to be realized. This was not repeated on the present occasion; and therefore the total net increase, after allowing for this sum of £325, was £5169. It might be asked what had been done with this. Well, increased business meant a greater outlay for coals, &c.; and coal had cost them, because of the larger make of gas, £229 more. Upon repairs, &c., the Directors had—and he thought the shareholders would say very wisely—incurred an additional expenditure of £2455. These two items—and the repairs were specially necessary for reasons which he would explain later—disposed of the bulk of the £5169. But they would not have these additional repairs again in the future. The Directors met the shareholders that day without the nasty cloud which was over their heads when he had to report the serious frauds that had been going on in the Company's service, not detected, as they ought to have been, by those whose duty it was to watch over and protect the interests of the Company on the spot. Extensive repairs were found to be needed by the gasholders, which, in that climate, were specially susceptible to rapid wear and tear; and the rapidity of the deterioration was increased when there was any negligence in the matter of the purity of the gas. At any rate, from whatever the cause, they had had to put practically the whole of the storage capacity in good order. This year they were completing the renewal of the second of the larger holders, besides having extensively repaired one; so that they would be starting again with holders in good condition. The result of this, he thought, would be seen in the reduction of the leakage, which, as they were aware, arose not only in the distribution system, but in connection with storage as well. The total distribution charges showed a decrease of £1317; but reductions under this head he never boasted much about, because the charges arose largely from repairs to mains, &c., on which he preferred to spend a considerable sum. He had spoken of the increase in the public lighting; and it was a matter of gratification to the Board to know that Bombay continued to be lighted by gas to the exclusion of electricity. Fortunately, the Municipality were not interested in electricity supply, in the way that was seen in this country—and which was shown up in Parliament only last week—where corporations levied rates upon the ratepayers, and upon the gas companies as large ratepayers, in order to make up losses which they were incurring in connection with electricity undertakings with which they were competing with the very gas companies who were among their largest ratepayers. Happily in Bombay they had a better informed Municipality. They appeared to follow closely what was going on in this country. When one saw what went on, it was clear that the question of the supremacy of lighting for large spaces in public streets had been definitely and absolutely settled in favour of gas. Even in a part of London with which he was very intimately acquainted, the whole of the area of one Gas Company was divided between two boroughs, each of which had an electric lighting undertaking. But so thorough and complete had been the conviction that had been driven home to the members of these Borough Councils of the superiority of gas, that they did not dare to extend the electric lighting in aid of their concerns. Only just lately, in the "JOURNAL OF GAS LIGHTING," they had seen it reported that a borough had decided not to put up electric standards in some roads that could be lighted by gas. The only argument that could be advanced in favour of electricity was that, as they had got a lot of capital involved in the electricity undertaking, they had better help it out of the rut as far as possible, by lighting the streets electrically, whether the system was better or not. But the ratepayers would not allow them to waste the rates by lighting the place in anything but the cheapest and most efficient fashion. He told the shareholders some years ago that Mr. Thompson, who was then Engineer of the Melbourne Gas-Works, when he came across to England, made, at a banquet of gas engineers, what was to himself (the Chairman) the very interesting and very remarkable statement, that Bombay was the best lighted city he had seen. In view of the fact that Mr. Thompson had just visited Vienna, Berlin, Paris, and London, this was a very high testimonial. He hoped the officers would strain every nerve to see that Bombay retained this position of supremacy. In the matter of public lighting, they must march with the times; and their staff must demonstrate to the authorities and the people what was the best lighting system. He himself was not at all devoted to the square lantern which they saw on

the top of a post in the streets, and which was really only a survival of the ancient thing that, in the early part of the last century, was used to hold a rushlight, and hung across the road. All that had been done was to add a gas-pipe to it, and a burner—generally a bad one—and call the street lighted. He was himself of opinion that the inverted mantle, which threw its light downwards, with a globe round it having no bars to obstruct the light, with automatic control of lighting, &c., would give a better effect even than the present Welsbach light, and more thoroughly demonstrate the advantages of gas lighting than did the present system. Of course, in speaking thus, he was not in any way binding his colleagues; but personally he hoped they would succeed, by demonstrating to the Municipality, in bringing this about. Their Engineer found a difficulty in pushing the sale of gas for domestic and trade uses other than that of lighting, which had now established itself. Of course, when they asked a man to burn gas in a stove which was going to heat a room or to cook food, or to consume it in driving an engine, melting metals, or in any of the many other processes that were common in this country, he naturally looked at the price; and the result of their experience (and he was speaking in the presence of Mr. Charles Hunt, who had a wide knowledge of these things) was that they must sell the gas cheap. Sitting on the Board for the years he had done, and comparing the progress in reduction of price with that of other companies he was associated with, he had not felt contented with the progress in the reduction of the price of the gas. They had a contract with the Municipality which had yet some years to run; but he was sure the shareholders would agree with him that, if they could make a general reduction to the ordinary consumers, it would be only wise (and the Directors would wish) to make a similar reduction to the Municipality, though the contract might not have expired. In addition to this, anything they could possibly do by adopting new systems to improve what Mr. Thompson had already described as almost matchless, it would be wise for them to do; and they would certainly do it. He was glad to say that, not only had the Company recovered from the drawbacks from which they had suffered through the state of the accounts and the rather neglected condition of the works (which made him almost sorry that Bombay was so far away that he could not go and look things up himself), but their career was now becoming one of peaceful, steady progress. The Board had been impressed by the unhealthy conditions that had surrounded the houses on the works; and the proprietors would be gratified to know that they had authorized a considerable expenditure on the building of bungalows for the staff and also on improving the accommodation for the officers at the gas-works. This had been a matter which had appealed very strongly to their colleague Sir Evelyn Wood, with his great knowledge of Indian life; and although the improvements in the dwellings of their servants might involve an outlay of (say) £2000 or £3000, he was sure it would not be grudged, because unless the men kept their health and strength they could not give the best services to the Company. One word more as to electricity. It was a most valuable and useful element in Nature; but it had been greatly exaggerated by people who induced local authorities and others to invest capital in it. Fortunately, he did not think there was any fear of the Bombay Municipality being led into wasting capital on any such scheme as this. He concluded by moving the adoption of the report and accounts, and the declaration of a dividend of 3½ per cent., free of income-tax, making, with the interim dividend, 6½ per cent. for the year.

Mr. LOUIS PENNY seconded the motion.

Mr. CUFF congratulated the Directors on the very good report they were able to submit. He said it was a very satisfactory feature that the Board were in a position to show another good increase in the private consumption this year. With reference to the suggested reduction in the price of gas, this would be excellent, if they saw their way to bring it about, and thus induce a still larger consumption. But as regarded the Municipality, they had a maximum price with which they were perfectly satisfied under the contract. He would venture to suggest therefore that, in the event of a reduction being possible to other consumers, such reduction might perhaps in the case of the Municipality vary according to the price the Company had to pay for coal—always, of course, being under the maximum.

The CHAIRMAN: A very wise suggestion.

The resolution was then carried unanimously.

The retiring Directors (Field-Marshal Sir Evelyn Wood, V.C., G.C.B., and Mr. W. G. Bradshaw, the Deputy-Chairman) were then re-elected, on the motion of the CHAIRMAN, seconded by Mr. CHARLES HUNT; and the Auditors (Messrs. S. Gore Browne and J. Hill Perrins) were re-appointed, on the proposition of Mr. CUFF, seconded by Mr. FITZMAURICE.

The CHAIRMAN proposed a vote of thanks to the staff; remarking that the greatest zeal, energy, and ability had been shown by the Engineer (Mr. A. R. Burch) and his assistants in Bombay, while their Secretary in London, and his staff, also gave their very best services to the Company.

Mr. S. SPENCER seconded. Referring to the remarks of the Chairman on the subject of lighting, he said that the Corporation of London had sent a deputation to different cities; and when their report was issued, he thought it would be found very favourable to gas. They would already have seen from the "JOURNAL OF GAS LIGHTING" that Mr. C. A. Teuton, the Chairman of the Streets Committee, who went on the deputation, had stated that in some of the cities they had visited there "certainly was quantity, if not quality," of light. He (the speaker) thought that if the burners the Chairman had spoken about were brought into general use in these places, they would be a very great advantage.

The vote was heartily accorded.

Mr. W. WILLIAMS proposed a vote of thanks to the Chairman and Directors; and Mr. F. R. SMITH seconded the motion, which was carried. Mr. Williams said the report was very satisfactory in every way. It was a live, progressive Company; and the Board were entitled to the best thanks of the shareholders for the manner in which they carried on the business.

The CHAIRMAN, in acknowledging the vote, referred to the excellent position now occupied by gas securities from a financial standpoint. He pointed out that at an auction sale a few days previously stocks in some of the smaller companies were disposed of at prices which yielded the buyer in many cases under 4½ per cent. on his money, and in very few

instances over this figure. This showed that confidence had been restored in the public mind with reference to gas as an investment. Some years ago, before the price of coal rose and certain alterations occurred in the labour market, these securities stood at about the same level as now; and he used to prophesy that they would come down to a 4 per cent. basis. But they went back until quite recently. A year-and-a-half ago, one could obtain a yield of 5½ per cent., and even a little more, in good substantial companies. As, however, he had said, it was now down again to 4½ per cent., or rather less.

CAPE TOWN AND DISTRICT GASLIGHT COMPANY.

The Depression at the Cape.—Conditions Peculiar to the Colony.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, New Broad Street House, E.C.—Mr. J. E. LILLEY, J.P., in the chair.

The SECRETARY (Mr. H. Yuill) read the notice convening the meeting; and the Directors' report and accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, in the course of a long speech, said he was pleased to be able to show the shareholders that the Company had done better during the past year in regard to results generally, although they had not done quite so well in respect of the quantity of business. They had, however, been more fortunate in this respect than the majority of people who traded in Cape Colony. Almost every other large undertaking—whether financial or commercial—had had even less favourable results than in 1907. In their own case, they had been able to increase their profits a little—not to a great extent; but he thought they had something on which to congratulate themselves. The make of gas had decreased by about 8 millions; but part of this was a favourable item, inasmuch as the decrease was caused by less gas being lost through leakages. Then a further portion of the decreased requirements resulted from their not lighting the streets of Woodstock during 1908, as was done in 1907. Those who were present at the meeting last year would remember it was stated that the street lighting had been taken from the Company, and that the streets were to be illuminated by electricity. This represented 4 million cubic feet decrease in the requirements for gas. When he mentioned that the total sales were only 3 millions less than last year, although they lost the sale of 4 millions in this one direction, it would be seen that, in the ordinary business, there was a small increase apart from public lighting. The street lighting was not profitable to them; so that, by losing the contract, they did not lose profit. At the same time, the Directors did not like losing contracts for street lighting; and they strove hard to keep them. They served seven municipalities in their area; and they had lit all their districts, except Cape Town, for some years. Seapoint had now also given notice of its determination to have electricity for street lighting. The Directors tried very hard to put the price down below what it would have cost them to retain the lighting. But it was no use; and they knew now they would lose the contract at the end of the year. However, they would not lose profit. The saving in leakage was an important thing; and the Company would benefit from it. A great deal of attention had been given to this matter during the year—in Cape Town almost exclusively. The important streets had been taken up by the municipal authorities, and relaid with asphalt or wood paving. As those shareholders who knew the place were aware, the people of Cape Town suffered severely from dust in their streets; and it was thought that the improved paving would somewhat mitigate the nuisance. The Directors thought it advisable to take advantage of these alterations to carefully inspect the mains and services; and they did this to avoid the liability which might otherwise have devolved upon them later of opening these expensively made streets, and re-instating them. The expense of this would have been very serious. Leakages were found and everything was put in perfect order; and no doubt this was the cause of the decrease in the unaccounted-for gas. At the present time, they were engaged in making a systematic inspection of their mains, taking each district separately. They had increased the number of the consumers. The year started with 5238 consumers; and finished with 5398. At the end of the year, there were 2311 ordinary meter consumers, against 2611 at the beginning; showing a loss of 300. In prepayment meters, however, there was an increase from 2627 to 3087; showing a gain of 460. Therefore, the net gain during the year was 160. The number of consumers could have been increased to an even greater extent; but they had a few important things to consider bearing upon the question. One was the expenditure of capital necessary for the purpose, because the capital had all been expended before 1908. The Directors felt it was necessary to go very carefully into the installation of prepayment meters. They used to hear the whole of the expense; but this was changed now. For some time past, they had required any person who wanted an installation on the prepayment system to bear a portion of the cost. It was found that this answered very well; and they would continue the practice so long as they could increase the business on these terms, because a person would not expend money to have pipes carried into his house if he did not intend to use them. Their practice was to put in a certain number of new installations as they were required, and where it was thought they would give them the best results, and then to pause for a little while, and see whether satisfactory returns were being obtained from them. If they were, then they canvassed for new customers, and were generally successful in getting them. During the year they had to disconnect 1726 meters from their customers. Anyone who knew anything about gas supplies would consider this a large proportion of the 5000 odd. Nearly all these were cases of customers who were leaving their houses. Of course, this was a great expense, as their district was a wide one, measuring nearly 15 miles from one end to the other. Cartage there was much dearer than here; and so the expense of sending men to make these disconnections and remove the meters was very considerable. However, they had one compensation; and it was that during the past year they were enabled to connect 1886 meters while removing 1726. These constant changes, nevertheless, were a serious expense; and the Directors would be very glad indeed when circumstances and the conditions of living in Cape

Town were such that people did not have to remove so frequently. During the year they had made a little saving on the price of coals, and a greater saving on the freights—putting the two together, coal had cost 2s. 2d. per ton less than in 1907. But this did not account for the whole of the saving in the manufacture, because a part of it was due to the increased production of gas per ton of coal carbonized. The Directors had made satisfactory arrangements with regard to freights until June, 1910. Respecting coal, they had made no contracts. They did not do so last year; and they found a little advantage in watching the market carefully, and buying as prices became lower. So far this year they had succeeded in purchasing their coals quite as favourably as last year, and perhaps he might say a little more so. As to residuals, they had done a little better than the previous year. Three years ago they had a tremendous incubus of coke that at the time they could not move. It amounted to over 3000 tons; but at the end of last year they only had 562 tons. They had reduced the stock still further; and they hoped to clear the coke yard soon. As to breeze, the sale was entirely at a standstill. The brick makers were their best customers for this commodity; but they were idle now. A market had consequently to be found for it, wherever possible, at greatly reduced prices. Regarding tar, they had done decidedly better during the year; but this was not an item that came to very much. Still the sales of tar were good; and they were getting a better price than in the preceding year. The whole of the gas making was now being done at the Woodstock works; and they found they could work quite satisfactorily from the one station, and make considerable savings. If the shareholders looked at the revenue account, it would be seen that in the cost of manufacture and distribution of gas, there was a saving of between £5000 and £6000. This, however, must not be taken as a net saving, because the make of gas was less and the sales were less, taking everything into consideration. Though it was not all profit, it showed considerable savings had been made. As to repairs and maintenance of works, they had been carrying out the alterations necessary to enable them to do all their work at Woodstock. The alterations cost well over £2000, beyond what would have been incurred for usual repairs in an ordinary year. Inasmuch as the Directors had come to the conclusion to make further alterations during this year to complete their arrangements, they had thought it better to pay the whole cost out of the year's revenue. One alteration had been to put in through retorts in place of the old short, single ones. A sum of £2000 had also been written off the value of the stocks; and everything was now at a realizable price. The investments had been written down to their market value at the end of December last, and for this £412 had been deducted from the profits. They had restored to the reserve fund rather more than the amount they had to take from it last year, by transferring to it £1300. Then they had put £400 to the workmen's accident insurance fund. This was really more than the insurance for one year; but the Directors felt they would like a little nucleus to start with, and so raised the fund from £100 to £500. The reason they took this step was that the insurance rates were high; and they thought it better to have their own fund. Insurance rates, however, were now sinking; and the Directors would always be willing to insure through a company if they were satisfied the premiums would be better than having a fund of their own. So far, however, the workmen's accident claims on them had not amounted in the past two years to £20. It would be seen that they had taken out of the year's profits above £5000, and applied the money to purposes which certainly consolidated and strengthened the Company; and, in addition to this, they carried forward a larger sum by £1600. It was, however, with great regret the Directors felt it necessary not to pay any dividend. If the shareholders, however, would look at the capital account, it would be found that £6887 was expended last year; and they had no capital to draw upon for this money. Just after Dec. 31, too, debenture interest fell due, and payments for coal and other matters had to be made. Regarding capital, they charged nothing to the account excepting for services and mains. A large main had been finished from Woodstock to Cape Town, to enable them to supply gas from the former works; and the services for new installations had required about £4000. These installations, however, brought them in new business. The results from the prepayment meters, though not so good now as in the past, still remained so good that they paid well to instal. From each service, the Company obtained nearly £5; so that it did not take an unreasonably long time to pay for the installations after deducting the profit for each year. Part of the expenditure of the year that ordinarily would have gone to capital, the Directors put entirely to repairs and maintenance. They wanted to consider the capital account closed for all purposes if possible, except such as would bring in increased revenue. Among other work of the year had been the resheeting of the crown of a holder, and some necessary alterations to the framework; and £700 had been expended for this. There was no improvement in the general condition of affairs at Cape Town at the present time. Business he believed was a little better; but, taking things on the whole, affairs there had been just about as bad as they possibly could be.

The VICE-CHAIRMAN (Mr. H. R. Savory) seconded the motion.

Mr. W. H. HARDING and Mr. JAMES RANDALL put a number of questions, chiefly bearing upon the accounts.

The CHAIRMAN, in the course of his reply, said he did not think anyone could have secured a greater reduction than 2s. 2d. per ton on freights and coal together. At the end of 1907, the coal they had in stock had cost them on this side about 11s. per ton. By the time it reached Cape Town, it had cost them 3s. per ton, including Government duty, dock charges, and so on. To get the coal delivered into their stores cost them 4s. per ton. At the end of the past year, the price delivered on board ship was 9s. 9d. per ton; and this year the total cost would be 32s. to 33s., including all charges. The Directors had quotations for coal from various collieries; but they did not change from the class employed now for some years unless they saw some distinct advantage in doing so. They adopted South Pelaw coal, and found it answered their purposes admirably, both with regard to gas and coke. There was little demand for gas for heating purposes in Cape Town. At the price they were compelled to charge, few people would employ gas for heating. They, however, supplied a large number of cooking-stoves, both on the ordinary and prepayment meter system. As to a revival of trade, he had no hesitation in saying that the present year would be much better than last; but he was sorry

to say the first three months of the year, compared with the corresponding period of last year, showed a considerable decrease in the demand for gas. During the middle of last year, there were some heavy failures in the way of restaurants and hotels, which used gas almost exclusively for cooking. The Company had consequently lost the business of these places. The Government and the municipalities had also reduced their staffs. All this had lowered the spending power of the people in Cape Town; and now the number of empty houses and shops was most serious. Through this, no doubt, the Company had lost a considerable number of consumers. By canvassing hard, however, they had already recovered a large number of customers. They had, in fact, pressing demands for new meters, prepayment services, and so on; and therefore he did not feel at all depressed on this subject.

The motion was unanimously carried.

Resolutions were passed, re-electing the retiring Director (Mr. R. A. Fairclough) and the Auditors (Messrs. C. F. Kemp, Sons, and Co.).

The usual complimentary votes terminated the proceedings, which had been somewhat protracted.

BAHIA BLANCA GAS COMPANY, LIMITED.

Progress of a New Undertaking.

The Second Ordinary General Meeting of the Company was held last Thursday, at the London Offices, No. 1, East India Avenue, E.C., under the presidency of Mr. J. C. IM THURN, the Chairman.

The SECRETARY (Mr. J. M. Macmorran) read the notice convening the meeting; and the report and accounts (noticed on p. 402 of last week's "JOURNAL") were taken as read.

The CHAIRMAN, in moving their adoption, pointed out that they referred to the last half of 1908; and he thought he might claim that they were satisfactory, having regard to the fact that they only commenced gas making in the autumn of 1907, and that the Board were already in the position of being able to recommend a dividend—though only a small one. He believed that, for a gas undertaking started in a town which was still in the making, it was somewhat unusual to be able to make such an early beginning as they did with the payment of dividends. There was not much to be said about the accounts themselves; probably it would interest the shareholders more to hear what the Directors thought of the future. Since the meeting in November last, the business had made steady progress. He told them then that they had 1250 meters and 420 stoves in use; whereas by the end of last month (April) there were 1450 meters and 500 cookers fixed. They had now commenced to supply gas for the public lamps, having obtained a contract for 41 lamps, which number, the Board had reason to believe, would ere long be considerably augmented. In view of the fact that the intervening months, from December to April, were the summer months, when the days were very long, and the heat very great, he regarded this result as satisfactory. Their Manager (Mr. Percy Bridger) wrote on April 15 that he was receiving many applications for installations, and that as the cold weather came on he expected to have a very busy time. There were now 33 miles of mains laid, as compared with the 9 miles which were originally projected, and as against the 29 miles mentioned by him last November. Now that the business was developed, he thought they might look forward to a continued and steady increase in consumption in the immediate future. In fact, the Directors regarded the prospects as excellent in every way. There was a sufficient stock of coal on hand, and paid for, to last until the middle of September; and the latest advices were that residuals were selling well, and accumulations of stock were being avoided. The Board had been able to increase the mileage of mains to the extent he had stated, and to hold a stock of coals, &c., to the value of £28,823, without calling on the shareholders for any more money, though it had depleted the modest working capital with which the Company started. Should further large developments be projected, it might be necessary to take steps to meet the outlay; but the Directors had no reason to anticipate anything of this nature at present—the more so as the Committee had wired that they would be able to supply the Board with regular remittances during this year. The gas consumption from January to April last was 292,306 cubic metres, as compared with 203,200 cubic metres for the same months of the previous year. This was an increase of 43 per cent.

Mr. ROSS PINSENT seconded the motion; and after one or two shareholders had drawn attention to the meagreness of the report, the resolution was carried.

On the proposition of the CHAIRMAN, seconded by Mr. PINSENT, a dividend on the "A" shares of 2 per cent., free of income-tax, on the working of the Company up to Dec. 31, was declared.

Subsequently the retiring Director (Mr. Pinsent) and the Auditors (Messrs. Arthur Goddard and Co.) were re-elected; and the meeting was brought to a close with the customary vote of thanks.

Increased Gas Profits for the Rates at Wigan.—At a meeting of the Wigan Gas Committee last week, the Engineer (Mr. J. Timmins) submitted his report. This stated that the profit on the undertaking for the past year was £11,704, including £5402, which was the cost of public lighting. It was decided that the sum of £4000 should be handed over to the general district rate. The amount of the profits contributed to the district rate last year was £3000.

Results at Tiverton.—At a meeting of the Tiverton Town Council last week, Mr. J. Thorne submitted the financial results of the year's operations of the gas-works. The gross profits were £2547; sinking fund contribution, £1307; and interest, £1154. This left a balance to the good of £86. But for the reduction during the past year of 2d. per 1000 cubic feet in the price of gas, the net proceeds would have been £200 more. The total amount now in the reserve fund is £3073; and in the sinking fund, £14,045. The profits accumulated since the works have been in the hands of the Council amount to £17,199 3s. 7d. Mr. Thorne paid a high tribute to the work done for them by the Gas Manager (Mr. C. Jeffery).

FINCHLEY ELECTRIC LIGHTING SCHEME.

Echo of Local Government Board Inquiry.

Arising out of the recent Local Government Board inquiry into the application of the Finchley Urban District Council for a loan for arc lighting, at the last meeting of the Council Mr. Rabbidge, who was one of the witnesses at the inquiry, brought forward what he said was a grievance in connection with the matter. He stated that in 1905 a letter was received by the Council from the Local Government Board to the effect that, in future applications for loans for street lighting, the terms of the Gas Company should be ascertained. He complained that the contents of the letter were never communicated to the Council. The Chairman (Mr. W. C. Cope) said the letter was brought before the Finance and Electricity Committees; and on Sept. 19, 1905, it was read at a meeting of the Electricity Committee at which Mr. Rabbidge was present. Mr. Rabbidge retorted that he did not remember it. The Clerk read the letter, which was dated Aug. 31, 1905, and which suggested that in future the District Council should carefully consider the cost of street lighting by electricity as compared with that of lighting by gas. The Clerk said the letter was fully set out in the report of the Finance Committee which was circulated to every member. Mr. Bloomfield said he understood from the letter that the Local Government Board only made the suggestion that the Council should get terms from the Gas Company; there was no instruction. The Chairman: They have no power to give such an instruction. Mr. Bloomfield said the Lighting Committee did consider the question of lighting by gas, and decided against it.

The Chairman said he did not care whether the Council had arc lighting or not; but he did complain that the inquiry had been turned into a discussion on Electricity *v.* Gas. The Gas Company had put forward the plea that they were the second or third largest ratepayers; but they were there for their own profit. It was stated that the Council were losing money on the street lighting; but if they were going to throw over this proposed extension, they would be losing a big customer and more money. He did not think any sane man with a business undertaking such as the Council's lighting would hand over a portion of it to a rival Company. If the light was not good enough, let them improve it; but so long as he remained a member of the Council, he would not consent to their taking it from an opposition Company.

Mr. Tew asked whether, in view of the great opposition to the arc lighting scheme, it was the intention of the Council to proceed with it. Mr. Royston, in reply, said the Council had a motion to that effect; and Mr. Tew might show his opposition in a tangible manner by bringing forward a motion to rescind it. He proceeded to point out that Mr. Tew had charged him with misrepresentation in stating at the inquiry that the Highways Committee were unanimously in favour of the loan for arc lighting. This, however, was a fact; and Mr. Tew himself supported the resolution to this effect at all the meetings of the Committee except the last, at which he was not present. Prior to the last meeting Mr. Tew told him he was no longer in favour of arc lighting, but did not intend to vote against it. He (Mr. Royston) therefore felt that he was justified in telling the Inspector that he had had no official notice of any opposition from a member of his Committee until the evening before the inquiry.

BUSINESS METHODS AT SUNDERLAND.

Assisting the Electricity Undertaking.

A new bridge across the River Wear is to be opened at Sunderland; and the Town Council have been discussing a recommendation of the Committee concerned that the lighting should be by electricity. Alderman Fairless, in moving the adoption of the recommendation, said he would be candid in regard to the matter. The Committee had before them estimates as to the cost of lighting by electricity and by incandescent gas. They found that the installation of electric light would cost £331 more than gas, and the maintenance expense of electricity would be £33 a year more than gas. Still, in view of the fact that the Council themselves would supply the electricity, they recommended it. Mr. Hoey moved, as an amendment, that they accept the estimate of the Gas Company. He said the lighting of the bridge by electricity would cost for the installation £457; while the cost for the gas installation would be £126. With regard to upkeep, electricity would cost £156, against £123 for gas; the light in both cases being of the same candle power. In his view, apart from cheapness, gas would give them a better light. Mr. Lawson seconded the amendment. The tender for electric light came, he said, from their own Electricity Department. If the offer had come from an outside company, they would not have entertained it for a moment; it would have been "laughed out of court." These tenders had not been considered on their merits by the Committee; but, on the contrary, the electric light was recommended because it was supplied by their own department, to which they proposed to give preferential treatment. He was utterly opposed to any such method of bolstering up the Electricity Department; and, in his opinion, such a course would do harm in the long run. Alderman Turnbull supported the recommendation of the Committee. It was contended, he said, that incandescent gas lights were better than electric lights. Let anybody who had these incandescent lights inside his shop give them due attention; and he would find that after the first three or four nights they would begin to go wrong. Electricity would be the light of the future. The amendment was lost by 13 votes to 26; and the recommendation of the Committee was then adopted.

Referring to this decision, the "Sunderland Daily Echo" says: By 26 votes to 13, it was resolved to adopt electricity, though, as Alderman Fairless "candidly" said, in moving the adoption of the report, this would cost £331 more for installation than incandescent gas, while the cost of maintenance would be greater. "Still," the worthy Alderman added, "in view of the fact that the Council themselves would supply the electricity, they recommended it in preference to gas." Here we have an implied avowal that, in order to enable our electricity under-

taking to make a better show than otherwise it would, the spirit of business in respect of expenditure should be held in abeyance. This kind of thing is not new. Our Tramways Committee are paying much more for current than private companies are charging tram services in other parts of the district, so that the Electricity and Lighting Committee may present reports as little funereal as possible. Facts of this kind, together with strong presumptions that plant is being maintained in the books at excessive valuations, are not calculated to render the electricity undertaking a "proud argument" in favour of municipalization.

GAS-METER TESTING IN MANCHESTER.

Particulars of the Index Test.

In his sixteenth annual report to the Manchester City Justices, Mr. S. Dyson, the Official Inspector of Gas-Meters, says the number of meters tested during the year to March 31 amounted to 38,559, showing an increase of 135 as compared with the previous year. The fees received amounted to £1536; being an increase of £73. The amount expended on equipment for the year was £47; and this, together with the ordinary expenditure of £1844, makes a total of £1891.

There were 1277 meters rejected, or 3.30 per cent. Of the total wet meters tested—viz., 11,538—374, or 3.22 per cent., were rejected; and of 27,021 dry meters tested, 903, or 3.3 per cent., were rejected. The number of meters rejected increased from 605 to 1277, as compared with the previous year, or from 1.59 to 3.30 per cent. This increase was owing to a number of old meters being tested which belonged to the gas consumers, by whom they were purchased prior to the meter-rents being abolished.

The "index test" has been applied in the office since 1902 to all gas-meters belonging to the Corporation. The test was instituted by mutual arrangement between the Justices Testing Committee and the Gas Committee (in the absence of statutory powers), for the protection of the gas consumers in the city. During the past year, the indices of 10,391 dry meters and 8448 wet meters were tested; and 85 of these were rejected. The most serious cases of error were found in three meters, which had been repaired by the manufacturers; and, before being put into use again, they were submitted to the office for testing, with the following results:—

Two 3 light index transposed, registering 100 per cent. fast.

One 5 „ „ incorrect gearing, causing meter to register backwards.

Table Showing Cause of Defects in Meters Rejected by "Index Test."

Upright Shaft Out of Action with Drum Shaft.	Incorrect Number of Teeth in Index-Wheels.	Defective Front Plates and Inaccurate Marking.	Damaged Fittings and Wheels.	Index Wheels Out of Action.	Incorrect Gearing.	Indices Transposed.	Total.
14	4	34	17	13	1	2	85

Mr. Dyson says the London County Council, the Manchester Justices Testing Committee, and other gas-meter testing authorities, have at various times made representations to the Board of Trade to amend the law in regard to gas-meter testing. Last year the Board of Trade issued a circular-letter asking the testing authorities throughout the country for any observations they might see fit to offer as to the adequacy of the provisions of the existing Acts with regard to present testing requirements. In June last, the Standards Department of the Board of Trade appointed a Departmental Committee to consider what amendments are necessary in the Sale of Gas Acts with reference to the testing of meters. The meetings of the Committee (on which Mr. Dyson served) were held at Westminster; and Mr. Dyson submitted specially-designed machines for facilitating the testing of indices, and also wet and dry meters, showing a simple contrivance for detachable indices. The Board have the matter still under consideration.

The periodical re-verification of meters, adds Mr. Dyson, is also of great importance to both consumers and producers of gas. There are no compulsory powers at present for this. After meters are once tested and fixed on the premises of consumers, it is customary to allow them to remain in use for many years without being re-tested. He has known meters of this description with their original seals attached and unbroken for from 20 to 30 years without being re-tested; and he says that in all probability the majority of these meters would be registering inaccurately. The Manchester Corporation recently decided that all gas-meters should be re-tested which are owned by the consumers, and had been used by them in the Manchester area of supply for a period of ten years. From the results thus obtained, Mr. Dyson remarks, it would appear that the Corporation were well advised. Out of a total of 676 such meters tested, there were only 135 found correct; while 541 were incorrect, or 80.1 per cent. The London County Council advocate for the proposed Amended Act the abolition of the internal soundness test of all new meters. They consider this test "unnecessary, and that it greatly delays the testing operations." Mr. Dyson, however, observes that it would be unsatisfactory to stamp a meter as correct without first ascertaining that it is internally sound, as no reliable registration test can be obtained with an unsound meter. He has devised an arrangement whereby two meters can be tested simultaneously. While one meter (which is internally sound) is undergoing the registration test by the standard holder, the second meter is connected to a leakage meter and tested for both internal and external soundness under the prescribed pressure of 3 inches. This arrangement, he says, will greatly facilitate the internal soundness testing of meters, and will to some extent overcome the objection of the London County Council.

Messrs. Fletcher, Russell, and Co., of Warrington, have issued an illustrated booklet dealing with their patent indestructible gas cooking-ranges, and other domestic appliances—including water-heaters. On the front of the cover are two pictures showing "the cheapest methods of cookery known." The first (or primitive) is of a Maori cooking at a natural hot spring; and the second (or scientific) is of a housewife using one of the firm's gas-cookers.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards held a sale of gas stocks and shares, at which remarkably satisfactory prices were realized; there being keen competition for the various lots by the large number of bidders who attended. The average prices realized per £100 of stock, the dividends at present paid, and the yield per cent. on the average purchase price, were as follows: Lea Bridge District Gas Company, £1000 of consolidated ordinary stock (present dividend 6 per cent.), average price per £100 of stock £124 1s.; yield upon investment, £4 16s. 9d. per cent. Ilford Gas Company, £1000 of ordinary "C" stock (dividend 6½ per cent.), average price £137 11s.; yield, £4 14s. 6d. per cent. Bromley and Crays Gas Company, £1000 of "C" ordinary stock (dividend 5½ per cent.), average price £114 19s.; yield, £4 15s. 8d. per cent. Hornsey Gas Company, £1500 of 5 per cent. preference stock, average price £118 10s.; yield, £4 4s. 5d. per cent. Maidstone Gas Company, £992 5 per cent. capital stock (dividend £7 5s. 6d. per cent.), average price £148 6s.; yield, £4 18s. 2d. Pinner Gas Company, Limited, 200 £5 tully-paid "B" shares (dividend £7 17s. 6d. per cent.), average price £8 7s. 9d. each; yield, £4 13s. 11d. per cent. Romford Gas and Coke Company, Limited, 180 £5 "B" shares (dividend 9 per cent.), average price £9 3s. 7d. each; yield, £4 18s. per cent. Romford Gas and Coke Company, Limited, a 4 per cent. debenture bond for £1000, price £97 per £100; yield, £4 2s. 6d. per cent. Wandsworth and Putney Gaslight and Coke Company, £1496 of 3 per cent. debenture stock, average price £77; yield, £3 17s. 11d. per cent. Guildford Gaslight and Coke Company, £1425 of ordinary stock (dividend 5½ per cent.), average price £118 18s. 7d.; yield, £4 16s. 9d. per cent. Eastbourne Gas Company, 61 £10 fully-paid "B" shares (dividend 12 per cent.), average price £28 10s. 9d.; yield, £4 4s. 1d. per cent. Southgate and District Gas Company, £500 of 5 per cent. preference stock, price £116; yield £4 6s. 2d. per cent. Southgate and District Gas Company, £300 of 4 per cent. perpetual debenture stock, price £100 10s.; yield, £3 19s. 7d. per cent. Cromer Gas Company, £1000 of ordinary stock (dividend 2 per cent.), average price £44 12s.; yield, £4 9s. 8d. per cent. Southend Gas Company, £500 of new ordinary stock (dividend 5½ per cent.), average price £118 14s.; yield, £4 16s. 11d. per cent. Southend Gas Company, £500 of new ordinary "B" stock (dividend £5 7s. 6d.), average price £113 8s.; yield, £4 14s. 9d. per cent. Some days ago, Messrs. Fenn and Co. sold locally by auction some "A" and "B" shares of £20 each in the Colchester Gas Company. The "A" shares were disposed of for £46 10s. each, and the "B" shares at prices ranging from £31 5s. to £34 10s. At another local sale, 210 £1 ordinary shares in the Morpeth Gas Company, Limited, realized from 25s. to 25s. 3d. each; while 66 £1 preference shares fetched from 25s. 3d. to 25s. 6d. each. Last year's dividend on the ordinary shares was 6 per cent., and on the preference 5 per cent. At a sale by auction last week, some £10 shares in the Torquay Gas Company, bearing a dividend not exceeding 10 per cent., realized £23 7s. 6d. per share; and £10 shares bearing a dividend of 7 per cent. sold at £16 2s. 6d. to £16 12s. 6d. per share. At Wakefield, some days ago, 21 £25 shares in the Wakefield Gaslight Company were offered for sale in four lots; the prices realized being from £63 2s. 6d. to £63 7s. 6d. each. Afterwards 57 £5 shares in the same Company were disposed of in six lots; the prices realized being from £12 15s. to £13 each. £435 of 4½ per cent. preference stock in the Company was sold at £111 per £100. Fifteen £10 shares in the Bridlington Gas Company realized from £33 15s. to £34 2s. 6d. each. Then £100 of consolidated "B" stock in the Harrogate Gas Company was sold at £325; and £100 of consolidated "C" stock in the same Company, at £310.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A decision was given by Lord Johnston in the Court of Session on Thursday which may be of some help to corporations in regard to their duties with respect to public lighting, as regulated by section 99 of the Burgh Police (Scotland) Act of 1892. The section is as follows: "The Commissioners shall make provision for lighting in a suitable manner all the streets and all other places within the burgh which, in their judgment should be lighted at the public expense, and shall provide, erect, and maintain, such a number of lamps, lamp-posts, and lamp-irons, and other appurtenances as may be necessary for this purpose, and shall light, or shall enter into contracts for lighting, and cause to be lighted, such lamps by means of gas, or such other light of an improved kind, subject to the provisions of the Electric Lighting Act of 1882, or any Act or Acts amending or superseding the same, as they may find expedient." The Police Commissioners of Tranent have equipped the burgh with a complete installation of gas lighting, and have adopted a scheme of lighting such as is common in all the smaller burghs, in which, among other things, the street-lamps are not lighted at all between certain dates in the summer season, and in winter when there is moonlight. On the evening of Sept. 5 last, when the moon was past its first quarter, and did not set till after eleven o'clock, their scheme provided that Bridge Street should not be lighted. On this evening, a miner, who, the Commissioners said, was under the influence of drink, was knocked down by a motor-car in Bridge Street and killed. The widow raised an action against the Corporation for £500 damages; and founded her action upon the failure of the Commissioners to have the street properly lighted. The Corporation pleaded in defence that the accident was due to the fault of the deceased; and, further, that it had never been considered necessary to light the lamps at that date, that they had discretionary power as to what streets were to be lighted, and as to the hour of lighting them, and that, in deciding not to light Bridge Street at the period of the year in question, they duly exercised the powers and discretion committed to them by the Act, and were not in fault. Lord Johnston said that the Statute imposed an absolute duty upon the Commissioners to light. As to whether the

provision for lighting on this particular evening between eight and nine o'clock complied with the requirements of the section was a question of fact requiring proof. If it were proved to be necessary, then the Commissioners had a duty to light; and if the consequences of their not lighting were an accident, they were responsible for it. The discretion confided to the Commissioners had reference to "other places within the burgh" which could not be provided for by the General Statute, and as to the lighting of which the burgh authorities must apply their judgment. If, in their judgment, they did not want to light, there was no obligation upon them to do so; but that there was an obligation upon the Commissioners to light the streets he had no doubt. He therefore repelled the defenders' plea as to discretion. He was of opinion, however, that the case was otherwise not relevant, because it was not set forth why the deceased did not see the bright lights of the advancing car. The deceased had a duty of self-preservation; and the pursuer's own statement did not negative the possibility that the accident was due to the deceased's want of care. He therefore dismissed the action as irrelevant, with expenses. The judgment amounts to this, that no time-table as to seasons or the state of the moon will avail to avoid an action in the event of an accident. It is imperative that the streets be lighted whenever it is dark, irrespective of any resolution of the Police Commissioners. The decision has a wide-reaching effect. Moonlight, for instance, is subject to great vagaries. It is matter of common knowledge that when the almanac shows there should be sufficient moonlight, it is frequently not experienced. Police Commissioners who, for reasons of economy, instruct, at the beginning of the lighting season, that the lamps shall not be lighted on certain dates, will not be safe. They must make up their mind night by night, as to whether or not the street lamps are to be lighted. And even if they should make up their minds at (say) eight o'clock that the lamps should not be lighted, and a sudden darkness should come on later, and an accident happens, they would be liable. The conclusion to be drawn is that it would be safer for corporations to have all their lamps lighted every night, and throw economy to the winds. This will be hard upon the smaller burghs. How about the larger towns! In the city of Edinburgh for instance, for reasons of economy, from the beginning of May onwards during the summer months, every second lamp is not lighted. Under this decision, suppose an accident were to happen near an unlighted lamp, the Corporation would be held liable, because, having the provision for adequately lighting the thoroughfare, they had failed to light it.

A writer in the "Dundee Advertiser" to-day states the opinion that it will be gratifying to the ratepayers, whose burden of taxation in other respects will certainly be increased, to learn that a reduction in the price of gas is practically assured. Notwithstanding dull trade, the accounts of the Gas Department for the year are in a highly satisfactory condition. There has been a large increase in consumption over the estimate, with a proportionate enhancement of revenue. Further, as a result of a series of experiments extending over the past two months, the cost of producing gas has been materially reduced, by which means a saving of some £2000 has been effected. The state of the accounts is such that it will be possible to make a reduction to the ordinary consumer of 1d. per 1000 cubic feet—from 2s. 4d. to 2s. 3d.

In the Kirkcaldy Town Council on Monday, the Gas Committee reported that they had considered which Act they should proceed under in the purchase of the gas-works, and that the Town Clerk had explained to them that there were two Acts which dealt with the subject—one the Kirkcaldy Burgh and Harbour Act, and the other the General Act known as the Burghs Gas Supply Act. The suggestion had been made that a Private Act might be promoted by the burgh for the purchase of the gas undertaking, one of the objects of which would be to get more favourable conditions for the sinking fund. There were, however, objections to the promoting of a Private Act. The Committee, therefore, unanimously recommended the adoption of the Burghs Gas Supply Act of 1876, which the Council agreed to.

Instead of erecting entirely new gas-works outside the burgh, as was contemplated by the Corporation of Burntisland four months ago, the Town Council have resolved upon extending the existing works by the addition of a gasholder only, which, it is hoped, will be in use by the end of the year.

In the Markinch Town Council on Monday, Mr. McCorquodale moved that it was desirable, in the interests of the ratepayers, that the gas supply should be under municipal control, and that a Committee be appointed to consider the question and report. The motion was adopted unanimously, and a Committee was appointed.

In the Hamilton Town Council on Tuesday, the Gas Commissioners reported that the railway siding into the gas-works had now been completed, and that the Caledonian Railway Company had agreed to work the siding without any extra charge in the meantime—this arrangement being terminable on one month's notice. The Manager had been requested to see that the shunting of waggons be carried out as speedily as possible. Satisfaction at the result was expressed; and the Council agreed to pay the Railway Company their account for the cost of construction, including extras—the amounts being £2082 and £220.

It was reported to the Arbroath Town Council on Monday that in the period from May 15 to March 31 there had been an increase in the output of gas to the amount of over 1½ million cubic feet, as compared with the previously corresponding period. The Gas Manager—Mr. A. C. Young—reported that progress had been made with the construction of the tank for the new gasholder, and the concrete foundation was partly laid down. A circular from the Sulphate of Ammonia Committee was submitted, in which it was stated that there was a proposal to extend the use and sale of sulphate of ammonia by propaganda work, and the Council were asked what assistance they would give towards meeting the expense of the work. The Gas Committee were satisfied that any expenditure of this kind would be remunerative; and they recommended, for this year, a contribution at the rate of 1s. per ton on the amount of sulphate produced and sold at the gas-works. The Council agreed to this proposal.

An attempt has been made by the North of Scotland Electric Light and Power Company, Limited, who supply electricity in Montrose, to capture the lighting of Dorward's House of Refuge in the town; but it has not been successful. An offer by the Company was considered by the House Committee some month ago, and was very favourably

received. Since then the Gas Manager—Mr. A. Mackay—put himself in communication with the Committee, and laid before them reasons why gas should be retained as the lighting medium, which were so cogent that, when the subject came before the Managers of the Institution on Monday, it was found that a number of the members of the House Committee had changed their minds, and were favourable to the retention of gas. It is interesting to note that it was not an offer of a cheaper light, for the cost—£27 15s. per annum—was quoted as being much the same as is paid for gas, which fetched the Committee at first, but an offer of free wiring. The price quoted was for a supply of 1000 units per annum, which was thought to be sufficient for the house, if care were exercised; but the members of the Committee came to be doubtful if this quantity would suffice. The Superintendent of the house seemed in favour of electricity, for he reported that there had been frequent escapes of gas from leaking pipes. Mr. Mackay, however, stumped the objection to gas by offering to examine all the pipes and put them right, free of cost. The Manager of the Electric Company had been shown Mr. Mackay's letter; and he wrote stating that many of the statements in it were grossly exaggerated, and could not be permitted to pass unchallenged. He did not, however, condescend upon what he regarded as exaggerations; and the Managers, without a dissentient voice, resolved to accept the Gas Manager's offer.

The Glasgow Corporation Water Committee recommend that the domestic water-rate within the limits of compulsory supply be reduced from 5d. in the pound, at which it has stood since 1899, to 4d. The rate beyond the limits of compulsory supply is to remain at 8d., and the public water-rate at 1d.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 15.

The market opened quietly; but towards the close there has been more demand for covering May contracts, and a slight recovery from the lowest prices touched. Direct buying has, however, been in but small compass, and there has not been any substantial improvement in values. The closing prices are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. There has also been considerable inquiry for the later months of the year and for spring delivery; but makers' prices are still prohibitive, and any business done abroad has been taken speculatively. The near months have been neglected, though prices very little above the spot level have been quoted.

Nitrate of Soda.

This market has been quiet, but very steady on spot; the quotations being 10s. 4½d. per cwt. for 95 per cent., and 10s. 7½d. for refined quality.

Tar Products.

LONDON, May 17.

Tar products have been steady throughout the past week. Pitch has been very firm, and prices have advanced all round. Not much business has, of course, been done for prompt, with the exception of South Wales, where they have been purchasing for near delivery for fear of a strike later on. Creosote has been steady. The market is quiet in London, where there is some disposition to sell for prompt delivery. In the Midlands, makers are comfortable. In Yorkshire, a considerable quantity has been cleared out, and makers are now asking improved prices. Carbolic is steady; but the market is apparently kept up by speculation, and makers do not appear to be buying. Benzols are still weak. Solvent is steady in London and elsewhere. Heavy oils are quiet. Tar is advancing slowly.

The average values during the week were: Tar, 14s. to 18s., ex works. Pitch, London, 26s. 6d. to 27s.; east coast, 26s. to 26s. 6d.; west coast, 25s. 3d. to 26s. 3d. f.a.s. Mersey ports, 25s. 3d. to 25s. 9d. f.o.b. others. Benzol, 90 per cent., casks included, London, 5½d. to 6d.; North, 5½d. to 5½d.; 50-90 per cent., casks included, London, 6½d. to 6½d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8½d.; North, 8d. Crude naphtha, in bulk, London, 3½d. to 3½d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been very quiet throughout the past week, and prices have declined. London makes on Beckton terms are quoted £11; and £10 18s. 9d. to £11 is the ruling figure in Hull. In Liverpool, £11 is said to have been accepted. In Glasgow, £11 2s. 6d. was taken; while in Leith, the market closes at £11 5s. to £11 6s. 3d. The fall in sulphate is remarkable when the advancing prices and good demand for nitrate of soda is taken into consideration.

Hinckley Gas Supply.—The report of the Gas Manager (Mr. Fred Lee), for the year to March 31, was presented to the Hinckley Urban District Council a few days ago. The net profit made on the gas undertaking during the twelve months was £2683; being about £800 less than in the previous year, owing to the reduction in the price of gas. It was recommended that, in addition to the sum of £1054 already transferred to capital account and £864 to special renewals fund, an amount of £520 be transferred to the general district rate, and the balance carried forward. The coal used during the year was 6967 tons, compared with 6826 tons. The gas manufactured was 75,106,000 cubic feet, being an increase of 1,466,000 cubic feet; and the quantity sold amounted to 72,783,600 cubic feet. Owing to depression in trade, the gas consumed in the factories was 3,000,000 cubic feet less than in the preceding year.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is rather uneven in tone, through the rumours of labour difficulties in other districts, which make both buyers and sellers here reluctant to enter into forward sales, though, at the same time, it stimulates the demand for early delivery. Best Northumbrian steam coals are about 12s. 1½d. to 12s. 3d. per ton f.o.b.; and second-class steams are from 10s. 3d. to 10s. 9d. Steam smalls rather vary in price—from 5s. to 6s. 6d. per ton; the demand being fair and the supply full, so that the shipments are heavy. In the gas coal trade, the inquiry is now rather less for local use; but the exports are steady, and Baltic shipments are being regularly made, as the Northern ports are generally open. Durham gas coals vary in price, according to quality—from about 9s. 1½d. to 10s. 3d. per ton f.o.b. for the usual classes; while for "Wear Specials," up to 11s. is quoted. There is less doing in contracts at the present time, for the reason above stated. A few sales for export are, however, being made; and prices in such cases seem to be tolerably firm, more especially when early delivery is needed—the uncertainty as to the Mines Hours' Act having its influence on later delivery. In the coke market, the demand is better for export. This and the lessened production make gas coke firm; the quotation being from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.

There is little change to report. The fear of trouble over the wages question on account of the Eight-Hours Act (which comes into force on July 1) has not, so far, had any effect upon the market. The quotations are: Ell 8s. 9d. to 10s. 9d., splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 315,354 tons—an increase of 3790 tons upon the previous week, and of 8668 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,719,743 tons—an increase of 266,753 tons upon the corresponding period.

Lighting of South Dublin Union.—A short time ago, the South Dublin Board of Guardians decided, in spite of strong opposition, to light the Union by gas; and seemingly the defeat has been taken badly by the electricity partisans, who called a special meeting last week to take into consideration "the injustice about to be done to the ratepayers by the adoption of a resolution by the Board of Guardians on April 14, 1909, whereby it was resolved to accept the offer of the Gas Company for the supply of gas for lighting purposes of the Union premises at a cost of £1142, plus £394 for fittings, for one year." The Chairman (Mr. J. Scully, J.P.) said the matter had been fully discussed, and was finally decided when over two-thirds of the entire Board were present—the voting being 33 to 22. He refused to permit any further discussion of the subject; and, declaring the meeting adjourned, left the room. A new Chairman was thereupon selected, and the ten members present proceeded to rescind the resolution giving the contract to the Gas Company, and to accept an offer of the Ampere Electrical Company to carry out the lighting; the Clerk expressing the opinion that they were quite in order.

Tarapaca Water-Works Company, Limited.—The twenty-first annual general meeting of the Company was held on the 3rd inst., under the presidency of Sir Robert Harvey. In moving the adoption of the report, which was noticed in the "JOURNAL" for the 27th ult. (p. 249), he pointed out that there was a reserve fund of £80,000, which had been built up to make the return of £2 per share in reduction of capital. They had as against it, and the £20,000 further added on Dec. 31, upwards of £100,000 in investments, cash, and hills. In conformity with the policy laid before the shareholders, the Directors had placed out of the profits a further £20,000 to the reserve fund to form a nucleus for a further return of capital when a sufficient amount had been accumulated. The water sales showed about 6 million gallons increase. They supplied during the year 139 million gallons in all, and they were very well satisfied with the way in which the mains and storage-tanks carried these large quantities of water. The report was adopted.

A Challenge at Ilfracombe.—In the "JOURNAL" a fortnight ago, it was stated that, in view of assertions which had been made as to advantages in point of price of the new metallic filament lamps over gas, Mr. L. Fletcher had issued, on behalf of the Welshach Company, a challenge to the Electric Light Company to put the matter to the proof on conditions which were set forth. The suggestion was that two precisely similar houses should be installed, one with electricity the other with gas. In his reply to the challenge, Mr. H. J. F. Stewart, the Engineer of the Electric Light Company, says he would like to know how it was proposed to find two houses in which the test could take place that were precisely similar in every way. After referring to the challenge as one which "any lighting expert knows to be played out and absurd," he continues: "The proof that electricity in conjunction with certain metallic filament lamps in most cases is cheaper than gas is that we have been, and are, installing the electric light in a large number of houses in this town at fixed charges per annum, which are below the gas bills for past years, without in any way taking into consideration the undisputed advantages of the electric light." This is the challenge to a direct comparison evaded.

Truro Water Supply.—In view of representations made by the Corporation, the Truro Water Company took steps to have the purity of the water supply tested. Samples were submitted to Sir William Crookes; and his report was submitted to a meeting of the City Council last Tuesday. Sir William said that from an organic point of view the water was excellent, but the bacteriological analysis did not show such good results. It was a strange fact that the water taken from the mains was superior to that drawn from the filtered water tanks at the works. This showed that the filtering plant was not working satisfactorily, or that some parts of it were not properly cleaned. The plant should be thoroughly inspected, and the collecting-ground should be examined to see if it was possible to remove any existing cause of contamination. Personally, he did not think it was necessary to have the water boiled; but he hesitated to advise the Council to have the notices as to this withdrawn. The Water Company, in a letter accompanying the report, suggested that the Corporation should withdraw the notices recommending consumers to boil the water. The Council decided not to take this step, and asked for assurances from the Company that they will carry into effect the recommendations of Sir William Crookes.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 433.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	7	Alliance & Dublin 10 p.c.	17½-18	..	5 11 1	501,000	Stk.	Feb. 25	10	Liverpool United A. . .	225-227	..	4 8 1
290,955	10	"	7	Do. 7 p.c.	12½-12½	..	5 9 10	718,100	"	"	7	Do. B. . .	168-170	..	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6½	Bombay, Ltd. . .	5½-6	..	5 8 4	75,000	5	Dec. 11	5	Malta & Mediterranean. .	4½-5	..	6 0 0
40,000	5	"	4½	Do. New, £4 paid.	42-43	..	5 15 6	560,000	100	Apl. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
50,000	13	Feb. 25	14	Bourne-) 10 p.c. . .	28½-29½	..	4 14 11	250,000	100	"	4½	Melbourne J 4½ p.c. Deb.	100-102	..	4 8 3
51,810	13	"	7	mouth Gas B 7 p.c. .	16½-17	..	4 2 4	541,920	20	Nov. 13	3½	Monte Video, Ltd. . .	12½-13	..	5 7 8
53,200	10	"	6	and Water) Pref. 6 p.c.	15½-15½	..	3 15 7	1,775,892	Stk.	Feb. 25	4½	Newcastle & Gt. Sh'd Con.	106½-107½	..	4 35 3
380,000	Stk.	"	12½	Brentford Consolidated	249-251	+1	4 19 7	518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	5 3 0
300,000	"	"	5½	Do. New . . .	189-191	+1	4 19 6	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	193-20	..	5 3 8
50,000	"	"	5	Do. 5 p.c. Pref. . .	122-124	..	4 0 8	55,940	10	"	7	Do. 7 p.c. . .	13-13½	..	5 15 1
226,250	"	Dec. 11	4	Do. 4 p.c. Deb. . .	101-103	..	3 17 8	300,000	Stk.	Apl. 29	8	Oriental, Ltd. . .	137-139	..	6 0 0
200,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	212-214	+1	5 0 6	60,000	5	Mar. 31	8	Ottoman, Ltd. . .	6-6½	..	4 19 0
246,320	"	"	7½	Do. A Ord. Stk. . .	154-156	+1	4 19 4	31,800	53	Feb. 25	13	Portsea Island A. . .	137-139	..	4 19 3
467,000	21	Apl. 16	10	British . . .	42½-43½	+½	4 12 6	60,000	50	"	13	Do. B. . .	129-131	..	4 19 2
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c. .	116-118	+1	5 1 8	100,000	50	"	12	Do. C. . .	119-121	..	4 17 1
165,700	"	"	4½	Do. do. 3½ p.c. . .	86-88	+1	5 2 3	114,800	50	"	10	Do. D and E. . .	101-103	..	5 0 0
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	131-133½	..	5 1 10	398,490	5	May 13	7	Primitiva Ord. . .	6½-7	..	4 13 0
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb. . .	94-96	..	4 3 4	796,680	5	Jan. 28	5	Do. 5 p.c. Pref. . .	58-1½	..	4 2 6
100,000	13	"	—	Cape Town & Dis., Ltd.	41-5	—	—	488,903	100	Dec. 1	4	Do. 4 p.c. Deb. . .	95-97	..	5 6 8
100,000	13	"	—	Do. 4½ p.c. Pref. . .	5½-6	+½	—	1,000,000	10	Apl. 29	8	River Plate Ord. . .	144-15	+½	4 2 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb. . .	95-97	..	5 12 3
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	77-79	..	5 13 11	250,000	10	Mar. 31	8	San Paulo, Ltd. . .	134-14½	+½	5 0 0
157,159	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109-111	..	4 10 1	62,500	10	"	—	Do. 6 p.c. Pref. . .	112-12	..	5 0 0
1,493,280	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk. .	108-110	..	4 16 6	125,000	50	Jan. 2	5	Do. 5 p.c. Deb. . .	50½-51½	..	4 17 1
560,000	"	"	5	Do. 3½ p.c. do. . .	102-104	..	4 16 2	135,000	Stk.	Mar. 12	10	Sheffield A. . .	236-238	..	4 4 0
475,000	"	Dec. 11	6	Do. 3 p.c. Deb. Stk. . .	82-84	..	3 11 5	209,984	"	"	10	Do. B. . .	233-235	..	4 5 1
800,000	Stk.	"	3½	Continental Union, Ltd.	99-101	..	6 8 9	523,500	"	"	10	Do. C. . .	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref. . .	139-141	..	4 19 3	70,000	10	Oct. 29	10	South African . . .	14-14½	..	6 17 11
492,270	Stk.	"	5	Derby Con. Stk. . .	121-123	..	4 1 4	6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	123-125	..	4 5 4
55,000	"	"	4	Do. Deb. Stk. . .	103-105	..	3 16 2	1,895,445	"	Jan. 14	3	Do. 3 p.c. Deb. . .	85-86	..	3 9 9
143,995	"	Mar. 31	5	East Hull 5 p.c. Ord. .	97-99	..	5 1 0	209,822	Stk.	Mar. 12	8	South Shields Co., Stk.	152-154	..	5 3 11
486,097	10	Jan. 28	12	European, Ltd. . .	23½-24½	..	4 19 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
351,669	10	"	12	Do. £7 res. paid.	17½-18½	..	4 18 5	60,000	"	"	5	Do. 5 p.c. Pref. . .	124-124	..	4 0 8
15,151,545	Stk.	Feb. 11	41/10/8	Gas 4 p.c. Ord. . .	103-104	..	4 7 0	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	122-126	..	3 19 4
2,650,000	"	"	3½	light 1 3½ p.c. max. . .	88-89	..	3 18 8	502,310	Stk.	May 13	5	Southampton Ord. . .	107-109	+½	4 11 9
3,797,735	"	"	4	and 4 p.c. Con. Pref.	105-107	..	3 14 9	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c. . .	132-134	..	5 0 9
4,193,975	"	Dec. 11	4	Coke 5 p.c. Con. Deb.	85-86	..	3 9 9	423,940	"	"	5½	Do. B 3½ p.c. . .	110-112	..	4 13 9
258,740	Stk.	Mar. 12	4½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	149,470	"	Dec. 30	4	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
82,500	"	"	6½	Do. do. 5 p.c. . .	118-120	..	5 4 2	162,300	10	"	5	Tuscan, Ltd. . .	82-91	..	8 13 0
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½-18	+½	6 2 3	149,900	10	Jan. 5	8	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
123,570	Stk.	Mar. 12	6½	Ilford "A" and "C" . .	134-136	..	4 15 7	236,676	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105-107	..	4 12 2
65,783	"	"	5	Do. "B" . . .	103-105	..	4 15 3	255,676	Stk.	Feb. 25	6½	Wands-1 B 3½ p.c. .	139-141	+8	4 1 1
63,000	"	Dec. 30	4	Do. 4 p.c. Deb. . .	102-104	..	3 16 11	79,416	"	Dec. 30	3	worth 1 3 p.c. Deb. Stk.	72-74	..	4 6 9
4,940,000	Stk.	May 13	8	Imperial Continental .	182-184	+1	4 7 0	895,872	"	Feb. 25	5½	West Ham 5 p.c. Ord. .	119-121	..	3 18 9
473,000	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	210,000	"	"	5	Do. 5 p.c. Pref. . .	125-127	..	3 13 5
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120-122	+3	4 18 4	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk. .	107-109	..	3 13 5

Prices marked * are "Ex div."

Reinstatement of Pavements in Westminster.

At the meeting of the Westminster City Council last Thursday, the Works Committee reported with reference to the conference with the various gas, electric, and other companies having statutory powers in the borough, on the subject of reinstatement after digging trenches. The conference was held in October; and the decisions of the Council with reference to it were arrived at in December and January. The Gaslight and Coke Company wrote, on March 9, expressing, on behalf of the various companies represented at the conference, appreciation of the friendly spirit in which they had been met in this matter, and stating that, with one or two exceptions, the proposals of the Council were agreed to. The first exception related to "splaying back" concrete. In this matter the companies felt that their contention for a 3-inch instead of the 4½-inch splay on each side, as offered by the Council, was perfectly fair and reasonable; and it was accepted by practically every other Metropolitan Borough Council. The second exception related to the use of steam-rollers on every small road repair. The companies contended that such a proceeding was altogether unnecessary and unduly costly; and that the need (if any) for the use of a steam-roller must arise shortly after the filling in, and not when there was an accumulation of small trenches which must by then have become consolidated by the ordinary traffic. On this point, it was asked if the Council had fixed any limit of time within which the roller should be employed on such trenches; and, if so, what the limit was. The companies hoped the Council would reconsider these points. On the subject of burying mains in concrete, the companies regretted that there seemed to be no likelihood of agreement between themselves and the Council; and the point would have to be settled by friendly action at the first opportunity. On the matter of "splaying back" concrete, the committee stated that the Council had already reduced the width of the splay from 6 inches to 4½ inches on each side; and they could not suggest any further reduction. As to steam-rolling, they reported that in every case of macadam repair in Westminster the road was consolidated by steam-rolling; and the City Engineer did not advise any departure from this rule in the case of reinstatement after trenches. The Committee further pointed out that the area of macadam roadway in Westminster was small compared with the area of paved roadway; and the tendency was for the Council to diminish it. They were, therefore, unable to recommend the Council to make any alteration in their present practice with regard to the use of the steam-roller; and they suggested that the Council should reply to the letter from the Gaslight and Coke Company in accordance with their report. This was agreed to.

The Health Committee of the Wrexham Town Council have had before them a complaint from a resident of a "horrible stench" which was alleged to come from the sulphate of ammonia plant at the gas-works. The Sanitary Inspector stated, however, that the works had been visited on several occasions; and nothing offensive had been found there. It was decided to forward the complaint to the Gas Company for their observations.

Warrington Water Supply.—Owing to increasing demands, some difficulty has been experienced by the Warrington Corporation in so distributing their plentiful supply of water as to meet all needs. The Water Committee have accordingly had under consideration proposals for dealing with the difficulty, and in conjunction with their Engineer (Mr. J. Deas) have prepared a scheme which has been submitted to a special meeting of the General Purposes Committee. This comprises the laying of a 24-inch main from the Winwick Pumping-Station, additional pumping plant at the Houghton Green Station, and further high-level works consisting of two triple-expansion engines each capable of delivering 750,000 gallons of water per 24 hours, a water-tower of a capacity of 300,000 gallons, and some distributing mains.

Public Lighting in Westminster.—At the meeting of the Westminster City Council last Thursday, the Works Committee reported on a number of contracts between the Gaslight and Coke Company and the Council for public lighting, which expire at various periods between the latter part of the present year and the end of 1910. The Committee stated that they proposed to consider the advisability of negotiating terms for a new contract covering all the public gas lighting now undertaken by the Company. In the meantime, they had instructed the Town Clerk to negotiate with the Company for all their contracts with the Council for public lighting to be terminated at one time. They recommended the Council to give notice to the Gas Company to terminate the contracts in reference to the lighting in the parishes of St. Martin, St. Margaret, and St. John, and in Parliament Street and Whitehall, at their expiry on Dec. 31 next. This was agreed to.

Suicides by Coal Gas.—Twice within a week the Coroner for Folkestone (Mr. G. W. Haines) held inquests on women who ended their lives by placing their heads in gas-ovens. The first case was that of the wife of a Hastings grocer, named Isabel White. It was stated that the deceased woman, who had shown symptoms of mental derangement, was discovered at the house of her brother-in-law with her head in a gas-oven, over which was placed a sheet. The gas was turned on, and the woman had been suffocated by the fumes. A verdict of "Suicide while temporarily insane" was recorded. In the second case, the subject of the inquiry was Elizabeth Jane Andrews, aged 63, who was found by her husband on the previous day with her head in the gas-oven. She had stopped up the principal air apertures, and had also placed on the edge of the stove a kind of pillow, on which it is presumed she had rested her head. A verdict was returned of "Suicide from gas poisoning while in an unsound state of mind." Last Thursday, Dr. Ambrose held an inquest on Mrs. Sarah Ann Boardman, 61, the wife of an engine fitter at Leyton. The husband deposed that his wife had lately given way to drink; and on the previous Sunday she was ill and did not have any dinner. In the afternoon he went upstairs to lie down, and when he returned at about six o'clock, he discovered his wife with her head in the gas-oven. His overcoat was wrapped round her, and the gas-taps were turned on. A medical man gave evidence to the effect that death was due to suffocation from gas poisoning; and a verdict of "Suicide" was returned.

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IS writ large in the view of every Gas Engineer who buys Gas Cookers. With such far-sighted men, other things being equal, the "MAINTENANCE Cooker" wins every time.

It is natural, therefore, that they should stand by the "New Davis"—
THE SCREWLESS COOKER.

The Davis Gas Stove Co., Ltd.,

Diamond Foundry, LUTON.

Public Lighting of Chichester.—The Chichester Town Council have adopted a recommendation of the Lighting, &c., Committee to accept the Gas Company's tender for lighting the streets and public places in the city for five years from the expiration of the present contract at the end of this year. The contract is to be determinable at the option of the Corporation at the end of the first or third year, on giving six months' notice; and the price is to be £3 10s. per lamp.

A Father's Desperate Deed at Conisborough.—Driven desperate by family bereavements and want of work, a Conisborough miner named George Brown, and aged 46, last Saturday morning cut his throat and attempted to kill his eight children by turning on the gas-taps in the house. The man himself was dead when the police arrived; but fortunately the children's lives were saved—their escape being put down to the fact that the flow of gas, after going on for some time, was automatically cut off by the penny-in-the-slot meter.

Manchester's Increasing Water Consumption.—The increasing consumption of water in the area supplied by the Manchester Corporation is causing some anxiety to the Water Committee. It was stated at last Thursday's meeting of the Committee that the consumption for the three previous days had been at the rate of 46,000,000 gallons per diem, compared with 43,000,000 gallons at the corresponding period of last year. Members of the Committee are satisfied that there must be a considerable waste, apart from the legitimate increased demand upon the department; and it was decided that precautions be taken to prevent this as far as possible. Basing the average daily consumption on 41,000,000 gallons, the Corporation have at present in stock 125 days' supply.

A Shocking Affair at Hackney.—An explosion of gas, by which six persons—three police constables and three civilians—were seriously injured took place early on Sunday morning in Guinness's Trust Buildings, Hackney Road. Mrs. Dillon, the wife of the tenant of the room where the accident occurred, on returning home, could not gain admission; and so summoned assistance. It was when the helpers forced the door that the explosion occurred, which caused so much personal injury. Though the explosion was an accident, it is to be feared that the escape of gas was wilfully caused; for the supply-pipe at the meter had been severed with a hammer and chisel, which were found on the table, while the tenant was dead on the bed, which he had previously pushed up against the door to make entry more difficult. The sad old explanation of straitened circumstances, owing to lack of regular employment, is put forward as the reason of the suicide.

The brilliant illumination of the New Savoy Hotel at Newport, we learn, attracted a considerable crowd, and aroused favourable comment in the neighbourhood of the station approach last Thursday. The whole of the lighting of the establishment is effected by an installation of high-pressure incandescent gas, which has been furnished throughout by the Newport Gas Company. Gas is also used for the whole of the cooking and heating apparatus.

We have received from the Davis Gas-Stove Company, of Luton, a copy of their new summer booklet for 1909, which illustrates the firm's cookers, steamless radiators, water-heaters, and other domestic appliances for use in connection with gas. The "New Davis" screwless cooker first attracts attention; and there is also described a new series of high-grade cookers introduced this season for the first time. This series consists of four sizes; and an important feature of the stoves is that, in designing them, every effort has been put forth to make all the details as perfect as possible from a maintenance point of view.

Messrs. John Wright and Co., of Birmingham, are performing a useful service to the industry generally, as well as to themselves, by producing and circulating among architects a pamphlet written with the view of bringing to their notice the advantages of gas for heating purposes. Under the title of "Domestic Heating—the Warming and Ventilation of Dwelling-Houses," facts and arguments are set forth which should convince even the most sceptical as to the soundness of the claims of gas in this connection. The type employed is large, and the lines are well spaced; while the pamphlet is not too long to hold the interest of the reader.

The Ammanford Urban District Council have been congratulating themselves on the settlement arrived at in connection with the Gas Bill. The Chairman (Mr. W. Evans) said they would be able to have gas for the streets at 3s. 5d. per 1000 cubic feet. The Clerk explained that the Council would benefit by a rebate of 20 per cent. as compared with private consumers. Mr. Roblings remarked that 3s. 9d. was the price fixed, subject to revision. They had tried to get a 4s. maximum for private consumers; and they had actually obtained 4s. 3d. With a rebate of 20 per cent., the Council's maximum would only be 3s. 5d. per 1000 cubic feet. Colonel Morris pointed out that, though this was a good thing for private consumers, it had come too late for the Council, who had already entered into a contract for street lighting.

The report to be submitted at the meeting of Meters Limited, next Tuesday, states that the trading for the year to March 31 has resulted in a gross profit of £32,006, which is reduced by general management expenses, Directors' fees, legal charges, expenses on patents, income-tax, and depreciation of buildings, machinery, and plant. A sum of £3615 has been spent out of revenue on repairs and renewals. After providing for interest on debenture stock £5627, the net profit amounts to £21,545, which, with £2759 brought forward, makes £24,304, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares and at the rate of 4 per cent. per annum upon the ordinary shares were paid in November last. The Directors now recommend the payment of further dividends at the rate of 5½ per cent. per annum upon the preference shares and at the rate of 8 per cent. per annum upon the ordinary shares (making the ordinary dividend 6 per cent. for the year); that £5000 be added to reserve fund (making this fund £60,000); and that the balance of £2762 be carried forward to the next accounts.



PARKINSON'S
"UNIQUE" BOILER
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WASHING COPPER.

SUBSTANTIALLY
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INEXPENSIVE,
SPECIALLY
SUITABLE FOR HIRING OUT.

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(Incorporating Maughan's Patent Geyser Co.) LTD.

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STOUR STREET.

LONDON:
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The annual report of Messrs. Fletcher, Russell, and Co., of Warrington, shows that the net profit, after payment of debenture interest, &c., is £3673. The amount brought forward was £290; and £5000 has been transferred from the reserve fund. The dividend on the 6 per cent. preference shares absorbs £3000. It is now proposed to declare a final dividend on the ordinary shares at the rate of 5 per cent.; an interim dividend at the same rate having been paid for the half year ending August. This will leave £964 to be carried to next year's account.

The Cockermouth Gas Committee, after having considered the question of expense involved in supplying gas to very small consumers, recommended that new consumers using less than 20s. worth of gas per annum be charged the yearly sum of 2s. towards the cost of installation. It was explained that some consumers, after having had an installation at a cost of £2 10s., only used 7s. 6d. worth of gas per annum. One member of the Council opposed the minute on the ground that small consumers would be penalized; and, on a vote being taken, it was resolved to delete the recommendation.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CHEMIST (ONE MONTH). No. 5094.
CLERK. No. 5095.
DRAUGHTSMEN. Newton, Chambers, and Co., Sheffield.
GAS-WORKS ASSISTANT. No. 5095. Applications by May 25.

Situation Wanted.

GAS MANAGER OR ASSISTANT. J. R. Love, care of "JOURNAL" Office.

Research Fellowship. University of Leeds.
Particulars of Registrar.

Plant, &c. (Second-Hand), for Sale.

GAS-COOKERS. Coventry Gas Department.
PURIFIERS, &c. Sutton Gas Company.
PURIFIERS, &c. East Ardsley Gas-Works.
PURIFIERS AND STATION METER, &c. Solihull Gas Company.
SULPHATE PLANT. Greenock Gas Department.
Tenders by May 24.

Stocks and Shares.

BEXHILL WATER AND GAS COMPANY. June 9.
EAST HULL GAS COMPANY. June 2.

TENDERS FOR

Coal and Cannel.

BARNOLDSWICK GAS AND WATER DEPARTMENT.
Tenders by June 1.
BOLTON GAS DEPARTMENT. Tenders by May 28.
BRIGHOUSE GAS DEPARTMENT. Tenders by May 29.
BUXTON GAS DEPARTMENT. Tenders by May 29.
CRENCESATER GAS COMPANY. Tenders by May 31.
CLITHEROE GAS DEPARTMENT. Tenders by May 22.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.
DENBIGH GAS AND WATER COMPANIES. Tenders by June 3.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 1.
ELSECAR, &c., GAS COMPANY. Tenders by June 2.
EXMOUTH GAS COMPANY. Tenders by May 27.
GLOUCESTER GASLIGHT COMPANY. Tenders by June 1.
ROCHESTER, &c., GAS COMPANY. Tenders by May 26.
SEDDLEY URBAN DISTRICT COUNCIL. Tenders by May 31.
SHREWSBURY GASLIGHT COMPANY. Tenders by May 22.
TEIGNMOUTH GAS DEPARTMENT. Tenders by May 31.
TIVERTON LIGHTING COMMITTEE. Tenders by June 4.
TORQUAY GAS DEPARTMENT. Tenders by May 24.
WHITTINGTON GAS COMPANY. Tenders by May 22.

Conveying and Elevating Machinery, &c.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by May 25.

Fire-Clay Goods.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.

General Stores—Lime, Iron and Steel, Lead, Compo., Lead Pipe, Oils, Paints, Castings, Ironmongery, &c.

BRIGHOUSE GAS DEPARTMENT. Tenders by May 29.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 26.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.

Incandescent Goods.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.

Meters.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.

Pipes, &c.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.
WOMBWELL GAS AND WATER DEPARTMENT. Tenders by May 26.

Purifiers.

TEIGNMOUTH URBAN DISTRICT COUNCIL. Tenders by May 31.

Retort-House and Retort-Bench.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by May 25.

Tar and Liquor.

BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 26.
BUXTON GAS DEPARTMENT. Tenders by May 29.

Valves, Brass and Slot Fittings, Taps, &c.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by May 27.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,

PALMERSTON HOUSE,

OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON 182 Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.

Correspondence invited.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.

39, VICTORIA STREET, S.W.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

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Telegrams: SATURATORS, BOLTON. Telephone 0848.

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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

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OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

BENZOL

AND

CARBURINE FOR GAS ENRICHING.

ALSO

THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,

7, BISHOPSGATE STREET WITHOUT,

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Telegraphic Address: "Carburine, London."

GEO. NEWTON, Limited,

Wires: "AUTOMATIC, MANCHESTER."

40 YEARS' REPUTATION.

WET, DRY, ORDINARY and PREPAYMENT, STATION METERS, &c.

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(NATURAL)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.

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Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

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DERBY, ENGLAND,

FOR REALLY HIGH-CLASS

ELEVATORS AND CONVEYORS

ALSO

DRIVING AND CONVEYOR CHAINS.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.

See Advertisement, May 4, p. II. of Centre.

ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams: "MOTORPATHY, LONDON." Telephone: 5118 WESTMINSTER.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement May 4, p. 273.

OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the

NEW WESTBURY IRON COMPANY, LTD.
WESTBURY, WILTS.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas. Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "DORIO," Newcastle-on-Tyne. National Telephone No. 2497.

R. & G. HISLOP,

GAS ENGINEERS, RETORT BUILDERS,
CONTRACTORS, &c.

RETORT SETTINGS, COAL-TESTING PLANT,
BOILER FIRING.

UNDERWOOD HOUSE, PAISLEY.

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GAS LIGHTING ENGINEERS AND CONTRACTORS,

18 & 20, FARRINGDON ROAD, LONDON, E.C.

Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

Telegrams: "CHEMICALS."

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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

TO Gas Managers, &c., Wanted, Old

Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.

J. WILSON, Pleasant Grove, York Road, King's Cross, LONDON, N.

ROBERT B. FITZMAURICE,

4, EAST INDIA AVENUE,

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Telegraphic Address: "FITZMAURICE, LONDON." Telephone: No. 11,113 CENTRAL.

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Advertiser, who is Shipping Agent to several Gas Companies, Municipalities, and Gas Material Makers, would be glad to undertake SHIPMENT OF GOODS ordered by Colonial Gas-Works or Others.

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MEADE-KING, ROBINSON, & CO.

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment, 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

J. E. C. LORD, Ship Canal Tar Works,

Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of

AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WENNESBURY, and STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."

Apply, **THOMAS HORROCKS**

Albert Chemical Works, BRADFORD, MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

KINGS Patent Agency, Limited, 165,

Queen Victoria Street, London, E.C. Director Benj. T. King, A.I.M.E., British Chartered Patent Agent (Regd. by Exam.). Telep. 692 Central. Teleg. "Geologic," London. We sustain over quarter of a century's Experience and Reputation for Patenting Inventions and Registering Trade Marks throughout the World. Write or call. We attend and advise you free.

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PINCHBECK'S Meters and Burglar PROOF STRONG BOX.

See illustrated advertisement, May 11, p. I. of Centre.

PINCHBECK LIMITED, Adams Place, George's Road, HOLLOWAY, N.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 477.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

FRASER'S FIRE CEMENT.

FOR Gas-Works, Retort Settings, &c.

Supplied to the Largest Works in the Kingdom.

A. C. FRASER'S FIRE CEMENT CO., Corbett Street, Bradford, MANCHESTER.

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JOHN E. WILLIAMS AND CO.,

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DELLWIK-FLEISCHER WATER GAS.

BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.

FOR Particulars of Annual Generating

Capacity of Plants built or in course of construction, see Advertisement in the "JOURNAL" for May 4, p. 273.

The DELLWIK-FLEISCHER WATER GAS SYNDICATE, 25, Victoria Street, Westminster, LONDON, S.W. Telegraphic Address "Dellwik, London."

TO GAS ENGINEERS AND MANAGERS.

THERE will shortly be announced in the "JOURNAL" Particulars of a NEW BURNER for STREET LIGHTING, which will be known as the TWIN-LIGHT. There has never been anything to approach it in Efficiency; and we would like all those interested in Public Lighting to look out for the Announcement mentioned.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

STAINES AND EGHAM GAS COMPANY.

APPLICANTS for the Post of Maintenance Inspector are THANKED, and Informed that the Position HAS NOW BEEN FILLED.
May 14, 1909.

ADVERTISER (Age 25), son of a well-

known Gas Engineer, desires Situation as MANAGER of small Works, or ASSISTANT on large. Five Years' Practical Experience of Gas Manufacture and Distribution. Two Years Retort Setting. Competent Draughtsman, Chemist, and Book-keeper. Excellent Testimonials. Disengaged.
Address JAS. R. LOVE, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE UNIVERSITY OF LEEDS.

(DEPARTMENT OF FUEL AND GAS ENGINEERING.)

RESEARCH FELLOWSHIP.

APPLICATIONS are invited, up to May 28, for an OPEN FELLOWSHIP of £100 per Annum, established by the Institution of Gas Engineers for the Encouragement of Research in the Chemistry of Gases and Combustion.

For further Particulars, Apply to the REGISTRAR.

WANTED, a Chemist for One Month.

Must be capable of Thoroughly Analyzing in Detail Coal Gas.

Apply, by letter, to No. 5094, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Works Assistant.

Must be Technically Trained, able to Draw, and to make Usual Chemical Tests, &c. Age 21 to 25, Works' make, about 240 Millions.

Applications, with Particulars of Qualifications, Experience, and Two Testimonials (copies only) to be sent not later than the 25th of May, to No. 5096, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, One or Two

DRAUGHTSMEN accustomed to Gas-Works Plant, Elevators and Conveyors, and Constructional Steel Work.

Apply, by letter, endorsed "Draughtsman," Stating Age, Salary required, and Experience, to Messrs. NEWTON, CHAMBERS, ANN CO., LTD., Thorncliffe Iron-Works, SHEFFIELD.

GAS-WORKS CLERK, NORFOLK COAST.

WANTED, a Respectable Young Man

of Good Address (Age about 20 Years), for Ledgers, Wages, Residuals, Stores, General Booking, and Analyses. Must be persistently Energetic, Quick, and Accurate. Some knowledge of Gas-Works and Simple Chemical Tests desirable. Hours 8.30 to 5.30.

Apply, in own Hand-Writing, Stating fully Experience, Personal and General Particulars, and Wages required, to No. 5095, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, at the East Ardsley Gas-

Works, Four 8-Foot PURIFIERS, 4-Foot Deep, with Hydraulic Eight-Way Centre Valve. In Good Condition.

For Price and further Particulars, Apply to TOM BROADHEAD, Secretary, Bond Street, DEWSBURY.

FOR SALE—Three Purifiers, by Newton,

Chambers, and Co., 20 ft. square by 5 ft. deep, Planed Joints, 18-inch Valves and Connections, with Bye-Passes, Travelling and Lifting Gear. In Good Condition. Being Removed for Extension.

Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE—Four 8-foot Square by 4 ft.

6 in. deep PURIFIERS, with 8-inch diameter Valves and Connections, and Lifting Gear; also STATION METER, with 6-inch diameter Valves and Connections. All in good condition. Replaced by larger Plant.

Apply to the MANAGER, Gas Company, Solihull, BIRMINGHAM.

FOR SALE, Cheap, the undermentioned

GAS PLANT:—Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem. GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f. EXHAUSTERS, 10,000 and 8000 c.u.b. ft. per Hour. 4-inch Cast-Iron Vertical CONDENSER. Wrought-Iron SCRUBBER, 9 ft. high by 3 ft. Donkin's VALVES, 12-inch, 10-inch, 6-inch. Apply to SAMUEL WHILE and Son, 60, Queen Victoria Street, LONDON, E.C.

THE Coventry Corporation Gas Depart-

ment have FOR SALE about 170 WESTERN GAS-COOKERS, made by the Davis Gas Stove Company. These are excellent Gas-Cookers for Slot Consumers and are only offered for Sale because of being replaced by larger Cookers. They have been thoroughly Repaired, Cleaned, and Renovated, and supplied with New Grill Pans and Grids.

Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
April, 1909.

CORPORATION OF GREENOCK.

(GAS DEPARTMENT.)

TENDERS wanted for the Purchase and Removal of SULPHATE of AMMONIA PLANT, making about 80 cwt. per Twenty-Four Hours (Dempster's Still), which is being replaced by larger Plant. Plant can be seen at above Works.

Any further Information can be had from Mr. James McLeod, Gas Manager.

Offers to be in by May 24, 1909.

Inchgreen Gas-Works,
Greenock, May 11, 1909.

BARNOLDSDWICK URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE above Council invite Tenders for the Supply of 4500 Tons of Screened GAS COAL or NUTS for the Year ending June 30, 1910.

The Council reserve the right to Divide the Quantity between Two or more Contractors.

The Council do not bind themselves to accept the lowest or any Tender.

Form of Tender supplied.

Tenders to be on the prescribed Forms, and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, and delivered not later than June 1, 1909.

J. W. THOMPSON,
Engineer and Manager.

Town Hall, Barnoldswick.

DENBIGH GAS AND WATER COMPANIES.

TENDERS are invited for the Supply and Delivery, at Denbigh Station, of 1600 Tons of Well-Screened GAS COAL, as required, from the 1st of July, 1909, to June 30, 1910; also for about 80 Tons of Washed ANTHRACITE PEAS, 3-inch to 3½-inch, free from Dust, as required, from the 1st of September, 1909, to the 31st of August, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the undersigned, must be sent before the 3rd of June next.

W. EWART BROCK,
Manager and Secretary.

Gas-Works, Denbigh,
May 15, 1909.

BOROUGH OF TORQUAY.

THE Gas-Works Committee of the Torquay Town Council are prepared to receive TENDERS for the Supply of 2000 to 3000 Tons of approved GAS COAL, delivered free into Stores at St. Mary Church Gas-Works.

Further Particulars and Forms on which Tenders must be submitted may be obtained at my Office, Town Hall, Torquay.

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Noon on Monday, May 24, 1909.

The lowest or any Tender will not necessarily be accepted.

FREDK. S. HEX,
Town Clerk.

Town Hall, Torquay,
May 8, 1909.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-Light Company invite TENDERS for the Supply of about 19,000 Tons of Screened GAS COALS, to be delivered free at the Great Western or London and North Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1909, and ending June 30, 1910.

The Directors reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on Application at the Company's Works or by post, and must be sent to the undersigned on or before the 22nd day of May, 1909.

By order,
WM. BELTON, A.M.I.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
April 24, 1909.

BUXTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for:—

(1)—GAS COAL, NUTS, and CANNEL.

The Supply of 6000 Tons of Best Screened GAS COAL or NUTS, and 3000 Tons of CANNEL, to be delivered as required, at the Gas Siding, Midland Railway, Buxton, during the Twelve Months ending July 31, 1910, in accordance with the Specification and Conditions, which may be obtained from the Gas Engineer, Mr. H. Barker, Town Hall, Buxton.

Sealed Tenders, endorsed "Coal" and "Cannel" respectively, are to be delivered to the undersigned on or before Saturday, the 29th inst.

The Committee do not bind themselves to accept the lowest Tender, and reserve the right to divide the Contract.

(2)—SURPLUS TAR and AMMONIACAL LIQUOR.

The Purchase of the Surplus TAR and the whole of the AMMONIACAL LIQUOR which may be produced at the Buxton Gas-Works during the Twelve Months ending June 30, 1910. The same to be delivered into Contractor's Tanks at the Gas Siding, Midland Railway, Buxton.

Sealed Tenders, endorsed "Tar" and "Liquor" respectively, are to be delivered to the undersigned on or before Saturday, the 29th inst.

Forms of Tender may be obtained on Application to the Gas Engineer.

By order of the Committee,
(Signed) JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 13, 1909.

THE East Dereham Urban District Council are prepared to receive TENDERS for the Supply of about 1700 Tons of Screened GAS COAL, for the ensuing Year.

Conditions and Forms of Tender to be had of the undersigned.

Tenders, marked "Coals," to be sent in by Ten a.m. on the 1st of June, 1909, to

B. H. VORES,
Clerk to the Urban District Council.

East Dereham,
May 8, 1909.

CIRENCESTER GAS COMPANY, LIMITED.

TENDER FOR GAS COAL.

THE Directors are prepared to receive TENDERS for the Supply, during the Twelve Months commencing July 1 next, of about 5000 Tons of GAS COAL, delivered at the Watermoor Station of the Midland and South Western Junction Railway Company at such times and in such Quantities as required by the Manager.

Tenders, Forms for which will be sent on Application, to be forwarded to the undersigned not later than May 31.

JOHN P. BEECHAM,
Secretary.

12, Silver Street, Cirencester,
May 4, 1909.

BOROUGH OF BRIGHOUSE.

GAS COAL, &c.

THE Gas Committee are prepared to receive TENDERS for the Supply and Delivery of GAS COAL, Screened NUTS and Buxton LIME required by them during the Year ending June 30, 1910.

Specification and Form of Tender can be obtained on Application to the Gas Engineer's Office, Mill Lane, Brighouse.

Sealed Tenders to be sent in, addressed to the Town Clerk, Municipal Offices, Brighouse, on or before Saturday, the 29th of May, 1909, endorsed on the outside "Tender for Coal," or "Lime," as the case may be.

JAMES PARKINSON,
Town Clerk.

Town Clerk's Office,
Brighouse, May 10, 1909.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

GAS-WORKS EXTENSION.

PERSONS desirous of Tendering for the Construction of RETORT-HOUSE, RETORT-BENCH, COAL ELEVATOR AND CONVEYOR, HOPPERS, &c., in Connection with the above, are requested to send their names and addresses to Messrs. Corbet Woodall and Son, Palace Chambers, Bridge Street, Westminster, S.W., together with a Deposit of £3 3s. for Copies of Drawings, Specification, and Form of Tender. The Deposit will be returned on receipt of a *bona-fide* Tender.

Tenders must be delivered to the undersigned not later than Five p.m. on Tuesday, May 25.

The lowest or any Tender will not necessarily be accepted.

By order,
JOHN D. FIDLER,
Clerk to the Council.

Council Offices,
Sutton-in-Ashfield.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the Supply of about 6000 Tons of Best GAS COAL (Screened or Unscreened), to be delivered in such quantities and at such times as may be required from the 1st of August, 1909, to the 31st of August, 1910, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's Weighbridge, the Coal to be Fresh Wrought, Dry, and free from Hards, Smudge, Shale, and Pyrites.

Tenders to be accompanied by Practical Working Analysis.

Prices may be quoted c.i.f. or f.o.b. (by Sailing Vessels only) Exmouth Docks, or f.o.r. Exmouth Railway Station (London & South Western Railway).

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than Saturday, the 27th day of May, 1909.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided or required.

JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
May 6, 1909.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Tenders to State the Price Delivered at the Midland Railway Sidings, Hempsstead, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b. and also the Price Delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Tuesday, the 1st day of June next.

The Directors reserve to themselves the right to accept the whole or any portion of any Quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 3, 1909.

BOROUGH OF TIVERTON.

TENDERS FOR COAL.

THE Lighting Committee are prepared to receive TENDERS for the whole or part of 4000 Tons of Freshly-Wrought GAS COAL, Screened or Unscreened, including NUTS, giving Full Particulars of Coal with Analysis, and to be Delivered at the Railway Siding adjoining their Gas-Works at Tiverton during One Year, and in such Quantities as may be directed by their Manager.

Further Particulars and Form of Tender (which must be used) may be obtained on Application to Mr. Clark Jeffery, Gas Manager.

Sealed Tenders, endorsed "Tender for Gas Coal, and addressed to the undersigned, must be received on or before Friday, the 4th day of June, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
C. M. HOLE,
Town Clerk.

Tiverton, May 7, 1909.

WHITTINGTON GAS COMPANY, LIMITED, NEAR CHESTERFIELD.

THE Directors of this Company are prepared to receive TENDERS for the Supply of 3000 Tons of Best Quality GAS COALS, from the South Yorkshire or Derbyshire Coalfields, for Twelve Months commencing July 1, 1909.

Tenders must state the name of the Pits from which the Coal will be obtained, which is to be fresh Wrought and free from Slate and other Impurities.

The Works of the Gas Company are situated on the Dunston and Barlow Siding of the Midland Railway, and the Price must include delivery free alongside.

Tenders, marked "Tender for Coal," are to be sent in the first instance to the undersigned not later than Saturday, the 22nd inst., to No. 3, Winchester Road, South Hampstead, London, N.W.

The Company do not issue any Special Form of Tender.

(Signed) S. PENNY, Assoc. M. Inst. C.E.
Engineer.

BOROUGH OF BURTON-UPON-TRENT.

THE Town Council of this Borough invite TENDERS for—

LIME.

The Supply of about 100 Tons of Best Hand-Picked LIME for Purifying, to be delivered in Sender's or Railway Company's Waggons at the Gas-Works in such Quantities and at such times as may be required during the Twelve Months ending June 30, 1910.

TAR.

The Purchase of the Surplus TAR, which will be produced and delivered into the Purchaser's Tank-Waggons at the Gas-Works during the Twelve Months ending June 30, 1910.

Terms of Payment, Net Cash Monthly.

Tenders, endorsed "Lime" and "Tar" respectively, are to be delivered to the Assistant-Manager at the Gas-Works, Burton-upon-Trent, on or before Wednesday, May 26 inst.

The Council do not bind themselves to accept any Tender.

T. N. WHITEHEAD,
Town Clerk.

Town Hall, Burton-upon-Trent,
May 14, 1909.

URBAN DISTRICT COUNCIL OF COLWYN BAY AND COLWYN.

TENDERS FOR COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply of 7500 Tons, more or less, of GAS COAL (Screened or Unscreened, or Screened Nuts) required by them from the 1st of July, 1909, to the 30th of June, 1910, to be delivered free at the Colwyn Bay Gas-Works Siding in such quantities and at such times as required. Tenders to quote delivery in Council Waggons or otherwise, and must give Full Description of Coal, together with Working Analysis, &c.

Full Particulars and Form of Tender can be obtained on Application to the undersigned.

The Committee reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Coal," to be sent in addressed to the undersigned not later than Thursday, the 27th day of May inst.

GENERAL STORES.

Tenders are also invited for the Supply of the following STORES and MATERIALS, in such Quantities as may be required in the Gas Department of the above Council, for the Year or period ending the 31st of March, 1910—viz.:

1. FIRE-CLAY GOODS, LIME, &c.
2. IRON TUBES and FITTINGS.
3. LEAD and COMPO.
4. IRON and STEEL.
5. OILS.
6. BRASS FITTINGS and SUNDRIES.
7. SLOT FITTINGS.
8. DRY METERS.
9. MAIN TAPS.
10. STEAM VALVES.
11. CASTINGS.
12. INCANDESCENT LIGHTING GOODS.
13. IRONMONGERY.
14. PAINTS.

Form of Tender and any Information may be had from the undersigned, to whom sealed Tenders, endorsed "Tenders for Stores," addressed to the Council Offices, Colwyn Bay, must be delivered not later than Thursday, the 27th day of May inst.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JAMES AMPHLETT,
Clerk to the Council.

Council Offices, Colwyn Bay,
May 14, 1909.

BOROUGH OF CLITHEROE. (Gas Department.)

TENDER FOR GAS COAL.

THE Gas Committee invite Tenders for Screened GAS COAL, NUTS, and CANNEL, to be delivered on the Gas-Works Siding, during the Year ending June 30, 1910.

Particulars and Forms of Tender may be obtained from the undersigned. Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Saturday, the 22nd of May, 1909.

ROBT. BARRETT,
Engineer and Manager.

Gas-Works, Clitheroe,
May 6, 1909.

TENDERS FOR GAS COAL.

THE Sedgley Urban District Council invite TENDERS for the Supply of 1000 Tons of GAS COAL (more or less) to be delivered at the Shut-End Siding at such times and in such Quantities as may be directed.

It is desirable that a statement of an Analysis of the Quality of a Sample of the Coal to be supplied be sent with the Tender.

Sealed Tenders, marked "Coal," must reach me not later than the 31st of May, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS R. KNIGHT,
Clerk of the Council.

Council House, Sedgley,
May 11, 1909.

WOMBWELL URBAN DISTRICT COUNCIL. (Gas and Water Department.)

CAST-IRON WATER-MAINS AND SPECIALS.

THE above Council invite Tenders for the Supply and Delivery, at the Wombwell Midland Station, of about 1400 Yards of 8-inch diameter Cast-Iron WATER MAINS and SPECIALS.

Specification and Form of Tender may be had on Application to the Water-Works Engineer, Mr. P. D. Walmsley, B.Sc., at the Gas-Works, Wombwell.

Sealed Tenders, endorsed "Water-Mains," must be delivered to me the undersigned, on or before Wednesday, the 26th day of May, 1909.

PERCY MILNES WALKER,
Solicitor,
Clerk to the Council.

Town Hall, Wombwell,
May 12, 1909.

COUNTY BOROUGH OF BOLTON.

TENDERS FOR COAL.

THE Gas and Lighting Committee invite TENDERS, from Colliery Proprietors only, for the Supply of Screened and Unscreened GAS COAL, COBBLES, and NUTS required during the Year ending the 30th of June, 1910.

Specifications and Forms of Tender may be obtained on Application to Mr. Wm. Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the above Committee, to be delivered at the Gas Offices, Bolton, not later than 9.30 a.m. on Friday, the 28th of May, 1909.

SAML. PARKER,
Town Clerk.

Town Hall, Bolton,
May 14, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

TENDERS FOR NEW PURIFIERS.

TENDERS are invited by the above Council for the Provision and Erection of Four 16 feet Square Connectionless and Luteless PURIFIERS, fitted with Pickering's Patent Valve.

A Copy of the Drawings and Specifications may be obtained from Mr. J. Alex. Gray, the Gas Engineer, on payment of the Sum of £1 ls. which will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Purifiers," and addressed to the undersigned, to be delivered at the Town Hall, Teignmouth, not later than Monday, the 31st day of May, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

A. PERCIVAL DELL,
Clerk to the Council.

Town Hall, Teignmouth,
May 5, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.

THE Gas Department of the above Council invite TENDERS for the Supply of 3800 Tons of Good GAS COAL, Screened or Unscreened. The same to be supplied to the requirements of the Council between the 31st day of July, 1909, and the 30th day of June, 1910.

The Coal must be fresh Wrought and free from all Impurities.

No Special Tender Form will be issued. Tenders must be accompanied by a full Description and Practical Working Analysis of the Coals quoted, and may be either f.o.b., c.i.f. Teignmouth Harbour, f.o.r. Teignmouth Railway Station, or delivered into the Gas-Works Store. Seaborne Coal to be delivered in 200-400 Ton Sailing Vessels only.

Sealed Tenders, endorsed "Gas Coals," to be addressed to A. Percival Dell, Esq., Clerk to the Council, Town Hall, Teignmouth, and delivered not later than Monday, the 31st day of May, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
J. ALEX. GRAY,
Gas Manager.

Gas-Works, Teignmouth,
May 6, 1909.

ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY.

THE Directors invite Tenders for the Supply of the whole or part of 3500 Tons of Best Screened GAS COAL or NUTS, to be delivered at Elsecar Station (Great Central Railway), during the Year ending the 30th of June, 1910, at such times and in such Quantities as may be required by the Manager.

Tenders to be delivered by the 2nd of June, addressed to the Chairman, endorsed "Tender for Coal."

ALBERT F. HALL,
Secretary.

Hoyland, near Barnsley,
May 14, 1909.

ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY.

GAS COAL.

THE Directors invite Tenders for the Supply of about 35,000 Tons of GAS COAL, to be delivered between the 1st of July, 1909, and the 30th of June, 1910.

Further Particulars, with Forms of Contract and Tender, may be had on Application; and Sealed Tenders, marked "Coal," are to be delivered to me at these Offices not later than Noon of Wednesday, the 26th of May, 1909.

J. M. VEEVERS,
Engineer and General Manager.
Gas Offices, Rochester,
May 13, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

EAST HULL GAS COMPANY.

SALE BY TENDER OF £20,000 NEW FIVE PER CENT. ORDINARY STOCK.

THE Directors Offer For Sale by Tender the above amount of STOCK, to be issued under the Provisions of the East Hull Gas Act, 1906, and the various Acts incorporated therewith.

Since the Year 1867, the Company have paid, without intermission, the Maximum Dividend allowed by Parliament.

The Dividend is Cumulative—i.e., should the Profits of the Company in any One Year be insufficient to pay the Maximum Dividend, the same may be made up out of the Reserve Fund or out of Surplus Profits in any future Year.

Any amount of Stock being a multiple of £5 but not less than £20 may be applied for.

The Stock will be allotted to the Highest Tenders.

A deposit of £10 per Cent. on the nominal amount of the Stock applied for must accompany each Tender, and the Allottees must pay the remainder of the Purchase Money on or before the 30th day of June, 1909.

Last Day for Receipt of Tenders, Wednesday, the 2nd day of June, 1909.

Forms of Tender and Particulars of Sale can be obtained at the Local Branches of Messrs. BARCLAY AND COMPANY, LIMITED, Bankers; or from the OFFICES OF THE COMPANY.

By order of the Board of Directors,
DAVID WOOD,
Secretary.

Offices: Saint Mark Street,
Hull, May 14, 1909.

BEXHILL WATER AND GAS COMPANY.

SALE BY TENDER OF NEW ORDINARY SHARES.

THE Directors give Notice, that they will be prepared to receive, not later than Twelve o'clock at Noon on Wednesday, the 9th day of June, 1909, Sealed TENDERS for 1000 NEW ORDINARY SHARES of £10 each, being the first portion of the Additional Capital the creation and issue of which was authorized under the powers of the Bexhill Water and Gas Act, 1904, by Resolution of the Extraordinary Meeting of the Shareholders of the Company held on the 29th day of September, 1908.

Shares will rank with the Existing Ordinary Shares for a Maximum Dividend of Seven per Cent.

The lowest Price at which Tenders will be accepted (which may not be less than par) will be deposited with the Board of Trade pursuant to the Act.

In the event of the receipt of Tenders at the lowest price accepted for a larger number of Shares than those proposed to be issued, such Tenders will be subject to a *pro rata* diminution.

Every Purchaser will be required, on notice being given of the acceptance of his Tender, forthwith to pay to the Company the full Price of the Shares sold to him, including any premium; and if from any cause whatever such Price shall not be paid on or before the 18th day of June next, interest at 10 per cent. shall be paid thereon from that date until payment.

The Registered Holders of the Shares now sold will be entitled to Dividend from the date of payment for same.

Forms of Tender can be obtained personally or by letter from the Offices of the Company.

By order of the Board of Directors,
ROBT. DOUGLAS JESTY,
Secretary.

Offices of the Company,
5, Sea Road, Bexhill-on-Sea.

AUTOMATIC STREET LIGHTING

MEANS

DR. ROSTIN'S APPARATUS.

Largest Installations in the World.

109, CANNON ST., E.C.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES, CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE, AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

MIRFIELD GAS COAL. UNEQUALLED.

Sperm Value 87.85 lbs. per Ton.

Please apply for Price, Analyses, and Report, to the

MIRFIELD (GAS COAL) COLLIERIES

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LONDON: 16, Park Village East, N.W.

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AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

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STEEL OF ALL DESCRIPTIONS.

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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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NEWTONGRANGE, MIDLOTHIAN.

TROTTER, HAINES, & CORBETT,
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TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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16, DEANS_GATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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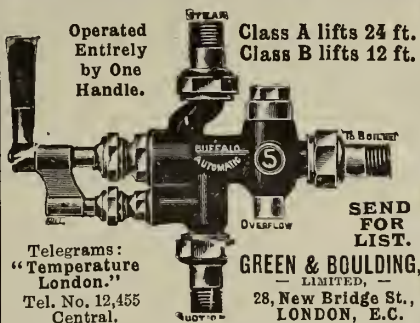
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Manufacturers of

FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED
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Operated
Entirely
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Class A lifts 24 ft.
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Gas Purifying Material

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Telegrams: "GASLUX, EDINBURGH."

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SPECIAL RUBBER
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29,000 feet and over 5000 Fasteners sold.

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"FLUXITE"
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Special Pressure and
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For RETORT-HOUSE GOVERNORS.
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GAS COAL AND CANNEL.

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Gas, Steam, and other Fuel for Home and Export.

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COAL AND COKE STORAGE PLANTS.

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STAMPED AND RIVETED STEEL ELEVATOR BUCKETS

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HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

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STEAM-CONTROLLER for Water-Gas-Plants

RAISES the Calorific Value up to 3000 Calories.

REDUCES the CO₂ Contents to 2 per cent.

INCREASES the Capacity of the Unit-Time.

DIMINISHES the Steam Consumption.

INCREASES the Yield.

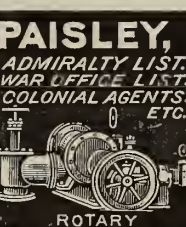
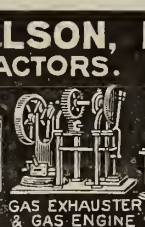
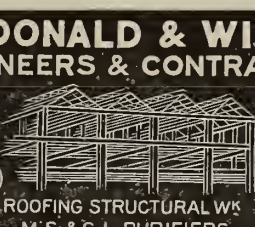
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Apparatus for Use in Heating-Plants of All Kinds, registering continuously and visibly the CO₂.

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Apparatus serving to Find out the Leakage in Gas-Mains.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM."

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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Designs and Estimates on application.

28, EAST PARADE, LEEDS.

20% GREATER YIELD PER MOUTHPIECE.

DECREASED FUEL CONSUMPTION.

ABSOLUTELY EVEN HEATS.

THEREFORE

NO STOPPED PIPES.

Telegrams: "CARBONIZER, LEEDS."
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CARBONIZATION MADE EASY.

A Few Recommendations for this System:—

Simplicity of Design.

No Machinery to get out of order.

Carbonizing charges 40 per cent. less than with Horizontals.

No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More liquid Tar.

Stopped Pipes unknown.

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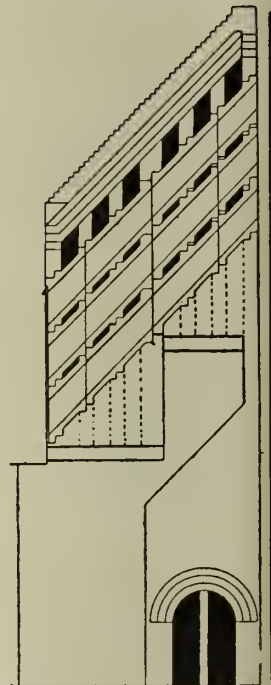
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Several Installations in course of construction or completed.

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**WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR
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SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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Undoubtedly the Finest and Best Preparation on the Market for **quickly** removing Burnt Grease from the Enamelled Lining of Cookers and Cleaning Lantern Reflectors is

Clarks "GASCOLITE."

(Registered Trade Mark.)

Can either be applied with a Brush, allowed to stand, Cold, for a few hours, or with Heat for about Half-an-Hour, when Liners and Reflectors can be washed off with Hot or Cold Water and will appear as **new**, or, **put into Tanks** with **Boiling Water**, when Liners and Reflectors will be cleaned in about Twenty Minutes.

This Result can only be obtained at **lightning speed** by using "**Gascolite**."

Now being used successfully by Gas Companies throughout the United Kingdom and Abroad.

For Trade Prices apply—

CLARKS
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Established 1832.

NEW "PHAROS" BURNERS.



CLUSTER LAMPS.
STREET-LAMP BURNERS.

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50-CANDLE POWER BURNERS.

ORDINARY
153-Candle Power.

FOR LOW PRESSURE
HIGHEST DUTY FOR GAS CONSUMED
Over 39 Candles per cubic foot.

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from our recent Advertisement in the "JOURNAL OF GAS LIGHTING," which showed a Bed of our Patent Machine-made Retorts that had been in constant use for **2108** days—nearly **6** Years.

THE BEST ARE THE CHEAPEST

BUY THE BEST.

If you have not already asked us for a Tender for this Year's requirements, we shall be pleased to have the opportunity of quoting you.

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Workmanship and Materials
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RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.

IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.

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PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND
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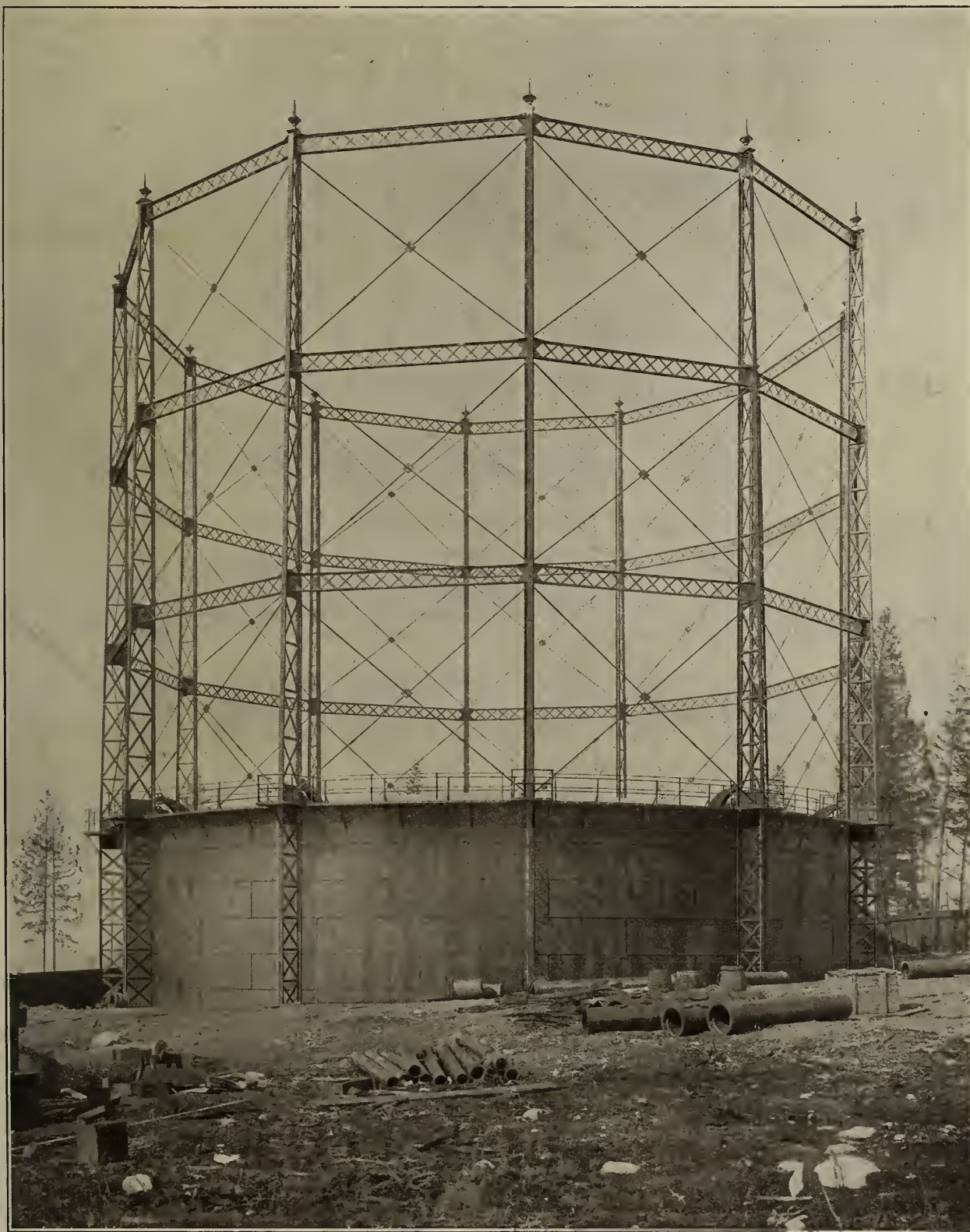
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DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

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THREE-LIFT GASHOLDER, OUTER-LIFT 100 FEET DIAMETER IN STEEL TANK.
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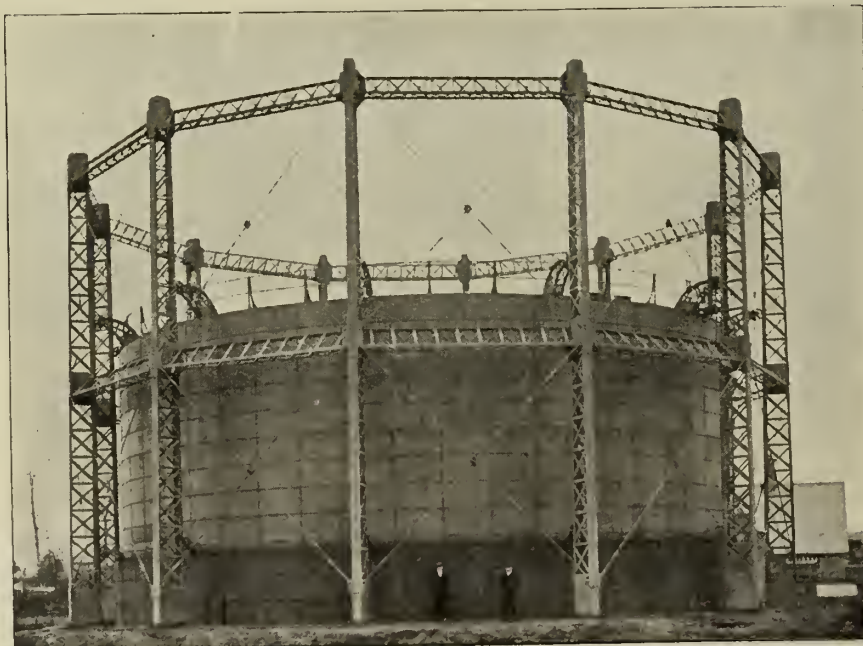
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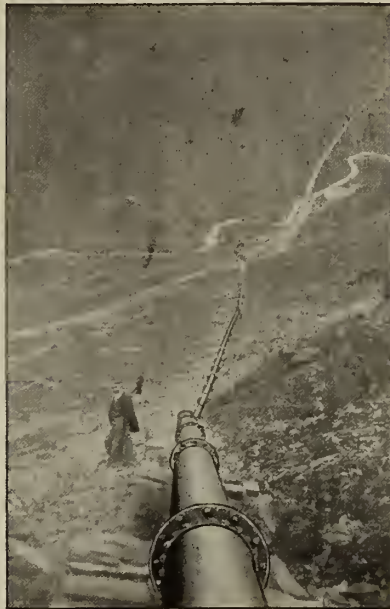
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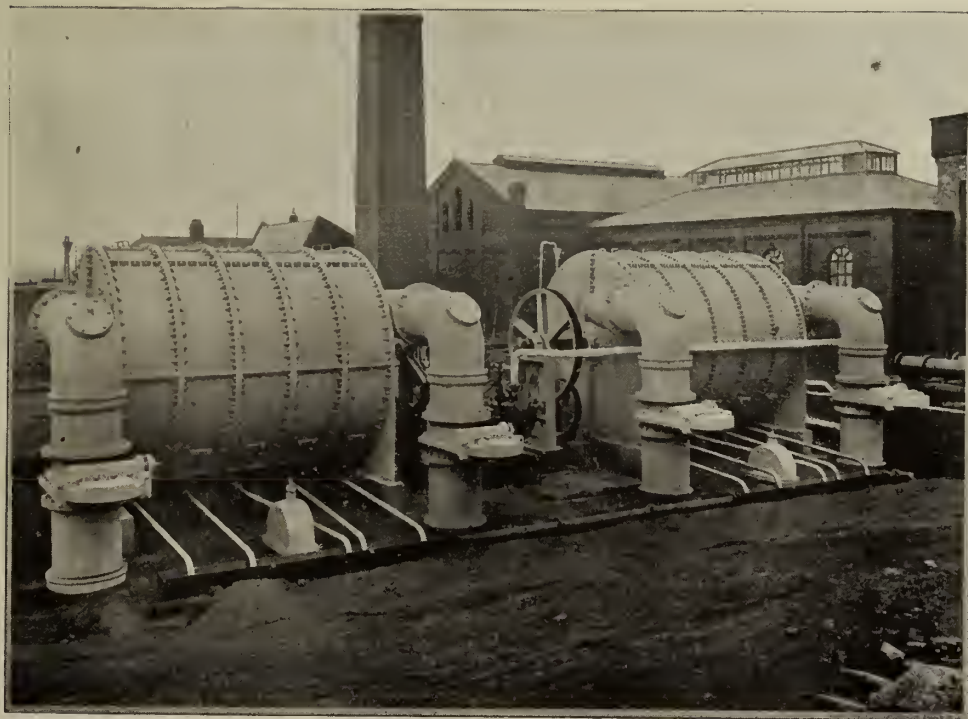
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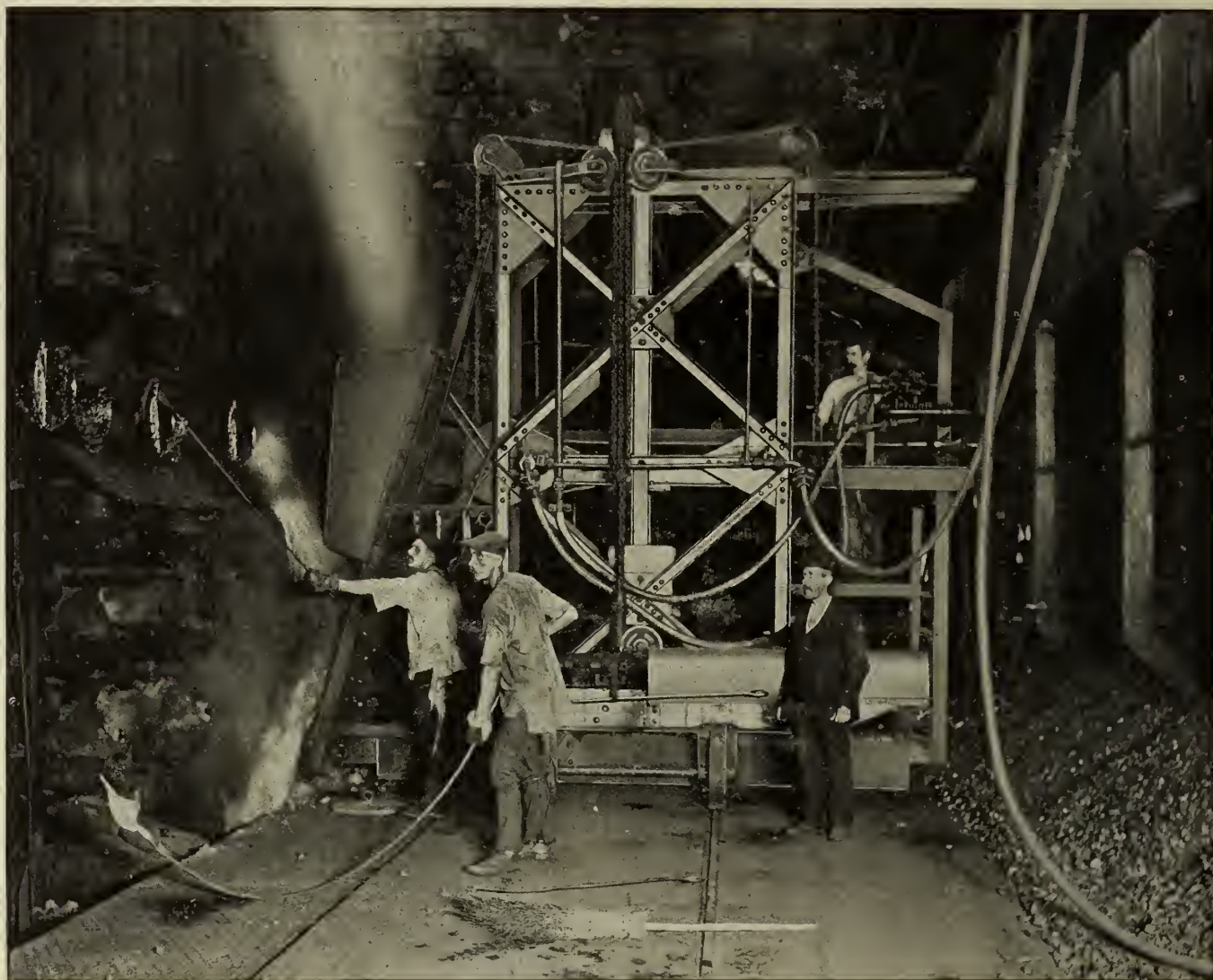
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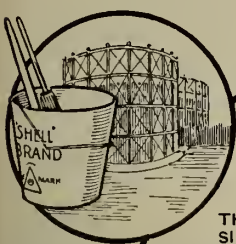
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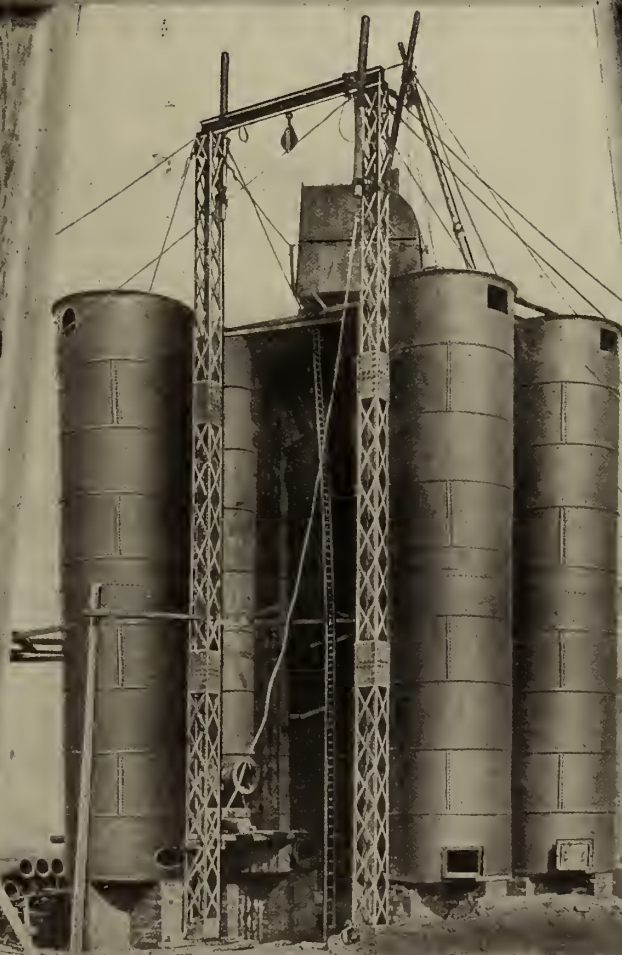
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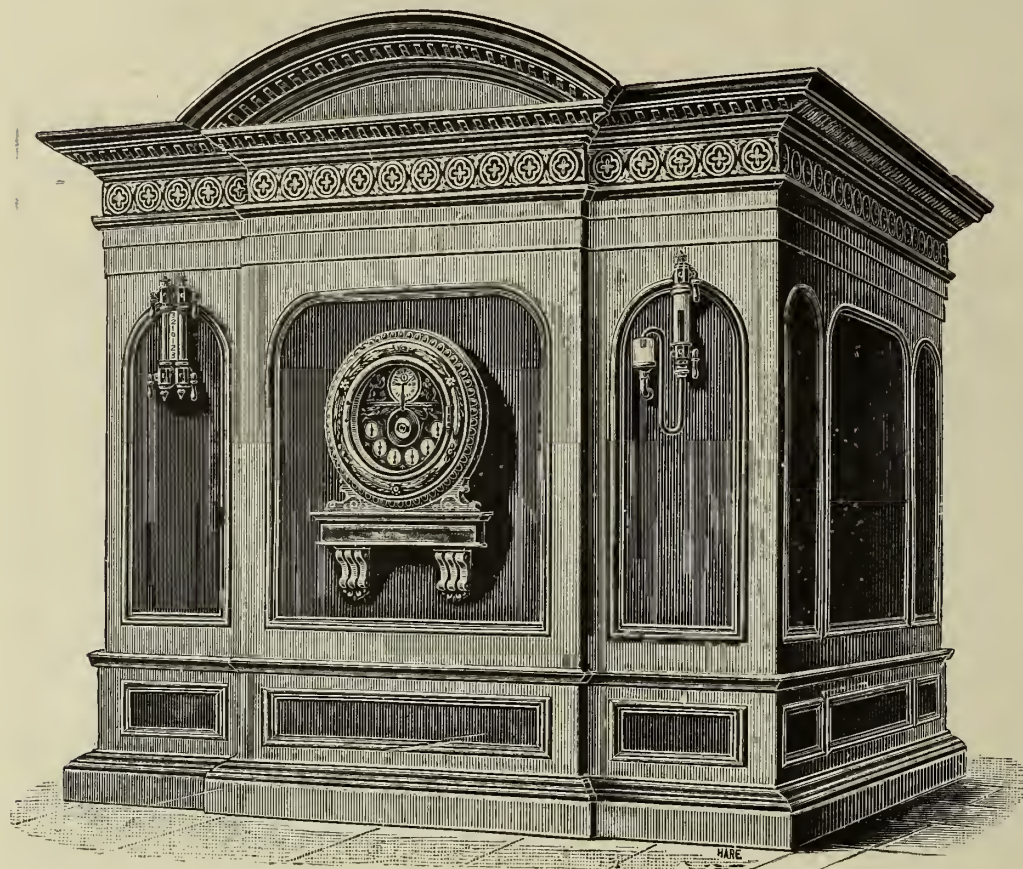
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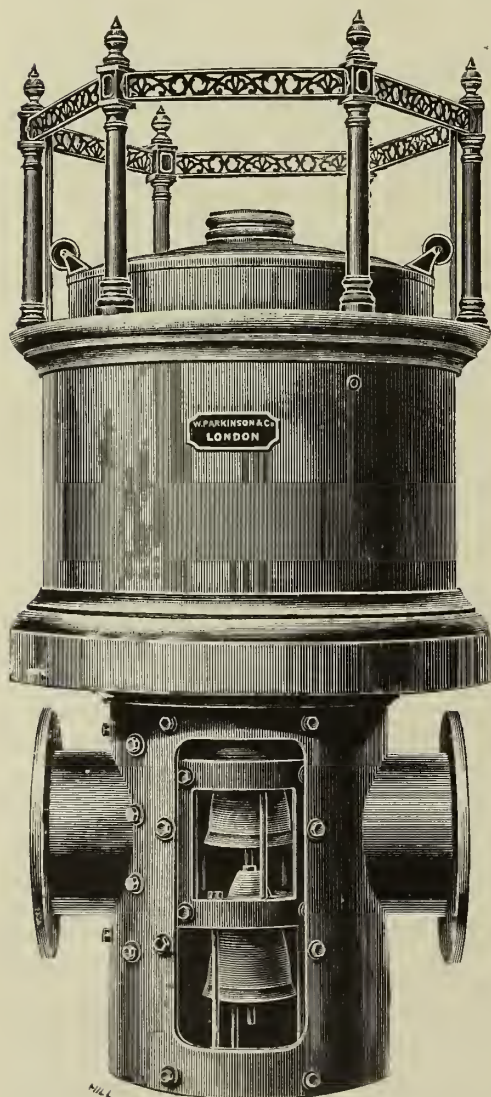
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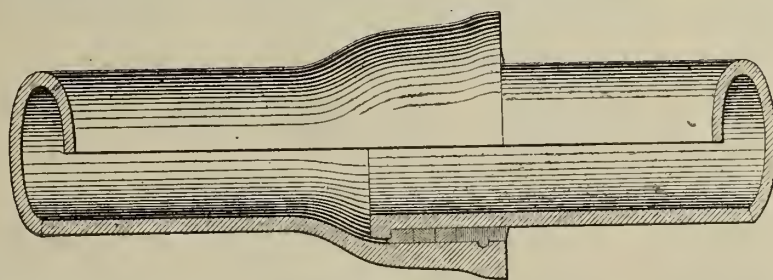
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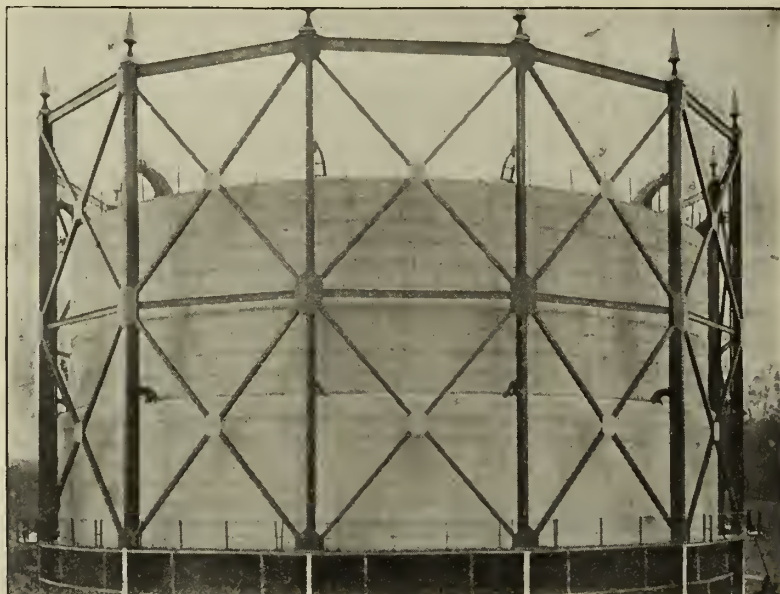
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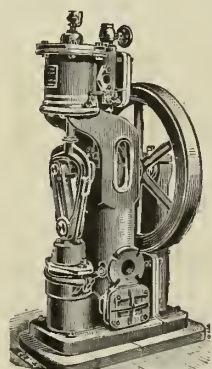


Fig. 705. "SINGLE RAM"
STEAM-PUMP.

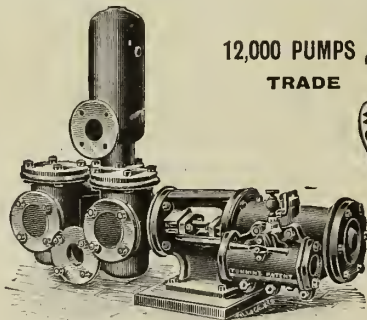


Fig. 598. "CORNISH" STEAM-PUMP FOR
BOILER FEEDING, &c.

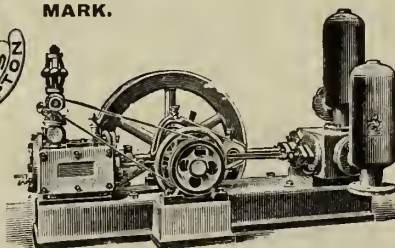


Fig. 685. "RELIABLE" STEAM PUMP FOR
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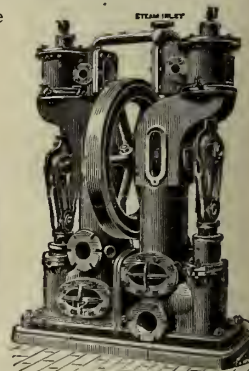


Fig. 712. "DOUBLE-RAM"
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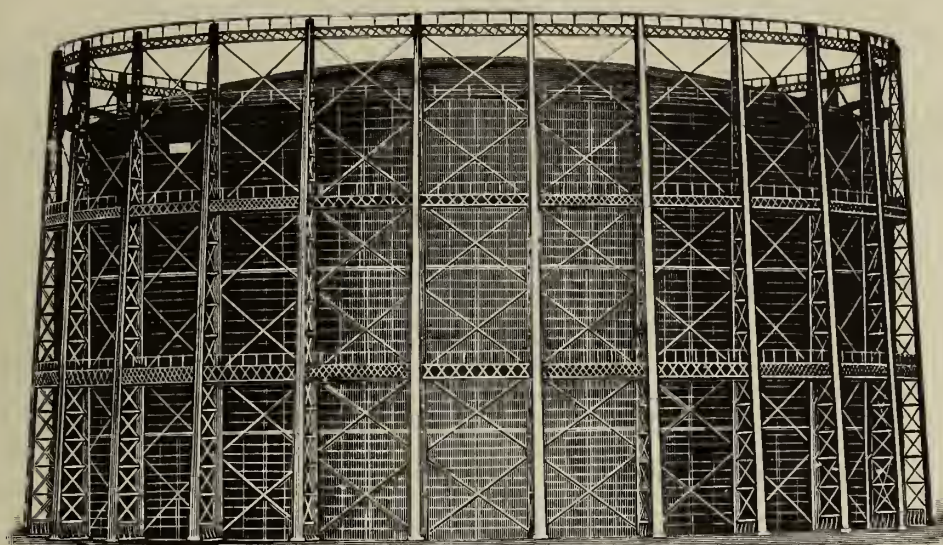
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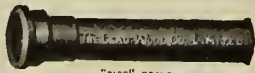
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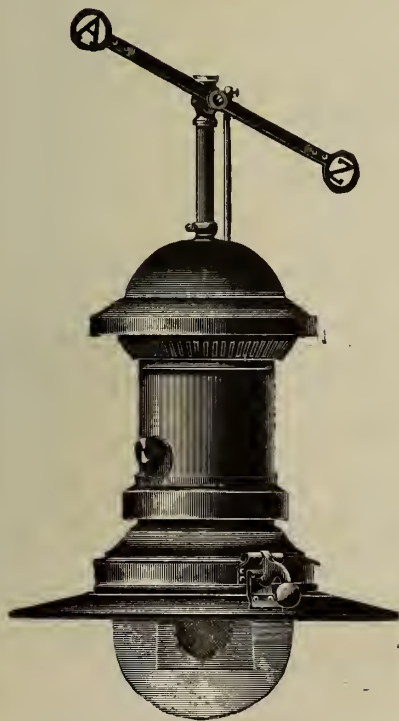
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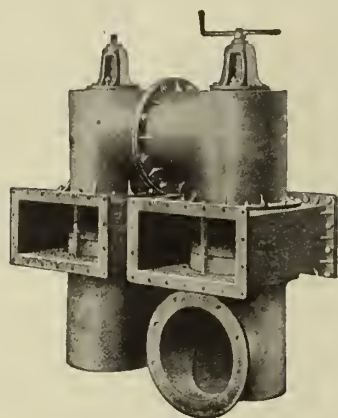
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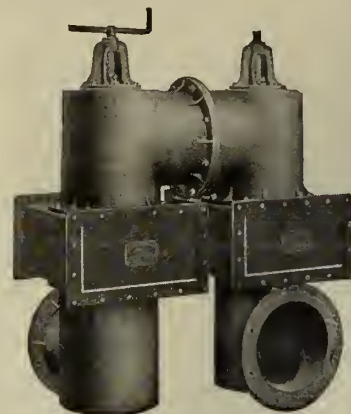
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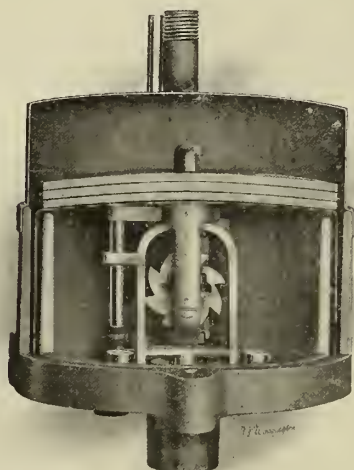


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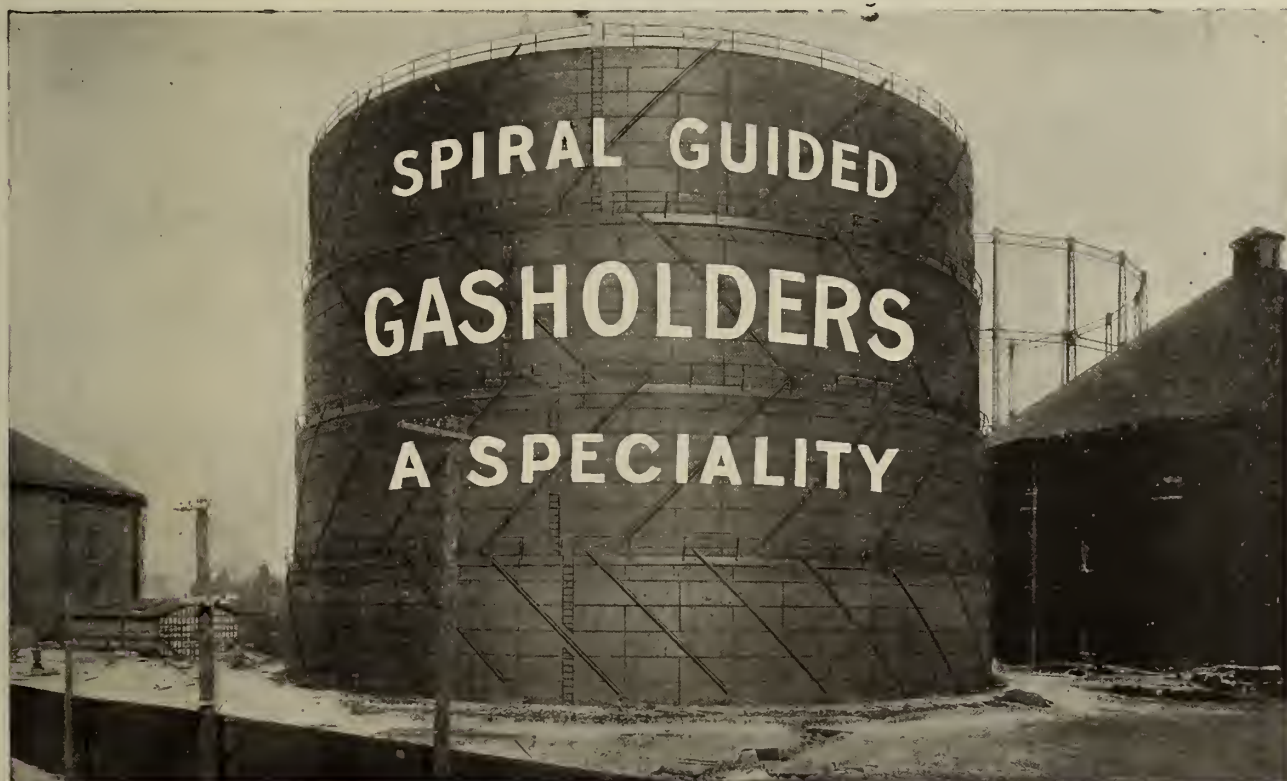
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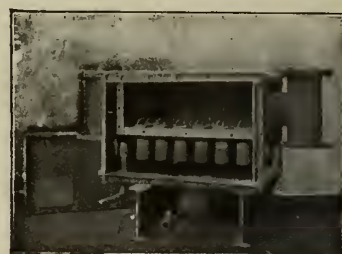
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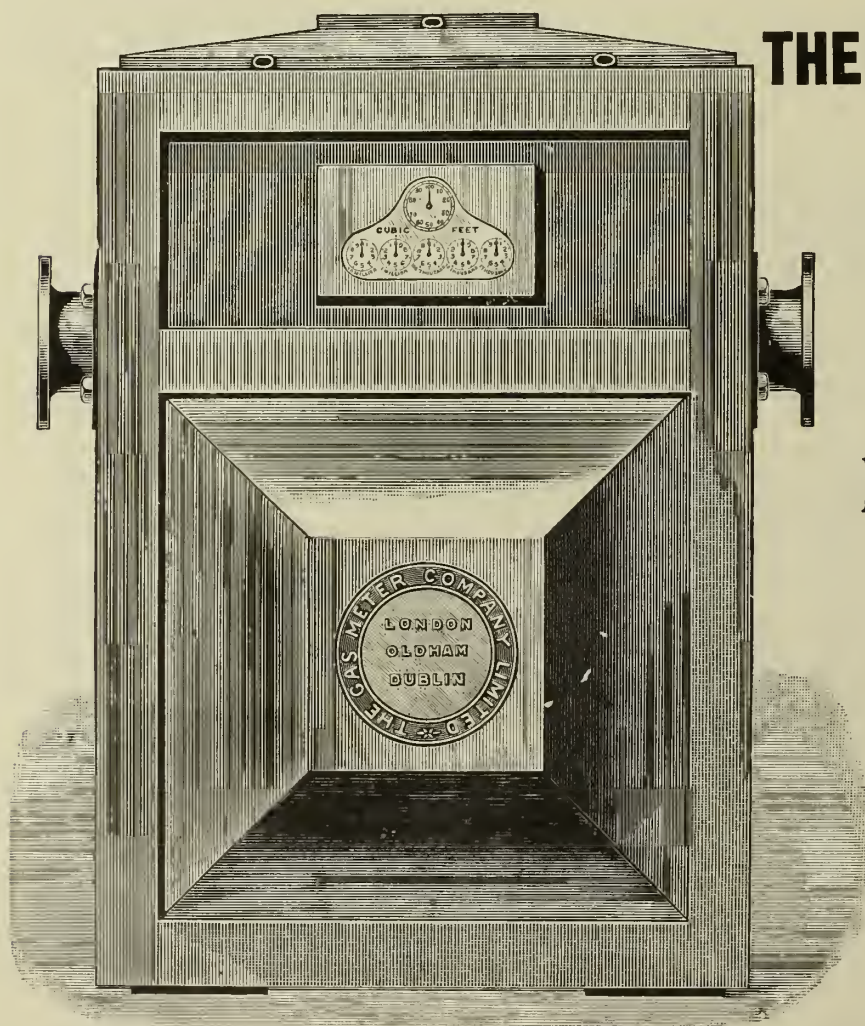
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Barrow . . .	300,000	Gelsenkirchen, Westphalia . . .	175,000	Romford . . .	300,000
Bath . . .	1,000,000	Gelsenkirchen (2nd) . . .	350,000	Romford (2nd) . . .	350,000
Belfast . . .	1,700,000	Geneva, Switz. . .	500,000	Rotterdam, Holland . . .	850,000
Belfast (2nd) . . .	4,500,000	Gosport . . .	200,000	Rotterdam (2nd) . . .	1,500,000
Berlin-Charlottenburg . . .	2,500,000	Göteborg, Sweden . . .	300,000	Rotterdam (3rd) . . .	750,000
Berlin-Rixdorf . . .	650,000	Göteborg (2nd) . . .	600,000	Rotterdam (4th) . . .	750,000
Berlin-Rixdorf (2nd) . . .	700,000	Graudenz, Prussia . . .	200,000	Rotterdam (5th) . . .	600,000
Berlin-Tegel . . .	3,500,000	Guildford . . .	350,000	St. Gallen, Switz. . .	225,000
Birmingham . . .	1,500,000	Guildford (2nd) . . .	200,000	St. Gallen (2nd) . . .	225,000
Bishop's Stortford . . .	200,000	Haarlem, Holland . . .	850,000	St. Joseph, Mo. . .	750,000
Bochum, Westphalia . . .	530,000	Hamburg, Germany . . .	1,750,000	San Paulo, Brazil . . .	700,000
Bognor . . .	100,000	Hampton Court . . .	500,000	Santiago de Cuba . . .	400,000
Bordentown, N.J. . .	125,000	Hartlepool . . .	750,000	Scarborough . . .	800,000
Bournemouth . . .	1,000,000	Hebden Bridge . . .	200,000	Schwelm, Westphalia . . .	100,000
Bournemouth (2nd) . . .	500,000	Heidelberg, Germany . . .	200,000	Shanghai . . .	225,000
Bremen, Germany . . .	550,000	Holyoke, Mass. . .	600,000	Shanghai (2nd) . . .	225,000
Bremen (2nd) . . .	950,000	Hong Kong . . .	450,000	Shanghai (3rd) . . .	1,600,000
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Bridgwater . . .	200,000	Innsbruck, Austria . . .	200,000	Southampton (2nd) . . .	500,000
Bridlington . . .	150,000	Ipswich . . .	750,000	Southgate . . .	400,000
Bridlington (2nd) . . .	200,000	Kampen, Holland . . .	350,000	Southport . . .	750,000
Brieg, Silesia . . .	100,000	Kiel, Sleswig . . .	1,000,000	Southport (2nd) . . .	900,000
Brighton . . .	1,750,000	L. & N.W. Rly., Crewe . . .	700,000	South Shields . . .	650,000
Brighton (2nd) . . .	1,850,000	Lausanne, Switz. . .	250,000	Stafford . . .	500,000
Bruges, Belgium . . .	200,000	Lawrence, Mass. . .	400,000	Staines . . .	600,000
Brussels-Anderlecht . . .	350,000	Lea Bridge . . .	350,000	Stockholm . . .	1,500,000
Brussels-Anderlecht (2nd) . . .	350,000	Lea Bridge (2nd) . . .	350,000	Stockholm (2nd) . . .	1,750,000
Brussels-Forest . . .	1,000,000	Lea Bridge (3rd) . . .	400,000	Stockport . . .	600,000
Brussels-Koekelberg . . .	1,000,000	Leeuwarden, Holland . . .	400,000	Stockport (2nd) . . .	600,000
Brussels-St. Gilles . . .	1,000,000	Leiden, Holland . . .	500,000	Stockport (3rd) . . .	400,000
Brussels-St. Josse . . .	1,000,000	Leigh, Lancs. . .	350,000	Stockton-on-Tees . . .	500,000
Brussels-St. Josse (2nd) . . .	600,000	Lemberg, Galicia . . .	260,000	Swansea . . .	750,000
Brussels-Ville . . .	750,000	Liège, Belgium . . .	1,000,000	Swansea (2nd) . . .	1,000,000
Brussels-Ville (2nd) . . .	750,000	Liège (2nd) . . .	750,000	Swindon . . .	300,000
Brussels-Ville (3rd) . . .	1,500,000	Lincoln . . .	500,000	Sydney-Harbour . . .	500,000
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Carlsruhe, Germany . . .	500,000	Magdeburg, Germany . . .	1,400,000	Taunton . . .	225,000
Chigwell . . .	350,000	Maidenhead . . .	225,000	Taunton (2nd) . . .	350,000
Chorley . . .	300,000	Maidenhead (2nd) . . .	225,000	The Hague, Holland . . .	1,000,000
Commercial, London . . .	850,000	Maidstone . . .	500,000	The Hague (2nd) . . .	500,000
Commercial (2nd) . . .	850,000	Malmö, Sweden . . .	350,000	Tilburg, Holland . . .	400,000
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Copenhagen . . .	700,000	Manchester (2nd) . . .	3,500,000	Tottenham (3rd) . . .	350,000
Copenhagen (2nd) . . .	2,500,000	Marlborough . . .	100,000	Tottenham (4th) . . .	1,000,000
Coventry . . .	600,000	Mayence, Germany . . .	700,000	Tottenham (5th) . . .	1,000,000
Coventry (2nd) . . .	600,000	McKeesport, Pa. . .	500,000	Tunbridge Wells . . .	1,000,000
Cracow, Galicia . . .	200,000	Merthyr Tydfil . . .	300,000	Utrecht, Holland . . .	1,000,000
Crefeld, Germany . . .	500,000	Middlesbrough . . .	1,250,000	Utrecht (2nd) . . .	1,000,000
Croydon . . .	1,250,000	Nelson . . .	400,000	Verviers, Belgium . . .	1,000,000
Croydon (2nd) . . .	625,000	Newburgh, N.Y. . .	600,000	Vienna . . .	3,500,000
Croydon (3rd) . . .	625,000	New York . . .	5,200,000	Waltham . . .	400,000
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Dublin (2nd) . . .	2,000,000	Norwich . . .	1,000,000	Wellington, N.Z. . .	350,000
Dublin (3rd) . . .	650,000	Norwich (2nd) . . .	300,000	West Ham . . .	1,500,000
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Eastbourne . . .	1,250,000	Poole . . .	1,500,000	Winchester (2nd) . . .	125,000
Edinburgh . . .	2,000,000	Port Elizabeth, S.A. . .	400,000	Zwolle, Holland . . .	200,000
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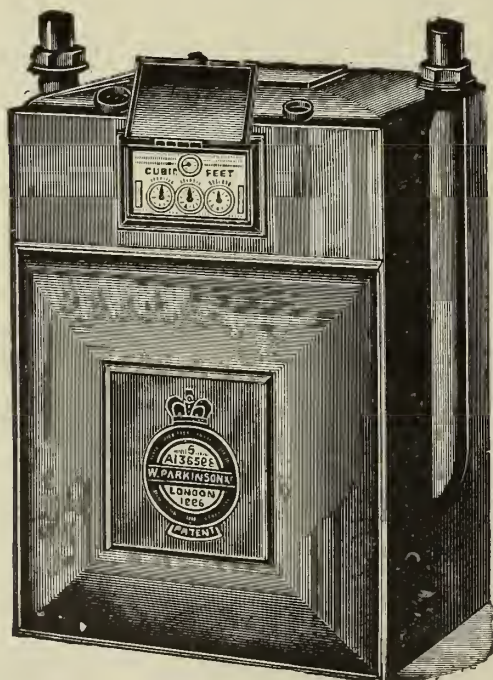
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EDITORIAL NOTES—GAS, &c.

The Institution Technical Programme.

THE Council of the Institution of Gas Engineers have made their selection of the subjects to be submitted for discussion at the forthcoming meeting of the Institution; and it may, to the extent that the titles enable judgment, be pronounced a good one. Although, so far as the programme of arrangements [p. 513] forwarded by Mr. W. T. Dunn informs us, there will be no lecture on this occasion, technically the proceedings should stand prominent in the annals of the Institution. The President (Mr. Thomas Glover) may be relied upon to set a high standard in this respect in his address; and this will give the keynote for the discussions. The members will welcome in the authors of the papers to be submitted at least three new contributors to the proceedings of British gas organizations—Mr. Arthur M. Forshaw, M.Sc., Mr. E. W. Smith, M.Sc., and Dr. Rudolf Lessing. But if Dr. Lessing will, under the circumstances, forgive the remark, there is an especial interest about the two former contributors to the proceedings, inasmuch as they give representation to the link that has been forged between the Institution and the Leeds University, through the special purposes fund; and their communications will report progress in the branches of research upon which they have been engaged.

It will be remembered that Mr. Forshaw was the first to have the honour bestowed upon him of holding the Institution Fellowship in Gaseous Fuel at the Leeds University; the honour being awarded by the Senate of the University, on the recommendation of the Board of Science and Technology. In the annual report of the Council of the Institution presented at the meeting last year, it was stated that Mr. Forshaw had taken up a very promising line of work on the relative "mantle" efficiency of carbonic oxide and hydrogen; and his exploration of the subject, it was expected, would elucidate many obscure problems relative to incandescent lighting. The title of Mr. Forshaw's paper, which the members will anticipate with a large amount of interest, will be "The Efficiency of a Gas in Relation to Incandescent Lighting." The communication by Mr. Smith will really consist of the report of the Gas Heating Research Committee, with an explanatory note. Mr. Smith is the Chemist to the Committee; and it will be gratifying, and a credit to him personally, if he is able to show a substantial advance in the work, which in some measure has, since its start, been hampered by circumstances beyond control. In their last annual report, the Council were only in a position to give an account of the preliminary work—largely consisting of the arrangements for experimental research—that had been carried out by their Chemist, Dr. Drugman. But towards the end of last year, Dr. Drugman unfortunately had to resign; and Mr. Smith was appointed to succeed him in prosecuting the work of the Committee. He has brought a large experience in pyrometry and gas analysis to this new field of work, together with energy and enthusiasm; and so, though he has only so comparatively recently taken charge of the investigation, we feel confident there will not be disappointment in looking to the report for both interest and instruction on a subject which is of much importance to the gas industry at the present time.

There are the indications in the programme of a considerable part of the proceedings being devoted to matters affecting carbonizing and other retort-house operations. With some assurance, it may be expected that the President will have something to say on the question of his experimental experience with 3 feet deep horizontal retorts at Norwich. An active supporter in the provision of technical fare is Mr. J. Ferguson Bell; and he will be forward with a paper on "Carbonizing." Last year, the meeting was largely

occupied with the question of vertical retorts; this year the subject has no representation—in, at any rate, the titles before us. But Dr. Lessing will give the results of his studies of "Carbonization in Chamber Settings." Dr. Lessing has contributed to our pages on the subject; and those members who desire to prime themselves before the meeting as to the Munich and Hamburg carbonizing chambers will find interest in the "JOURNAL" for July 14 last (p. 94), Sept. 15 (pp. 703, 704), and several other issues. Close on the question of carbonization is that of the removal of the spent charges from the retort-house; and Mr. Robert Watson will state, as he sees them, "The Advantages and Disadvantages of a Hot-Coke Conveyor." Out of financial questions, much controversy can arise; and good discussions should be provoked by Mr. Herbert Lees' "Study of Working Costs," and Mr. Arthur Valon's communication on "The Relative Capital Accounts of Gas Undertakings owned by Companies and by Local Authorities." This is an old topic in gas polemics, but one on which there has been little general public discussion. And in an organization in which the members are—excepting those who, like the author on this occasion, are free from official service—either company or local authority men, any debate on it must largely follow partisan lines. The technical programme strikes us as being one from which a vast amount of interest will be extracted; but there is not a single paper that touches the commercial side of the industry. Naturally, however, within the time available for the meetings, it is impossible to look upon more than a fraction of the multitudinous aspects of such a far-reaching industry, and one that is ever expanding in its great service to man.

Gas Engineers on the Calorific Power Test.

THE newest of our District Associations has been the first to discuss—not broadly, but within limits and with caution—the primary proposal for a statutory calorific power test. The discussion of the subject is to be commended; but it will be a difficult matter for some time to come (there is prudence in the course) to get gas engineers in charge of gas undertakings to commit themselves to any definite declaration that this or that number of B.Th.U.'s is correct as a standard for a gas of any given illuminating power denomination. A public pronouncement by individuals now may be brought up against them at some inconvenient season. But the opening that the President of the Welsh Institution (Mr. Thomas Acland) gave to the subject at last Wednesday's meeting, and the contributions to the short debate—if we may mention names without exposing ourselves to invidiousness—of Alderman Canning, Mr. H. D. Madden, and Mr. J. H. Canning show that around the question points can be assembled that can be debated with advantage. The subject is by no means limited to one essential, and that the fair standard calorific figure for gases of given candle power. On this point, the idea must not be allowed to get a too determinate hold that there is a necessarily approximate correspondence between calorific power and illuminating power, because, in the changing carbonization practice, the variation of gas constitution may be such as to knock on the head all such preconceived notions. Herr Körting has disclosed to us in his published tests that some of the gas produced in his vertical retorts on the Dessau system, though poverty-stricken in the matter of illuminating power, has a calorific value that would answer all the requirements of the Gaslight and Coke Company's agreement of 125 calories as the standard, with 112½ calories as the penalty point under the prescribed conditions of testing, and more particularly of the test agreed between the local authorities and the Tottenham Company, with a standard of 450 B.Th.U. For example, what is to be said about the relationship of 10·80 candle power and 545 B.Th.U. net? We should like to make this quite clear, that the standard the Gaslight and Coke Company have

accepted may be regarded as purely tentative. The Governor (Mr. Corbet Woodall) and the officers of the Company do not like the 125 calories for 14-candle gas any more than other gas engineers; and, without the 10 per cent. margin and an average of three days' testing, they would not have agreed to it for a 14-candle standard gas. It may be that, by or before the end of three years, the London County Council will see that the standard and conditions as they exist at present are cumbersome, and that some such figure as 112½ calories, without the (for all the purpose the addition will serve) useless 12½ calories beyond, will be sufficient. The very attitude and insistence of the Company show conclusively their feeling in the matter. Of this point, gas engineers should not lose sight in considering the general question.

There is no doubt about it that the common test now applied to gas is really an anomaly and an absurdity. The principle that the test should have relation with the major purpose of use is an excellent one. The illuminating power test was quite appropriate when applied; but it has receded by leaps and bounds from its old claim to propriety since the incandescent burner, cooking-stoves, gas-fires, and gas-engines became so generally used. The gas that is economically the best for cooking and power is the best for incandescing the mantle and the fuel of the gas-fire. The fundamental idea of a test is the safeguarding of the public; and, if a test in the case of gas is necessary at all, then Parliament will be serving the public better than they are doing at the present time by abrogating completely the illuminating power test, and generally prescribing one—providing it be a fair one—for calorific power only. The test applied should be expressive of the uses to which it is put the major, and not the minor, quantity of gas consumed in the country. The President and the speakers at the meeting were unanimous on this score; and their finding is that of practically the whole of the technical men of the industry. Parliament, however, has not yet been asked to completely annihilate the illuminating power test; and they will not—it is no use harbouring any idea that they may do so—remove that protection, however faulty it is, for the public, until the gas industry is agreed upon a test in substitution. And the only substitute will be, having regard to the applications of gas, the calorific power test. But this must not be put forward until there is absolute certainty as to the position, and until the whole of the conditions of use of the calorimeter for penal testing are thoroughly appreciated and defined, and made a statutory requirement. There must be no hole-in-the-corner or slipshod testing in connection with calorific power, any more than in the case of illuminating power. The conditions must all be reproducible. In regard to the prospect of a change, it must not be forgotten that Parliament has not been unmindful of the altered uses of gas, and of the perpetually shrinking importance and claim to necessity of an illuminating power standard, as is seen in their willingness, session after session, to lower (on request) the standard of requirement in this respect. As to dual penalty testing, the Gaslight and Coke Company were strongly disinclined to put themselves under the double obligation; but they had to regard it in their negotiations with the London authorities as a diplomatic concession. Only under very special circumstances, and for very special reasons, would the Governor and technical staff of the Company advocate the companioning of the two tests. It is undesirable and unnecessary; and it must be a *sine qua non* of any move in the—near or distant—future to make the calorific power test universally obligatory, that the illuminating power test shall go.

If Parliament would allow the gas industry to do without a penal test altogether, so much the better pleased would the gas industry be. There would be the utmost willingness on its part to commit its fortunes to the test only of popular approval, precisely the same as Parliament—though unfairly while gas is subjected to qualitative control—allows the electrical industry to do, in competing for lighting, power, and heating. While speaking of tests and of competitors, there is one small point that may be corrected in connection with Alderman Canning's remarks at the meeting. He seemed to infer that there were no prescribed penalty tests in respect of distributed power gas. That is a mistake. In all the Power-Gas Companies' Bills that have been passed by Parliament, provisions have been inserted prescribing forfeitures for absence of distinctive smell, excess of carbon monoxide, and shortage of specified thermal value. But who are the supervisory authorities?

Low Slot Price v. Fittings Supply.

THE paper that Mr. Edward A. Harman, of Huddersfield, read at the meeting of the Manchester Institution on Saturday does not pretend to be a literary effort; but it is a piece of composition that contains a point in every one of its short paragraphs and tables, and some of the points are striking. Gas supply by slot meter is now ubiquitous, and is so fostered by every gas undertaking of standing, that the making of any show at supporting its claims at this time of day would be treated to the same good-natured derision that advocacy of the importance of also encouraging the use of ordinary meters would now receive. Indeed, the slot meter in these times only lends itself as a subject for discussion in the two aspects of its constitution, and the methods accompanying its application to the service of the industry. And much that is useful can be collected by the recounting of experiences under different conditions of use—conditions that affect the class of consumer by such means, and the degree of service that the gas suppliers render to the consumers in respect of the installation of (to use the one word that comprehends the whole) the "system."

As Mr. Harman in substance points out, the slot-meter system has done as much as anything in the evolution of the current business ideals of the gas-supply industry; and a sounder policy than of yore has fortunately displaced the supine and autocratic demeanour of the past. This in itself is an excellent thing; for had the gas industry pursued the old courses, these would have conducted the gas industry straight on to a persistent decline. While the slot-meter has generally and generously broadened policy in the relationships between gas supplier and consumer, it has not carried the Huddersfield Corporation Gas Department farther than the supply of a cooker with the meter. These are fixed free of charge; but no additional internal fittings are furnished. Before there is condemnation of this limited provision, there are certain figures in the paper to be taken into account which bear upon the situation. Consider that (calculating in the discount) 40 cubic feet of gas are now supplied to the consumer for 1d., such a quantity would not be possible were the fittings included—as a matter of fact, the slot-meter consumer in Huddersfield is getting his gas at about the same price as the ordinary lighting consumer, 2s. 1d. as compared with 2s. Consider that the slot consumers exceed by about 3000 the number of the ordinary ones—that is to say, they represent 15,624 out of a total of 28,549. Consider, again, that through these slot meters the aggregate consumption is now only about 20 million cubic feet short of the quantity of gas sold to the ordinary lighting consumers; and further remark, from the data submitted by Mr. Harman, the continuous growth in the slot consumption *per capita*. This growth would not have been obtained had it not been for the low price at which the slot consumers are supplied, and for the fact that the large proportion of the slot consumers—12,424 out of the 15,624—use cooking-stoves. What, however, is good for Huddersfield might not be good for other towns. Not to include fittings other than a cooking-stove would in many places prove fatal to the system. But the facts at Huddersfield are as seen.

There may be some question as to the point that the slot consumer obtains his gas at a price so close (2s. 1d.) to that (2s.) of the lighting consumer. One reason for this is that the slot consumer prepays, while the ordinary lighting consumer has credit; another point is that differential prices obtain in Huddersfield—the charge being as low as 1s. 6d. for gas used for stoves and power, less a discount of 5 per cent. for prompt payment. The slot consumer has to pay the one figure all round; so that the ordinary consumer cannot prefer the charge that the slot consumer, in view of the extra expense incurred on his behalf, receives preferential treatment. Incidental to this point, it is interesting to notice that the quantity of gas sold at the lower price through ordinary meters for cooking and power exceeds the amount sold for lighting purposes, and, therefore, taking into account the quantity consumed through slot meters for cooking, the Huddersfield Corporation Gas Department has cause to congratulate itself upon an excellent day-load, and the consumers upon the moderate prices at which the commodity is supplied to them. Among other hints worth taking note of in connection with the paper are these: That the popularity of the slot system is enhanced by the fact that the consumers pay for their gas at the rate of 30 cubic feet for a penny, and get 25 per cent. of the money returned to them by the collector; that this personal interest in the contents of the

money-box causes an unfailing notification of removal; and that the same collector never empties the same money-box twice consecutively. There is no occasion to emphasize these points by comment. Mr. Harman is complimented on his showing under his limited (limited in respect of fittings) system of slot-meter supply, in which low price rather than the initial provision of the means of using the gas, has produced the good results.

Limitations in Competition for Power Business.

IT is with satisfaction that we publish to-day an article on "Suction-Gas Competition" by a gas power specialist of such recognized standing as Mr. W. A. Tookey, following up Mr. Henry O'Connor's recent lecture on the subject, and the editorial comments evoked by it. Mr. Tookey is in a position to take an altogether independent survey of the relative positions of town gas and suction gas in the power-gas competition; and his article will be found very suggestive, and therefore worthy of the careful consideration of town-gas men. The cardinal point of the contribution is that gas men should recognize that suction gas has come to stay, and that it and all established rivals—town gas, steam, and oil—have their special fields of usefulness, and that there is a fairly well-defined line of demarcation between their respective spheres. We accept the gentle reproof deducible from the submissions as coming from one who, we are afraid, is not fully cognizant of the aims and aspirations of progressive town-gas men in respect of future carbonizing practice, and the opportunity of paying more attention to the B.Th.U.'s saleable for a given price than to the illuminating power. In the gas industry, we do not desire, in this transition stage of gas-manufacturing practice, to grow accustomed to recognizing limitations of application of the primary product; but we do want to make the most of the part of the power field that is at the time particularly available, and to retain as much as possible of other parts. Mr. Tookey's hints as to the area that is especially suitable for exploitation by town gas are of practical utility.

That it would be the height of folly for town-gas men to work within a bounded area for power purposes, is one of the chief lessons to be drawn from our contributor's article. "There can be," he remarks, "no question that town gas is the gas *par excellence* for engine work. It is eminently suitable in composition, cleanliness, uniformity of quality, convenience, and constancy. It requires less capital outlay, less attention, less water. It gives more power per unit of cylinder capacity, can be obtained at a moment's notice, and all stand-by losses are avoided. But, notwithstanding all these good qualities, suction-gas competition exists. Suction gas is a suitable fuel, but needs all the above merits to be qualified. . . . All items of running costs [with it] are higher, as well as the increase in capital expenditure; while any great variation in the quality of the solid fuel burnt oftentimes leads to irregular and unsatisfactory working." With such a multitude of advantages in favour of town gas in contrast with suction gas, there is reason sufficient for not contracting the view as to the possibilities of town gas. In the superiorities of town gas are seen the inferiorities of suction gas; and among experienced manufacturers (our suction-gas friends must admit) there is steady growth in recognizing these things. The superiorities of town gas, as listed in the article, are weighing heavier and heavier in the balance of the manufacturers' preference; and the inferiorities of suction gas are largely discounting the face-value of its advantage as to gas cost per given horse power. Mr. Tookey supplies some comparative costs on a theoretical basis; but these costs are greatly departed from when the suction-gas plant takes its place, and has to accept its share and chance, in the common routine of a works. There are few works that can afford to keep gas and gas-plant specialists on their staffs.

"There is," remarks Mr. Tookey, "absolutely no reason why any suction-producer plant should not give every satisfaction; and the fact that a number have been abandoned shows incompetence of the erector, rather than defects of the apparatus." Deficiencies of suction gas compared with town gas cannot all be ascribed as faults of the erector; and those deficiencies we know have had, in certain instances, an effective persuasive influence in causing manufacturers to evict from their premises something that they found introduced a serious obstruction to the regularity of their operations. It may, of course, be possible to erect an apparatus that is free from all structural defects; but yet

the conditions of working, and the shortcomings of the product itself, may be disastrous to regularity of operation. This has been a by no means limited experience in practical working; and the disadvantages have gone to emphasize the advantages of using town gas, where the former have not so sickened the manufacturers that, reviling gas both gross and refined, they have gone direct over to electricity. Incompetence of the plant erectors, we repeat, is not the only cause of abandonment. In the cases of many abandoned plants (we might with a fair amount of confidence assume it has been so in all), the users have not gone to the length of discarding them without consulting the makers, and without attempts being made by the latter to realize satisfaction. Success from the manufacturers' point of view has still been wanting. At the same time, we do not refuse to recognize that suction-gas plants do, under other conditions, answer the purposes of manufacturers, but then not a few are happier for having town gas as a stand-by. All points considered, there is no necessity within sight for confining operations for power business on behalf of town gas, where reasonable terms are offered. To do so at the present time would be a deplorable mistake.

Continued Blocking of the Gaslight and Coke Bill.

The ways of parliamentary procedure, and the modes of expression, are sometimes deceiving. When the Bill of the Gaslight and Coke Company was before the House on the 13th inst., Mr. W. Thorne stated that "he did not intend to move his resolution," to the effect that the Bill be read the third time that day six months; and, as our own report and the minutes of the House showed, the Bill was thereupon formally considered, and ordered to be read the third time. In view of this, we may be excused for having arrived at the conclusion that the blocking of the measure by Mr. Thorne was at an end. When, however, the Bill came up on the order for third reading last week, Mr. Thorne again objected. Thereupon the third reading was deferred to Thursday, June 3.

South Wales Deadlock.

During the past week, matters reached another stage in the South Wales coalfield, with reference to the dispute over the Miners' Eight-Hours Act—and it is a stage that must be regretted by those who have the real welfare of either the miners or the coalowners at heart. At the same time, the deadlock which has been reached is not likely to have caused any great amount of surprise to those who have been carefully watching the trend of events in that important part of the country. We stated last week that a demand made by the owners for a 7½ per cent. reduction in wages had been referred to the Independent Chairman of the Conciliation Board; while the owners had agreed to refer to a Joint Sub-Committee the question of the working arrangements under the Eight-Hours Act. This Sub-Committee duly met and prepared their report, which was submitted at a meeting of the Conciliation Board last Friday. The effect of the report was that they had failed to agree upon the matters in regard to which they were appointed to endeavour to come to a settlement. It seems that the owners were willing to concede a good deal; but at last a point was reached beyond which they would not go. For instance, they waived their demand for a reduction in daymen's wages, and apparently also withdrew their contention that the existing wages agreement must necessarily terminate at the end of June. The point, however, on which they declined to budge had reference to their contention that under the new Act the men are liable to be called upon, and must be called upon, to work sixty hours per annum in addition to the eight hours per day. This the men would not accede to; their argument being that they were prohibited by the Miners' Federation of Great Britain from agreeing to any extension of hours without first putting the matter before them. An amicable outcome of the Sub-Committee's deliberations having therefore not been arrived at, the owners promptly reverted to their original standpoint, and determined that they will on June 1 serve notices to the effect that all existing contracts of service are terminable, by the Act, at the end of the month named. This action Mr. Brace, M.P., describes as "holding a pistol to the heads of the men;" but in some other quarters it is looked upon as a formality which, in view of the Counsel's opinion they had received, the owners

would in any event have felt compelled to carry out. Those leaders of the men who have ever counselled or threatened a strike will have a pretty clear idea of what "holding a pistol to the head" of anyone really means. The exact position of affairs appears to be that, though the owners firmly believe the new Act will automatically put an end to the existing wages agreement (which otherwise would not expire until next March), they are nevertheless prepared to allow the agreement to run its normal course provided certain concessions are granted them. These concessions have not so far been conceded; and, unless they are, the existing agreement will not be allowed to run its "normal course," but will terminate on July 1, when the new Act comes into operation. The position of affairs still contains a large element of speculation; but we feel almost inclined to agree with the particular leader of the men who says he "cannot remember a time when the outlook was so threatening." It is to be hoped, however, that he is anyway wrong in his prophecy that "this fight will not be confined to South Wales, but will be a fight throughout the whole of the British coalfield." Every effort must be made to limit the area involved. Subsequent to the events above alluded to, the Independent Chairman pronounced in favour of the reduction in wages of $7\frac{1}{2}$ per cent.

The London and Southern Junior Session.

With the annual general meeting which was held last Friday, the London and Southern District Junior Gas Association have completed a session upon the success of which the officers, contributors, and members are all to be congratulated—the officers on the excellent programme prepared, the contributors on their active support in the shape of papers, addresses, and personally conducted visits, and the members on their active support at the meetings, without which the best of programmes must be of no avail. We learn from the remarks made on Friday by the President (Mr. W. J. Liberty) that the Association, which has been in existence seven years, has a membership-roll of 123, drawn from no less than 21 gas undertakings. This widespread representation shows that there is a general interest in the Association—whose area is naturally a very large one. Of course, the London Association, like the other similar organizations, from time to time experience losses through members taking up more responsible positions; but upon such losses as these the Junior Associations are to be congratulated, for they show that the members are made of the "right stuff." The business transacted last session included an opening address by Mr. H. E. Jones on "Labour," a lecture by Dr. Samuel Rideal on "The Hygiene of Gas Lighting," and some half-dozen papers on subjects of close concern to the members; while, in addition, there were a number of visits to gas-works and other places of interest. The address of Mr. Jones, already referred to, was, it may be mentioned, only one of his attentions to the juniors during the past year; for it will be remembered that, on the occasion of the joint meeting of the Junior Associations at the Franco-British Exhibition last August, he also delivered an address which was greatly enjoyed by those who were privileged to listen to it. The joint meeting was altogether a successful function, and formed a worthy sequel to the similar enjoyable gathering which took place in Manchester in 1907 at the time the Gas Exhibition there was open. It will be seen that Mr. Liberty has been chosen to act as President of the London and Southern Junior Association for another year; and if the next session under his leadership should prove as successful as has been the one which has just terminated, the members will have no reason to regret their choice.

Mr. H. D. LUMB, of the Mirfield Gas-Works, has been appointed Assistant Manager to the Yeovil Corporation Gas Department.

Mr. JOHN H. CHEW, of the engineering staff at the Blackpool Gas-Works, has been elected a Fellow of the Chemical Society.

Mr. JOHN R. H. JACOBS, the Assistant Secretary and Accountant to the Reading Gas Company, has been appointed Secretary to the Southampton Gaslight and Coke Company. There were over 60 applications for the post.

We regret to learn from Mr. A. G. Cloake that he has recently sustained a loss by the death of his Director, M. REMI JACQUEMART. Deceased was for many years Director-General of the "Société Anonyme Métallurgique d'Aubrives et Villerupt," and was much respected and loved by all employed under him. He frequently visited England, and was known to many British Engineers. Members of the Association of Water Engineers will doubtless have a pleasant recollection of the entertainment given to them under his auspices at Aubrives.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 537.)

BUSINESS on the Stock Exchange last week was a good deal quieter than it had been the week before. In some of the more speculative lines, there was at times plenty of animation; but the more staid and humdrum departments were taking a rest. There was no stirring incident to quicken-up movements. The week opened in cheerful mood, and some small advances in price were effected; but business was on too limited a scale to have much influence. The best gilt-edged were firm, and the Foreign Market was steady; but the Railway Market was not strong. Tuesday was also a quiet day, but some investment buying lent support. The Railway, Foreign, and South African Markets were in favour. Wednesday underwent somewhat of a revulsion, and the tendency was downwards; Consols and the like being lower. Business on Thursday was, if anything, quieter still. The tendency was, however, more favourable, and Consols had a fractional recovery. The pendulum started swinging the other way on Friday. Most lines dropped for lack of support, and Government issues were depressed by the imminence of another Colonial Loan. Consols receded $\frac{1}{16}$. Saturday was steadier, and a few lines picked up a little. In the Money Market, the tendency was for rates to harden; and discount terms began to stiffen slowly and steadily. Business in the Gas Market was well up to the mark in point of volume, and several issues which are not often dealt in changed hands. In addition to this, there was another sale at the Mart, where several Suburban and Provincial issues found ready buyers. In Gaslight and Coke, the ordinary was fairly active, and was strong enough to gain half-a-point; transactions ranging from $103\frac{1}{4}$ to 104 . In the secured issues, the maximum was done at $88\frac{1}{4}$ and $88\frac{3}{4}$, the preference at from $105\frac{1}{2}$ to $106\frac{1}{2}$, and the debenture at from $85\frac{1}{2}$ to $85\frac{3}{4}$. South Metropolitan was fairly active at the figures of the previous week— 123 – $124\frac{1}{4}$. The debenture was done at $85\frac{1}{4}$. In Commercial, the 4 per cent. realized $108\frac{1}{2}$ and $109\frac{3}{4}$, the $3\frac{1}{2}$ per cent. $103\frac{1}{4}$ and 104 , and the debenture 83 . In the Suburban and Provincial group, Alliance and Dublin old made $17\frac{3}{4}$, ditto new $12\frac{1}{16}$, Brentford debenture 103 , British $42\frac{7}{8}$ and $43\frac{1}{8}$, Bromley "B" 89 , Ilford debenture 104 , West Ham from $120\frac{1}{2}$ to $121\frac{1}{4}$ (a rise of 2), and ditto debenture $107\frac{1}{2}$. In the Continental companies, Imperial was a point weaker at from $181\frac{1}{2}$ to $183\frac{1}{4}$, and the debenture was done at $95\frac{1}{2}$ and $96\frac{1}{2}$. Union advanced $\frac{1}{2}$, with business at 100 and 101 ; and both European issues advanced $\frac{1}{4}$ without business done. Among the undertakings of the remoter world, Bombay fully-paid changed hands at 6 , Buenos Ayres at from $13\frac{1}{4}$ to $13\frac{9}{16}$, Cape Town at $4\frac{3}{4}$, Melbourne 5 per cent. at $101\frac{1}{2}$, Monte Video at $12\frac{3}{4}$, Primitiva at from $6\frac{3}{4}$ to $6\frac{7}{8}$, ditto preference at from $5\frac{1}{4}$ to $5\frac{3}{8}$, and River Plate at from $14\frac{1}{2}$ to $14\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Electricity in Parliament—Trading in Electric Wiring and Fittings—
The Control of Parliament—Municipal Trading Losing Favour—
The Interfering County Council—Wanted, a Suitable Linking-Up
Scheme—Electricity, plus Rent and Maintenance.

THERE are a few matters referring to electrical legislation that have recently appeared on the parliamentary ground at Westminster which are of general interest, and therefore may be noticed here. The Electric Lighting Acts (Amendment) Bill is making better progress this session than it has heretofore done. In its progress, it is being touched up here and there to give satisfaction to parties; but every change produces dissatisfaction in other quarters. It is a trite saying that it is impossible to please everybody; and Parliament is perfectly cognizant of the well-established fact. The last move in the House of Lords in connection with the Bill has put municipal suppliers of electricity under an injunction which they would have preferred being without, but which the Electrical Contractors' Association have fought for continuously. The Bill originally proposed that, if municipal electricity departments engaged in the providing, letting for hire, fixing, &c., of electrical fittings or apparatus, the business should be conducted financially so that it would not impose any burden either on the undertaking or the ratepayers. At the instance of Lord Avebury, however, the business is now only to be done through a contractor; but, if there are no contractors in an area of supply, nothing is to prevent municipal electricity departments carrying out the work themselves. On principle, being unfavourable to municipal trading, we ought to endorse the action of the House of Lords in insisting that the work should be done through the local trade. But, so far as gas is concerned, there are so many reasons why it is preferable that fittings work should be carried out in all branches direct by the suppliers of gas, that we could not, if the restriction were applied to gas, give it any warm approval. The gas or electricity department knows best what is required by the consumer; and it is to the interest of the consumers and the suppliers of gas to get the work done at the cheapest possible rate without the intervention of too many profit-makers. If the municipal department supply and fix the fittings, there is a responsibility upon them; and as the Earl of Onslow says, it is very convenient to be able to hire fittings

direct from gas and electricity suppliers. On the other hand, Lord Faber thinks it is undesirable to give local authorities the power in any shape or form, because they are under statutory obligation to inspect wiring and fittings, and it would be unwise to allow them inspecting authority over their own work. However, gas authorities have no great care whether the fitting work in connection with municipal electricity supplies is done through the department or a contractor, so long as there is compulsion to put the business on a paying footing, so long as there is someone to see that this is done, and so long as gas undertakings are not called upon to pay through the rates any of the losses occasioned by the trading, and have not to face rate-aided competition.

There is no doubt Parliament has had an awakening lately as to its responsibility in the matter of municipal trading. This is seen in what has been done in the placing of greater control over the gas revenues of the Salford and Oldham Gas Departments, so that there is a limitation attached to the amount of profits carried over to the rates, and so that the consumers are not affected by gas being taken free from the undertaking for public purposes. It would be a good thing if this was carried further in the case of municipal electricity supply, by making it compulsory, after some definite incubation stage, for electricity charges to be so ordered that there was no loss on a concern. There is observed in the remarks of Lord Hamilton of Dalzell, in moving the third reading of the Electric Lighting Acts (Amendment) Bill, a further indication of the tendency of Parliament to place greater control over municipal electricity suppliers. Sub-section 1 of clause 5 of the Bill provides for the supply of electricity to railways, tramways, and canals partly outside the area of supply. His Lordship made this remark: "The Board of Trade will carefully consider the circumstances before giving their consent, and, in particular, will endeavour to prevent extravagant speculation on the part of local authorities which might injuriously affect the interests of the rate-payers and consumers of electricity within the area." We hope the Board of Trade will act wisely and well in this matter.

One more instance showing that, at any rate in the House of Lords, municipal trading is losing favour, arises in connection with the North Metropolitan Electric Supply Bill. The Company may supply energy for haulage and for lighting railway carriages, but they cannot supply current for illuminating railway stations situated in the areas of other authorized distributors. Twice before they have tried to get the disability removed, but have failed. On the third time of asking, however, the House of Lords have conceded the power, though the West Ham Corporation raised strong but ineffectual objection to the competition. The North Metropolitan Electric Supply Company were supported by Mr. J. F. Gooday, the General Manager of the Great Eastern Railway Company; this gentleman making it clear that he is anything but in favour of municipal trading.

Some of the local authorities of the Metropolis are crying out against the London County Council for meddling with Electric Supply and other Private Bills in Parliament. It has been one of the County Council's "funny little ways" in connection with Gas Bills over a long course of years; and the gas suppliers and consumers of the Metropolis have had to grin and bear the consequences. The inception of the electrical protest rests with the Westminster City Council; and they are backed by the Borough Councils of Battersea, Camberwell, Chelsea, Fulham, Kensington, Shoreditch, Southwark, Wandsworth, and Woolwich. All these authorities call the action of the County Council "an encroachment on the jurisdiction of the Metropolitan Borough Councils in electric supply and other Bills." The County Council are not penitent. On the contrary, they have announced that there is no intention on their part to discontinue the policy of which complaint is made. If the County Council supervision is good for the gas companies, it is surely good for the electricity authorities. There is a right to expect equality of treatment and attention from the Council. Whatever may be our individual views on special matters taken up by the Council, and affecting the interests in which one may be directly concerned, it is certain that it was a good thing for the ratepayers of London that the present County Council quashed the electricity supply scheme of their predecessors.

The value of the linking-up powers that a bountiful Legislature has conferred upon the electricity suppliers of the Metropolis has not yet been fully decided. The authorities have got the powers; but they do not know how to put them to the best use. There have been meetings at which resolutions have been passed and arrangements made for the consideration of schemes for unifying and standardizing the electric supply of London. It will be a queer thing if, after the linking-up project of last year having been successfully utilized as the highway to the destruction of the last of the London power schemes, no practical means can be evolved by which the new powers can be utilized. Those chiefly concerned are not at all certain on the subject. A resolution passed at a conference of the borough council and company electricity suppliers implies the existence of a doubt. The resolution was—"That, in the opinion of this Conference, it is advisable, *providing a suitable scheme can be formulated*, that the powers conferred under the London Electric Supply Act, 1908, should be carried out by the local authorities and companies jointly." It is a pity perhaps that Parliament did not, before conferring the powers, inquire whether the promoters had a suitable scheme up their sleeves for giving effect to the authorization. However, a consultative committee has been appointed to penetrate the matter deeper and see what can be done. Going a little further afield. Reference has

been made once or twice in the "Memoranda" to the project for intercommunication between the systems of the South Metropolitan Electric Supply Company and the Beckenham District Council, as a provision against breakdown. There was some doubt, however, whether the existing powers of the two authorities would allow them to give effect to the idea. The Board of Trade were taken into their confidence; and the Board have informed the parties that, while the Company are authorized to supply Beckenham, the Council cannot, under the existing law, reciprocate. But if the Bill in Parliament this session passes, all obstacles will be removed.

Electricity suppliers are ever devising some new schemes for the purpose of getting together a larger *clientèle*. The Woolwich Borough Council have just come out with a project. It is described as "a sound assisted wiring scheme, which makes it possible for the Council to offer a cheap and efficient supply." It is also said that "many promises of support" have been received. The Hastings Corporation have had many promises of support in connection with their business extension schemes; but alas! promises are often broken. The Woolwich scheme, however, is interesting enough for notice. The Council propose to put in complete installations of not less than six points of lighting, in approved revenue-earning positions, in houses exceeding £32 rental per annum without initial cost. The Council are to take a rent of 7d. per lamp installed per quarter for installations in Woolwich and Plumstead, and in Eltham 3s. 6d. additional for the necessary transformer—these rents to be perpetual, unless the installation is purchased. This means that, in addition to the account for current and the cost of lamps, the user of the six lamps in Woolwich and Plumstead is to pay 14s. a year rent, and in Eltham £1 8s. After the expiration of the twelve months' guarantee, the consumer is also to maintain the installation in full working order, or the Council will do this work for him at an additional charge of 9d. to 1s. per lamp per quarter—that is to say, maintenance charges, if we construe the conditions correctly, for these little six-lamp installations will amount to from 18s. to 24s. per annum, and electricity and rent on top of this. If this is how "electricity" comes out "cheaper than gas," well gas suppliers need not be startled, however shrill the dishonest cry.

SOCIETY OF BRITISH GAS INDUSTRIES.		
Livesey Memorial Fund.		
Amount subscribed through the Society of British Gas Industries by the following members and others		£433 11 0
Anti - Vibration Incandescent Lighting Co., Ltd., Otley.	R. Laidlaw and Son (Edinburgh), Ltd., Edinburgh	
J. & J. Braddock, Oldham.	Metropolitan Gas-Meters, Ltd., Nottingham.	
Clapham Bros., Ltd., Keighley.	Marsh and Thorp, Manchester.	
S. Clark and Co., London.	R. & A. Main, Ltd., London.	
Cannon Iron Foundries, Ltd., Deepfields, near Bilston.	James Milne and Son, Ltd., Leeds.	
Carron Company, Carron.	Mobberley and Perry, Ltd., Stourbridge.	
Clayton Son and Co., Ltd., Leeds.	National Gas-Engine Co., Ltd., Ashton-under-Lyne.	
Dugald Clerk, London.	G. Orme and Co., Oldham.	
Edward Deane and Beal, Ltd., London.	E. J. & J. Pearson, Stourbridge.	
Davis Gas-Stove Company, Ltd., London.	Richmond Gas Stove and Meter Co., Ltd., Warrington.	
Robert Dempster and Sons, Ltd., Elland.	Sturtevant Engineering Co., Ltd., London.	
Drakes Limited, Halifax.	F. C. Sugden and Co., Leeds.	
Fletcher, Russell, and Co., Ltd., Warrington.	William Sugg and Co., Ltd., London.	
Charles E. Fry, Leamington.	Sawer and Purves, Manchester.	
First Dutch Bog Ore Co., Ltd., Leamington.	Tilley Bros., London.	
George Glover and Co., Ltd., London.	Townson and Mercer, London.	
J. William Glover, London.	Joseph Taylor and Co., Bolton.	
Thomas Glover and Co., Ltd., London.	Tangyes Ltd., Birmingham.	
Gibbons Bros., Ltd., Dudley.	Thos. Vale and Sons, Ltd., Stourport.	
B. Gibbons, Jun., Ltd., Dudley.	J. E. Williams and Co., Manchester.	
Gas Meter Co., Ltd., London.	Wilson and Mathiesons, Ltd., Leeds.	
Harris & Pearson, Stourbridge.	West's Gas Improvement Co., Manchester.	
Ingram and Kemp, Ltd., Birmingham.	George Winstanley, King's Norton.	
Imperial Stove Co., Ltd., Leamington.	George Waller and Son, Stroud.	
W. J. Jenkins and Co., Ltd., Retford.	C. & W. Walker, Ltd., Donnington, Nr. Newport.	
Leeds Fire-Clay Co., Ltd., Wortley, Leeds.	Williamson, Cliff, Ltd., Little Bytham, Grantham.	
Amount as above		£433 11 0
Amount subscribed direct to the Institution of Gas Engineers by members of the Society of British Gas Industries, and already acknowledged		137 1 0
Total		£570 12 0

Mr. H. J. Ibbotson, who has been representing several manufacturing gas engineers in Japan and the Far East, has returned to England on business; and he expects to remain in this country for three months.

PRESENTATION TO MR. CHARLES CARPENTER.

THERE was a large gathering of the employees of the South Metropolitan Gas Company at the Livesey Institute on Monday last week, on the occasion of the presentation to Mr. Charles Carpenter of an illuminated address of congratulation on his elevation to the position of Chairman of the Company. The following account of the proceedings is taken from an advance proof of the report which will appear in the forthcoming number of the "Co-Partnership Journal," and for which we are indebted to Mr. Walter T. Layton, the Editor of that publication.

Mr. J. F. BRAIDWOOD, the Engineer of the Greenwich station of the Company, presided. In opening the proceedings, he said the idea of the address was suggested by the Station Engineers, and had been cordially taken up. He called upon Mr. C. Franks (the Hon. Secretary of the Committee) to read the address, which was as follows:—

*To CHARLES CARPENTER, Esq., Chairman,
South Metropolitan Gas Company.*

Your retirement from the position of Chief Engineer, your election as a Director by the shareholders, and your acceptance of the chairmanship, at the invitation of your colleagues on the Board, are events of such supreme importance in the history of the Company, that we feel the occasion should not be allowed to pass without placing on record an expression of the feelings of pride, respect, and esteem with which we regard you.

Thirty-five years ago you entered the service of the Company at the Greenwich works, and have risen by force of character and intellect to the highest position therein attainable; making a reputation as an engineer, organizer, and administrator second to none in the industry.

We congratulate ourselves that throughout your brilliant career you have devoted yourself to the interests of this Company, and that one so intimately acquainted with its history and policy, and so fully qualified by conspicuous ability, knowledge, and experience, has been chosen to succeed the late distinguished Chairman, our revered friend and benefactor.

The fact that you, as successor to the great founder of co-partnership in the gas industry, have been familiar with the system from its inception, have identified yourself with it, have experienced its advantages, and witnessed its beneficent influence upon the relations of employer and employed, and the condition and prospects of wage-earners, is a matter of profound satisfaction to us.

It is our earnest hope that you may for many years enjoy health and strength to discharge the great responsibilities of your high position; and we look forward with complete confidence to the future of the Company under your guidance.

In conclusion, we assure you of our loyalty to yourself and the Board, and that no effort shall be wanting on our part to maintain the prosperity of the Company which it is our privilege to serve as co-partners.

May 17, 1909.

Mr. J. TYSOE said it was impossible to add anything to the words of the address; but he wished, as a former colleague, to say he agreed with all that was said therein. Mr. Carpenter had attained his position by sheer hard work without any element of luck. Many who were present could speak of acts of kindness and consideration by their present Chairman which led them to believe that he would hold a place in the hearts of all of them—not as Chairman of the Company, but as Charles Carpenter.

Mr. BEARD, speaking as a workman, desired to add his testimony to what had been said. Twenty years ago he would not have dared to speak from that platform, but to-day they could speak to their Chairman as friend to friend. Mr. Carpenter had gained their esteem by his strict sense of justice; and he was worthy in every respect of the part he had to play.

Mr. MEWS (a Director) said the Board felt that Mr. Carpenter had earned his position by his assiduity and capacity. In him, they had a man after their own hearts. Both Directors and men knew that Mr. Carpenter was the right man in the right place.

Mr. Braidwood then formally presented to Mr. Carpenter the beautiful volume, containing the address and 5504 signatures, which was bound in white morocco with silver-gilt mountings.

Mr. CARPENTER, who was received with very hearty and prolonged cheers, said that was the most momentous day of his life. Certainly, any other ordeals which he had had to go through did not compare with it in the emotions to which they gave rise. Eloquence had been defined as the ability to implant one's own sentiments in the breasts of others. He could claim no such gift as that, but, after the manner in which they had been addressed that day, and after the responses thereto, he must feel that he had, at any rate, done something in his long association with the Company to warrant their confidence and esteem. As Mr. Braidwood had truly said, it was thirty-five years ago since, a lad in his 'teens, he had entered the Company's service. After the necessary formalities of paying his footing had been gone through, he must say that everyone with whom he had come into contact spared no pains in answering all that he was continually desiring to know. He inquired about everything he saw, and on every hand there was every desire to help him. There were one or two things that struck him very forcibly and very happily as he looked back over those thirty-five years. Men used not to be very particular how they talked between themselves; but he remembered that, when

they were addressing one another in their own particular vernacular, if they saw him near they were more moderate than when among themselves. This showed a kindly disposition towards a youngster. In one respect he could not agree with what Mr. Tysoe said. Certainly there was one instance in which he did think the chance or luck referred to by him had come in. This had been when an immediate superior had distinguished himself by making an unfortunate blunder, and, as a result, was called upon to resign his position. When the vacancy happened, he (Mr. Carpenter) was ready for it; and, as it was thought that he could occupy the position satisfactorily, he had it. The moral to draw from this was that one could not do too much in acquiring all the knowledge and information lying at one's hand—closer than one often realized. He would say: Take your cricket when you can, and your football when you must; but lose no opportunity of acquiring the knowledge that is necessary to understand one's business, and that could only be got by patient study. It would take him too long to go through the many names that came into his mind as he looked back over the years he had passed with the Company. To all and every one of them, he owed something—to many of them a great deal. Mr. Braidwood had spoken very eulogistically. It was one thing to address a body of shareholders, who, he might say, to some extent did not know, and it was another thing to speak, as he was doing then, to those who did know. He could only say that he had had no other object, while in the service of the Company, than to do what he believed to be right and fair. If they asked him what his ambitions were, they were to be a reputable engineer. Other duties, such as those which pertained to his present position, came along without his own seeking, but in a manner with which they were all familiar. He had said before that he owed very much to those with whom he had been associated. He thought it might be said they were honouring themselves on that day quite as much as they were honouring him, because the choice of the Directors, if he might say so, had been foreshadowed by their own choice in the matter, and by that he meant their disposition and good feeling towards him. Had it not been what it was, he felt quite sure he would not have been made Chief Engineer, and, in that case, he would certainly not have been chosen as Chairman of the Company. He could only thank them very imperfectly for the beautiful expression of their regard for him. He could not think of any more admirable manner in which they could have done it; and the address, with its valued signatures, would be one of his greatest treasures. He could not hope to take the place of their dear friend, Sir George; but he could promise them that he would always do his best to be sincere and just to them all.

Mr. BUSH (a Director, and formerly the Secretary of the Company) said he was delighted to be there that day to witness the presentation to Mr. Carpenter, because it showed that the officers and employees believed that they had in him an upright, honourable, just gentleman as Chairman. He had been associated with Mr. Carpenter for a great many years; it was no secret that they were very sincere friends. He had watched Mr. Carpenter's career with much pleasure; and he was quite sure that there was no man who could have filled the position occupied by the late Chairman better than Mr. Carpenter.

On the motion of Mr. SIMS, a vote of thanks was accorded to Mr. Braidwood for presiding; and its acknowledgment brought the proceedings to a close.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
May 17	Previously acknowledged	9	64	13 1
„ 19	Arthur Valon, Westminster	3	3	0
„ 20	Southern District Association of Gas Engineers and Managers	42	0	0
„ 22	Robert Beynon, Torquay	10	6	0
	Bradford Corporation Gas Committee	52	10	0
	A. Macpherson, Kirkcaldy	1	1	0
	Society of British Gas Industries—see separate list (p. 503) and note at foot of list	433	11	0
	Midland Junior Gas Association—Second List of Subscriptions:—			
	Mr. B. W. Smith	10s.	6d.	
	„ W. J. Fletcher	7	6	
	„ T. Brooke	5	0	
	„ C. Carrington Barber	5	0	
	„ Owen Evans	5	0	
	„ A. G. Phillips	5	0	
	„ W. Batt	2	6	
	„ W. Lycett	2	6	
	„ W. C. Hawtin	2	6	
	Midland Junior Gas Asso- ciation	14	6	
				3 0 0
	Total	£9800	8	7

THE USE OF TAR ON ROADS.

Some Interesting Statistics.

THE Roads Improvement Association have done a very useful work by the issue of a pamphlet, bearing the title of "Dust Problem Statistics," prepared by the Secretary (Mr. Rees Jeffreys) for presentation to the recent Road Conference organized by the County Councils Association, some of the papers submitted at which were noticed in the "JOURNAL" for the 4th inst. (p. 305). The pamphlet, which comprises nearly 200 pages, is a return of the methods adopted, and the materials used, by the road authorities of Great Britain during the year 1907-8 to render their roads dustless, together with the costs and the results of the processes adopted. In his preface, Mr. Jeffreys explains that, the treating of road surfaces by tar being recognized as the most efficient and effective means of rendering roads dustless without reconstructing them, the Association, when circularizing the authorities for the purposes of the pamphlet, asked those who had carried out this work to give particulars of the methods employed. The replies were summarized, and they were given in a special section of the book. Introductions have been written by Mr. H. E. Stilgoe, M.Inst.C.E., City Engineer and Surveyor of Birmingham, and President of the Association of Water Engineers, and Mr. H. P. Maybury, the County Surveyor for Kent; and Colonel R. E. Crompton, C.B., M.Inst.C.E., the Vice-Chairman of the Association, has contributed a memorandum on "Last Year's Road Improvements."

In the course of his introductory remarks, Mr. Stilgoe says:

The application of coal-gas tar to the surface of macadamized roads, practised some five years ago in almost an experimental manner, has become an established principle in many parts of the country. No little credit is due to the Roads Improvement Association in inaugurating the dust-laying competitions held two years ago, and thus bringing the matter prominently before the notice of local authorities. The process has gradually advanced, and machinery has been invented by which the tar can be applied hot or cold, under pressure or otherwise, either by horse-drawn or mechanically-propelled vehicles. Apart from the question of dust-laying, and the immense comfort conferred upon the frontagers to, and the users of, the street, there is great advantage derived in the preservation and lengthened life of the carriageways. While the benefit of the tar lasts, there is found to be less mud, that the surface is practically waterproof, and that the destructive effect of frost is hardly apparent. These advantages are obtainable at a cost of about 1d. per square yard. The duration of the benefit is dependent on the condition of the road when the tar is first applied, the amount of the traffic, and the weather. Generally speaking, the advantages are greatly in excess of the cost of the work; and there can be no doubt that the application of tar to macadamized streets is a great boon to all concerned.

Mr. Maybury, who was formerly Gas Engineer to the Malvern Urban District Council, makes the following observations:

Tar, in one form or another, must of necessity be the best medium for dust abatement, and will, upon its merits, continue to occupy the premier position. When considered from the point of view of cost per ton only, no other product can approach it. I suppose the average price paid by road authorities to-day for crude tar does not exceed 35s. per ton; and this quantity suffices to treat one-tenth of a mile of road surface, making same practically dustless and waterproof for one year. Gas companies, and local authorities owning gas-works, would be consulting the best interests of their undertakings if they would endeavour to help the road surveyor by increasing the storage capacity at their works; thus conserving the winter's production of tar for use upon the roads in spring and summer, and at the same time securing a better price per gallon than they now obtain from the distiller. The engineers of the larger gas-works could still further improve their balance-sheets by arranging to supply a "freed" tar to a standard specification. Crude tar, unfortunately, contains a large percentage of ammoniacal liquor, together with more or less supho and ferro cyanides. These impurities in the tar, when laid upon the road, render the surface less firm, dense, and durable than when "freed" tar is used. Special treatment with the production from each works is necessary if uniformity in results is to be achieved. The conclusion arrived at by the Paris Conference was that road improvement and dust abatement were to be looked for in the extended use of tar, together with that of the best hard granite, syenite, basalt, &c.

Coming to the section on "The Treatment of Road Surfaces with Tar," information was sought under the following headings: (1) Preparation of the road. (2) Kind of tar used, and price. (3) Number of square yards treated per gallon of tar. (4) Whether sand or any other material was spread over after treatment. (5) Cost of spreading, and particulars as to whether tar was machine sprayed or laid on by hand labour. (6) Life of the treatment. (7) Comments. The following is a brief summary of the replies, some typical ones being given in each case:

(1) To this question 180 replies were received. Of the total, 56 surveyors pointed out the necessity of thoroughly cleansing the road from dust by sweeping it first by machine brooms, and afterwards by hand brooms; 96 specified that the road should be well swept; 25 stated that the road should be in good condition; and 17 sent general replies.

(2) The 180 replies to this question revealed the fact that 134 authorities used crude or ordinary gas tar, that 25 used distilled or refined tar, and that 6 used oil-gas tar. The prices varied from 1d. to 4d. per gallon; the usual price being between 2d. and 2½d. There were 29 authorities who used specially prepared materials, such as "Tarvia," "Tarmite," Clare's patent tar compo, and "Dustabato."

(3) There were 156 replies to this question. In 33 cases, the spread was between 3 and 5 square yards to the gallon; in 99 cases, between 5 and 7 square yards; in 19 cases, between 7 and 9 square yards; and in 5 cases it was more than 9 square yards. When specially prepared tarry materials, oil-gas tar, and ordinary tar mixed with oil were used, the average spread to a gallon of tar was greater than with crude or distilled tar.

(4) To this question 166 replies were received; and of this number 77 of those who responded used sand, 37 used small (¼-inch) granite chippings and granite dust, 10 used large (over ¼-inch) granite chippings, 14 used limestone chippings or dust, 8 used slag chips or slag dust, 19 used road grit material removed from the road before treatment, and 15 used various local materials, such as shingle, pea gravel, cinder dust, &c. In five cases the surveyors did not place any material on the road after tarring it. Several expressed the opinion that granite chippings are superior to other materials for spreading over newly tar-treated roads. In many cases the superfluous material was swept off after a period when the tar was dry.

(5) There were 160 replies on the subject of the cost of spreading the material. In 49 cases it was applied by machine, in 84 by hand, and in the other cases no information was given. The average cost of treating the road surface with tar, including all expenses of preliminary sweeping, tar, sand, or other material spread after treatment, and labour, varied between 0.7d. and 3d. per square yard. The usual cost, however, was 1d. to 1½d. when a machine was used, and 1½d. to 1¾d. with hand labour. The variations in cost were due principally to the greater or smaller area dealt with per gallon of tar, and to the cost of the material spread after treatment. Further, when two coats were given, the cost for the second coat worked out much lower. The cost of spreading only was given in a few cases, and it varied between 0.1d. and 0.4d. per square yard; being nearer the former figure when the material was applied by machine, and nearer the latter when applied by hand.

(6) With regard to the life of the treatment, 133 replies to the question were received. In 61 cases it lasted a season, or from six to nine months; in 54 cases, twelve months; and in five cases, upwards of twelve months. In five cases, however, the life was less than a season. In some districts, the treatment lasted as long as two years; the average appearing to be about nine to twelve months, or one treatment per annum. The life of the road surface treated by tar varied considerably with the district, due to the difference in the volume and kind of traffic on the roads, whether one or two coats of material were laid on, the material used, and the character of the road.

(7) The general comments, a large number of which are given, are all of them favourable to the use of tar for the treatment of road surfaces.

The replies are followed by tabulated particulars as to the mileage of roads treated last year. The figures for surface tarring (machine and hand labour) are as follows: England, 1269 miles; Wales, 12 miles 2 furlongs; Scotland, 11 miles 5 furlongs—total, 1292 miles 7 furlongs, out of 1630 miles treated. Next come the "Dust Problem Statistics," showing what was done in each county during 1907 and 1908 to deal with the dust problem.

Upwards of 1000 copies of the pamphlet have been distributed gratuitously to road surveyors in various parts of the country, with the view of stimulating efforts to render their roads dustless during the present season; and a large number of them have expressed their appreciation of it, and placed it before their Highway Committees. Copies of the pamphlet may be obtained of the Secretary of the Roads Improvement Association, No. 1, Albemarle Street, Piccadilly, W. The selling price is 2s.

THE IMPERIAL INTERNATIONAL EXHIBITION.

THE International Exhibition at Shepherd's Bush was opened last Thursday; but in regard to the exhibits, it is still in a very incomplete state. It is, however, sufficiently far advanced to say that it will be "international" in name only. Few nations, and comparatively few industries, are represented. The long and fatiguing corridor (leading from the Uxbridge Road entrance), in which exhibits were housed last year, has been completely barricaded off, several of the huge buildings are derelict, and in the Machinery Hall there is desolateness compared with last year. There appears to be as much vacant as occupied space; and the exhibits are of a miscellaneous order. There are few signs of any extension of stands beyond those already in course of erection. The whole scene is almost depressing after the well-stocked building of last year. The exhibitors there on Saturday evening really looked sorry for themselves, so neglected were they.

The rear end of the hall is splendidly lighted by the Keith new high-pressure lamps, though the electric arc lamps are still suspended there. Up to the present, there are only three or four stands representing the smoke abatement section; and the goods on view are mostly enclosed stoves for anthracite. At the stand of Smoke Consumption, Limited (Cowper-Coles patents), information is obtained of a smokeless fuel, known as "Osbornite." It is "made from coal and, in some cases, from coal and peat; is about one-third lighter than coal; and the cost varies from 25s. to 30s. per ton, according to locality." It vies with coalite in the range of its virtues. The Keith and Blackman stand, showing the latest types of their gas-compressing plant—it is the plant used

for compressing the gas consumed in lighting a large section of the grounds and the rear end of the Machinery Hall—is worth a visit by gas engineers and others interested in economical high-power lighting. The plant was described in the article on "Gas at the Imperial International Exhibition" in the "JOURNAL" for May 11. Among the miscellaneous collection of exhibits, it was noticed that Messrs. Gibbons Bros., Limited, are showing a model of their patent I. K. transporter; a few glass cases are occupied by chemical apparatus—Messrs. Townson and Mercer being among the exhibitors with petroleum testing apparatus. The illumination by the high-pressure lamps in the grounds is a feature of the night effects. The part, however, that gas is taking inside the buildings and in the grounds was described in the article on May 11; and we should only be reiterating the particulars there given by stating what was seen in the course of a perambulation through the place on Saturday.

In regard to electric lighting this year, as the "Electrician" remarks, "the great outstanding innovation is the very extensive use of high candle-power metallic filament lamps. In the majority of cases, these have displaced arc lamps; and the authorities claim that for illumination and effect much better results are obtained as the best of well regulated arcs will flicker at times." From the metallic filament lamps "it is hoped . . . to obtain a perfectly steady light, and consequently better effects."

Reverting to gas, the business that the Brentford Gas Company will do in supply this year, though there is no Gas Section, will, it is expected, owing to the additional consumption by exhibitors for power and lighting, be about on the same scale as it was last year.

It is quite apparent that the White City has quickly lost favour for industrial exhibitors; and the crowds—less dense than on a Saturday evening last year—promenading in the open, and listening to the military bands, or patronizing the side-shows, while few were examining the exhibits in the buildings, indicate that the views of the public and the original intentions of the Exhibition promoters have clashed.

A COOKER OF THE SEVENTIES.

The Old Davis and the New.

PEOPLE who might be inclined to argue—if there be any such—that a gas-cooker must be a short-lived article, would find striking proof to the contrary on paying a visit to the Queen Victoria Street show-rooms of the Davis Gas-Stove Company, Limited, where there is to be seen an object of interest which is being treated with all the respect to which its age entitles it. This is a cooker which was supplied by the firm to one of the London Gas Companies in the year 1878, and has been, presumably, in constant use for a period of about thirty years. The badge number of the Gas Company which it bears is 1035. What, we wonder, would be the number of a stove sent out by the same Company to-day? Now the cooker has been returned to the firm, who are intending to provide it with a permanent—as well as a prominent—resting place in their show-rooms. Nicely "washed and brushed up," it looks (with the exception, perhaps, of the wrought-iron ring burners) little or none the worse for its long life of activity as a "gas consumer." A comparison of this cooker with one of the firm's latest make—the Davis 1909 screwless cooker—causes one to reflect that, though in the intervening period immense strides have been made in the matter of detail, the principle on which the gas-cooker is constructed remains still to a large extent the same as it was thirty years ago; and a point which the comparison brings out is that the makers of the Davis stoves have kept in view the question of maintenance right from the beginning—there being comparatively few screws in the old type, while the position of the newest pattern in this respect is indicated by its title.

In the old stove—a No. 9 size—the outer and inner casing are of plain sheet iron; and no packing is used. The interior parts—that is, the runners in which the shelves rest—are screwed on to the body of the stove; but the sides of the oven have no screws. They are held together by corner plates. The hot-plate is fitted with three wrought-iron ring burners; and the bars over them are also of oval wrought-iron. There is, of course, not that modern convenience a simmering burner to be seen on the stove. In the latest model screwless cooker, on the other hand, both the interior and exterior casings are of porcelain enamelled steel plates—with, of course, a packing of non-conducting material, to retain all the heat in the oven. The screwless cooker is bolted together, by means of four bolts passing from top to bottom; and thus it can be taken apart and put together again in a very short space of time. The runners inside the oven are arranged to be instantaneously removable for cleaning purposes; while all parts of the stove are interchangeable, and can be replaced easily in the event of breakage, &c. The hot-plate is a lifting one, which certainly facilitates cleaning; and the burners under it are all loose, and can be removed without trouble—though they are, it should be pointed out, locked in position when the hot-plate is down.

Mr. F. E. Webb, the Deputy-Chairman of the Brighton and Hove Gas Company, left estate of the gross value of £113,724.

SUCTION GAS COMPETITION.

By W. A. TOOKEY.

THE editorial remarks appearing under the above heading in the "JOURNAL" for the 4th inst. are much to be commended. It is indeed to the interest of engineers, gas managers, and manufacturers generally that papers of the importance of that of Mr. Henry O'Connor should not merely be read before a comparatively small audience and be partially discussed by some of those who happen to be present (the majority of whom have not been able to give the contents of the treatise the study it deserves), but should be published in, and commented upon by, a widely-read journal, to the advantage of a much larger body of engineers.

It is a matter for regret that only upon very rare occasions can adequate discussion take place during the actual meeting at which such papers are presented. But it is fortunate that the reports given by the leading technical journals are, in very many cases, accompanied by a more or less verbatim account of the discussion. This is a matter in which the "JOURNAL" has merited, and has received, a full measure of appreciation from its readers; and the reputation will be still further enhanced by the adoption of the attitude taken in the leaderette above alluded to, as undoubtedly not only should competition be accepted as inevitable, but the real character of the competing object, be it man or manufacture, should be truly appraised. This can only be done by an interchange of thought, either by written word or by speech. The limits of the latter are very narrow, even within the discussion chamber itself, where the anxiety exhibited by chairman and secretary to ensure a good discussion upon technical papers is equalled only by their concern in applying the closure should, by any chance, the subject be one that presents more than ordinary interest. By the written word, however, it is not only possible to throw open the debate to a much larger body of engineers who, by their own experience, are entitled to contradict, qualify, or criticize, but such contributions give coherent expression to thought without fear of incurring the well-intentioned imposition of a time-limit; while to some the words flow from the pen much more fluently than from the lip.

As one who, while daily concerned in the application of gas power, has no financial interest either in the manufacture of engines or of gas, and therefore is unbiassed in regard to the varying efficiencies of any of the fuels that enable the advantages of gas-engines to be exemplified, the writer would ask to be allowed to respond to the implied invitation in the "JOURNAL," and offer some comments upon town gas *versus* suction gas competition from the point of view of a gas-power specialist.

There are two main considerations—suitability and cost—that have to be taken into account by a manufacturer or his consulting engineer when making a decision in favour of one or the other fuel. There can be no question at all that town gas is the gas *par excellence* for engine work. It is eminently suitable in composition, cleanliness, uniformity of quality, convenience, and constancy. It requires less capital outlay, less attention, less water. It gives more power per unit of cylinder capacity, can be obtained at a moment's notice, and all stand-by losses are avoided. But, notwithstanding all these good qualities, suction-gas competition exists. Suction gas is a suitable fuel, but needs all the above merits to be qualified. It is suitable in composition if special provisions are made as to compression of working charges and their ignition. Its cleanliness is not to be compared by the same standard as the purified gas used for illumination; and special precautions have to be taken to prevent the inlet valves becoming inoperative through deposits of tar. Variation of power entails variation of quality; while even the continued operation of the producer tends to decrease the quality of the gas. Its convenience is great when compared with steam plants; but town gas far excels it in constancy and ready application. All items of running costs are higher, as well as the increase in capital expenditure; while any great variation in quality of the solid fuel burnt oftentimes leads to irregular and unsatisfactory working.

Why, then, is the competition so keen? And why do so many consulting engineers advise their clients to adopt suction gas in preference to town gas? The answer is that the cost of town gas is, as a rule, prohibitive for all but small engines, or those of larger power which are used for short and intermittent periods. Adopting the basis that one brake-horse-power can be developed for the hourly expenditure of 10,000 B.Th.U., 77 cubic feet of suction gas is thus accounted for if at 130 B.Th.U. per cubic foot, or 16.66 cubic feet of town gas of 600 B.Th.U. per cubic foot—the latter representing 60 B.H.P. hours for 1000 cubic feet, and the former 60 lbs. of anthracite for the same output and period. The two fuels can therefore be compared in terms of such relation as follows:—

Town gas at 1s.	per 1000 feet =	60 lbs. of anthracite at 37s. 6d. per ton.
" " 1s. 6d.	" " =	" " 56s. "
" " 2s.	" " =	" " 75s. "
" " 2s. 6d.	" " =	" " 93s. "

Of course, the actual costs, including water and labour, &c., reduce the discrepancies between the ruling prices according to locality and individual applications. An idea of this reduction may be obtained by assuming that attendance, water, depreciation, &c., can be assessed for a 60 H.P. plant at about 1s. per hour, and that wastage of coal, through dust, careless feeding, defective manipulation, unconsumed fuel in the ashes, stand-by losses, &c.,

increase the consumption of fuel by 25 per cent. This would give the corrected figures as under :—

Town gas at 1s.	per 1000 feet	= anthracite at 29s. per ton.
" " 1s. 6d.	" "	" " 44s. "
" " 2s.	" "	" " 59s. "
" " 2s. 6d.	" "	" " 74s. "

The advertised statements of gas-engine makers, as to the cost of power with suction gas being from 50 to 80 per cent. of town gas, may be thus explained.

But, after all, there comes the question of reliability. What would be the good of a manufacturer trying to economize his working expenses if the saving involved risk of stoppage or possible damage of material in process of manufacture through unreliable working? Instances have been known where suction-gas plants have been discarded owing to the constant recurrence of breakdowns. Scores of apparatus can be started only with difficulty. The number of stand-by services provided by the public supply mains is quite considerable—pointing either to a deeply-rooted feeling of distrust or a laudable desire to have a duplicate service in case of emergency.

On the other hand, it must be admitted that the majority of suction-gas installations are doing excellent service, even when there is no town-gas service available for occasional aid, both with regard to reliability and economy. Why this difference? It is purely and simply a matter of education. Makers have acquired a very considerable amount of experience during the last five years, and erectors are beginning to be taught that more than half of the difficulties encountered in connection with suction-gas apparatus would be avoided if they paid as much attention to the piping arrangements as their employers do to the design of the engine. A properly-planned suction-gas installation gives no trouble either in starting or in working. Wet sparking plugs are practically unknown, and the scrubbing arrangements are efficient enough although of but a simple character. There is absolutely no reason why any suction producer plant should not give every satisfaction; and the fact that a number have been abandoned shows incompetence of the erector rather than defects of apparatus.

Gas managers, therefore, should not look upon present suction-gas producer troubles as likely to be always existent, nor repeat—parrot-like—that three plants in Glasgow have been thrown out. By doing so they run the risk of lulling themselves into dangerous lethargy. The simplicity and economy of the suction-gas system has given it a great impetus; widespread application and general education with respect to the arrangement and connection of detail parts will do the rest; and in due time the competition between the two gas-engine fuels will be non-existent, because the sphere of each will be more clearly defined. Town gas will hold the field for small powers up to about 20 H.P., and probably in some circumstances to 30 H.P. For larger powers it would only be financially possible for intermittent work, such as electric lighting in business premises, for storm water pumping schemes, and similar duties, at rates at the present time ruling in the majority of districts. From 30 H.P. to 100 or 150 H.P. suction-gas producers will be installed in the large majority of instances. Between 200 and 500 H.P. gas-engines will perhaps hold their own when bituminous coal is gasified instead of anthracite; but at present there is a vast field in which the advantages of steam are as paramount as those of town gas for small powers and intermittent work. Each method of power production has its own advantages and disadvantages; and it is doing a dis-service to general progress to attempt to distort the natural limitations of each type of apparatus. Efforts should rather be directed to encourage the application of each in its own proper sphere; and this can be done for town gas by gas managers in many ways.

Mr. O'Connor's remarks as to the desirability of utilizing the service mains for power supply during the hours when the demand for illumination is at a minimum, should sufficiently indicate the possibility of lowering the rates to an amount which would bring increased profits, notwithstanding low rates, seeing that distribution and collection charges are but slightly increased, and that therefore a fair profit above the actual cost of manufacture would be distinctly remunerative. Upon such matters, however, the experience of others must be brought to bear. The methods to adopt for encouraging the use of town-gas engines are more within the ken of the present writer. With the facilities possessed by gas companies' inspectors, of ready access to manufacturing premises, it cannot be denied that every opportunity presents itself for a responsible official to become acquainted with the methods of power generation in use. When separate steam-engines are utilized, working at boiler pressures less than 80 lbs. per square inch, fitted with ordinary slide-valves and non-condensing; when the exhaust steam is practically wasted by being turned to no useful purpose; and when little or no heating is required for the industrial processes—very little inducement should be necessary to effect a change from steam to gas.

Permission should be sought for a test to be made to determine the average output of power throughout one whole day, in order to check the consumption of fuel and water in terms of indicated horse power. Indeed, no gas-engine should ever be put into service to replace any other form of motive power until such a test has been conducted to prove the normal and maximum load; for it is as desirable to have an engine large enough to deal comfortably with its load as it is necessary to avoid putting down a much larger engine than is actually required. In the one case,

the engine would always be likely to breakdown through overload temperature; while, in the second case, frictional losses of engine and transmission gear would be disproportionate to the average load, and compare badly with competing prime movers.

There is a very fruitful field for town-gas power service in the generation of electricity for the lighting of large business premises, drapers, grocers, hotels, &c. There are many openings for such installations in every large town; and, if proper attention be given to the efficient silencing of exhaust without back-pressure, such applications generally lead to an extension of this class of business. The personal influence and advice of a competent gas-power expert in the service of a gas company will usually prove just the one thing needful to turn the undecided proprietor into a large consumer.

Even in factories where a small quantity of steam is required for boiling and heating, gas power can make a good showing. For heating printers' stereotyping presses, bookbinders' presses, glue-pots, roller-composition melting pots, type cleansing, &c., to mention some of the applications of steam in one particular industry only, a very little steam can be made to go a very long way by generating it at low pressure in a small gas-fired boiler, conveying it in small pipes to the machine or process, and imparting a further supply of heat by means of a ring gas-burner immediately before use. It is astonishing to realize the economy of such a system, to say nothing as to the convenience and the cleanliness.

In this connection, reference may be made to such a system schemed by the writer for a firm of printers in London. A weekly publication was printed from stereotype plates, necessitating steam for heating the press used for drying the *papier maché* moulds. When a gas-engine was put down to drive the general printing machinery, the coal bill of 5 tons per week was reduced to 1 ton, plus 25s. for the gas used in the engine. The installation of two small gas-fired boilers with superheaters has now not only wiped out the coal bill altogether for an additional 3s. worth of gas weekly, but has done away with the necessity of making steam and keeping it, by constant stoking, for twenty-four hours. The processes are now interdependent, and can be operated at any time at five minutes notice; whereas, before the change, the steam was only available one day a week and everything had to be accumulated for the "weekly clear-up."

As for printers, so for laundries; for the coal fired boilers in use at the latter, especially in the smaller concerns, are usually hard pressed, and gas power gives a welcome relief. Besides this the steam generated can be much more efficiently used for boiling and washing than in a steam-engine, which allows so much of the heat in the raw coal to escape in the exhaust unused. The variations in steam pressure, due to the drawing-off of large quantities of steam and water at frequent intervals, often affect the power and speed of the engine. Gas, again, can be used for the ironing department if the admixture of gas and air is once properly set and made unalterable, and the pressure controlled. These things can be done, and should be done, but by a department separate from that of the ordinary inspector, whose multifarious duties in connection with illumination, heating, and cooking are well-nigh too much already. There should be a gas-power department under the supervision of an engineer skilled in such matters, who can make it his business to get into personal touch with all consumers of gas for industrial purposes, and give expert attention to each installation at intervals, to ensure maintenance of proper working conditions.

By thus encouraging and assisting proprietors of industrial concerns, gas managers will do more towards securing their full share of the power business than in seeking opportunities for decrying the performances of competing fuels and pouncing upon all reported failures, which, after all, show only a lack of intelligence on the part of those who are responsible for their erection and selection.

A Plea for Gas-Stoves.

At a meeting of the Royal Institute of British Architects on Monday last week, the subject of "Smoke Abatement" was debated at some length, on a paper read by Sir William Richmond. One of the speakers was Dr. H. A. Des Vœux, who urged architects to take up the question of cooking in private houses, and to recommend the use of gas. He expressed the opinion that, if architects brought their enormous influence to bear in this way, there would soon be an improvement in London. If they began with gas in the kitchen, he was perfectly certain people would follow by using it upstairs. He was a strong believer in gas for heating houses, and especially bedrooms. There were now 500,000 gas-stoves in London; and if gas was as deleterious to health as some people thought, they would have heard of its effects before this. Sir Aston Webb said that having recently, owing to illness, been compelled to have a fire in his bedroom, he was convinced that a gas-fire was preferable to a coal-fire, which when poked, disturbed the patient.

Sir John Colomb, one of the Directors of the Commercial Gas Company, underwent a very serious operation at his London residence on Monday last week. His progress was at first as favourable as could be expected. Unfortunately, however, later in the week his condition gave cause for great anxiety; and on Sunday it was still extremely grave.

THE MIDLAND ASSOCIATION IN THE POTTERIES DISTRICT.

THE President of the Midland Association of Gas Managers (Mr. W. Langford) being professionally centred in the Potteries district, to the Potteries district the members went for their May outing last Thursday. For pleasure it is usual to turn one's back on the seats of industry; but, in this instance, the members of the Association went into the very heart of industry for pleasure, and found it. Wherever they turned from noon on Thursday until they left Longton, they saw they were in one of the great workshops of the country. But they found that the men who are of the chief spirits of the fecund enterprise of the Potteries are not so absorbed by their business affairs that they do not know how to welcome and give pleasure to those who visit them. In the generous hospitality and the provision for the day's interest and conveniences, not only was the kindly disposition of hosts represented, but the worth and esteem in which the President is held in Longton was reflected. The chief host of the day, who made himself personally responsible for much, was the venerable Mayor (Alderman Aaron Edwards, J.P., C.C.), who won the hearts of all the visitors. Of him, Longton is proud. He is one of the mainstays of the borough. He is one of the men who has helped to lay the foundations, and to rear the structure, of England's industrial greatness; and the visitors recognized it. It was regretted greatly that ill-health prevented the Chairman of the Gas and Electricity Committee (Mr. Alderman E. Brookfield, J.P.) from being present, but the Vice-Chairman (Mr. W. Hulse, J.P.) was of the party throughout the day, as were also, we believe, the whole of the other members of the Committee. The names of the members of the Committee other than those just mentioned are: Aldermen A. B. Jones, J.P., and T. Potter, and Councillors A. Brookhouse, J.P., E. J. Brewer, J. W. Beswick, T. Copestake, T. W. Davis, W. C. French, W. Machin, J.P., A. H. Proctor, R. S. Robinson, J.P., W. Reid, and W. J. Taylor. Among the guests were Mr. J. W. Morrison, President of the Manchester Institution, Mr. W. Prince, Past-President, and Mr. John Young, President-Elect of the Eastern Counties Association. The greater number of the members, accompanied by the Hon. Secretary (Mr. Harold E. Copp), left Birmingham soon after nine o'clock; and by noon were assembled at the Town Hall receiving the hearty welcome of the Mayor. Few were his words, but there was a hearty ring about them. The mouthpiece of the members in acknowledging the welcome was Mr. Samuel Glover, of St. Helens. Then his Worship invited the members to take light refreshments with him in the reception room, before entering upon an inspection of the gas and electricity works.

THE HOST OF THE DAY.

There was one remark made by Mr. Glover in the acknowledgment referred to above that happily and aptly links together the Mayor and the industry of the district. "Where there are chimneys, there are men; and where there are men, there is, as a rule, a mayor." It will be interesting to the fifty or sixty members of the Association, the recipients of so much kindness at the hands of his Worship (who took such an imposing part in the day's outing, despite the fact that he has by some years passed the three score and ten years' span), if we put on record here some particulars of the main features of his long public and surely, in respect of the years of mayoralty, unique career. To do so, however, we must transfer to this part of the day's record from the speech made by Mr. Charles Meiklejohn, in proposing his Worship's health at the dinner in the evening, some of the interesting details of which he made use.

Alderman Edwards is now in his forty-first year of unbroken service as a member of the Longton Town Council, of which body he has been an Alderman since 1875. For 25 years he has occupied the position of Chairman of the Sanitary and of the Rate Appeal Committees, besides which, during his membership of the Council, he has taken an active share in the work of the other chief Committees. Alderman Edwards was first elected to the office of Mayor of his native town in 1874, since when the Council have honoured him by electing him to the office on no fewer than six occasions—the present being his seventh year as Longton's Chief Magistrate. He has always taken his mayoral duties seriously; and, recognizing the obligations of the office, he has devoted himself unstintingly to its duties, and most worthily upheld its traditions. Both his personal service and his private purse have ever been at the call of any movement whether philanthropic, educational, or social, that was for the good of the town or its inhabitants. For instance, in his mayoralty of 1896-7, when he followed the Duke of Sutherland in the chair, it was owing almost entirely to his own individual effort that the building of the handsome and spacious Technical School and Public Library was able to be begun, towards which he not only himself gave a very generous donation but also secured no less a sum than £7000 towards the building fund. The foundation stone was laid on Jan. 7, 1897, by the King (then Prince of Wales) with full Masonic honours, on which occasion Mr. Edwards presented His Royal Highness with a handsome mallet and trowel as a memento of the event. Later in the same year, he entertained the whole of the school children and teachers in the borough to tea in the Queen's Park, in commemoration of the Diamond Jubilee of the late Queen. Another memorable year of office was that of 1899, when the Sutherland Institute was formally opened by the Duke of Sutherland, accompanied by the then American Ambassador

(Mr. Choate), and a large house party, whom his Worship afterwards entertained at a banquet in the Town Hall. Each year of office has been marked by some special act of hospitality or generosity; and the present one will be no exception to the rule, for Mr. Edwards is completing the façade of the Sutherland Institute by the gift of a large entablature in terra cotta, designed to illustrate the staple industries of the town. He has for many years taken a large share in the judicial and magisterial work of the borough and county. It is now thirty-four years since he was placed on the Commission of the Peace for the borough, and some fifteen or sixteen since his name was added to the County Commission. In 1907, Mr. Edwards was elected as a member of the Staffordshire County Council as a representative of one of the Longton electoral divisions; and he is now an active member of several County Committees. In addition to the above, he has been Chairman of the Potteries Stipendiary Commission for the last seven years; and for some time past has acted as an income-tax commissioner for North Staffordshire.

INSPECTION OF THE GAS-WORKS.

The gas and electricity works of the borough, both of which stand on one site, and are under one Committee and one Engineer (Mr. Langford), are but a few minutes' walk from the Town Hall. They are of interest, apart from what is seen there, from the fact that Longton is one of the six towns to be federated in March next; and the existing municipal undertakings will then come under the new authority. But the Longton works, of course, only were under the inspection of the visitors on Thursday, and not the others. To anyone who visited the works a number of years ago, and entered them again after a long absence on Thursday, the change for the better that has been effected on all hands is very marked. Mr. Langford has been in office some ten years; and his conscientious regard for duty is shown in the works and in the financial and working statements. As a prelude to the description of the works, it may be mentioned that the undertaking was purchased from a private Company in 1878, at which time the make of gas was 65 million cubic feet, and it is now 155 millions; the population supplied being about 34,000. In the last published accounts, for the year ending March 31, 1908, it is seen that the total quantity of gas made was 154,450,000 cubic feet, of which 9,402,000 cubic feet were water gas. The quantity of gas sold to private consumers was 125,619,000 cubic feet; sold for public lighting, 20,070,000 cubic feet; used on works, 1,737,000 cubic feet, and unaccounted for, 7,024,000 cubic feet—the last figure equaling 4·5 per cent. of the gas made. The quantity of coal carbonized was 11,765 tons; the gas made per ton, 12,328 cubic feet; sold per ton, 11,630 cubic feet; coke made, 7647 tons; coke made per ton of coal used, 13 cwt.; coke sold, 6441 tons; used for retort fuel, 916 tons; per cent. of make used for retort fuel, 12·1; used for water-gas manufacture, 196·5 tons; used on works, 93 tons; oil used for water gas, 20,454 gallons; oil used for water gas per 1000 cubic feet, 2·17 gallons; average price of coke sold, less labour and carriage, 11s. 4·7d.; sulphate made, 138·1 tons; sulphate made per ton of coal, 26·29 lbs.; and tar made, 746·5 tons. These working results will have a peculiar interest for many gas engineers.

Some of the visitors inspected the offices, laboratory, &c. Then all walked to the retort-house, taking the other features of the plant *en route*, ending up at the electricity plant. We will briefly describe what was seen, with remarks on notable points.

Lingering for a few minutes in the laboratory, it was seen that it is of ample dimensions, and well fitted with instruments and apparatus for conducting the great variety of chemical tests necessary for securing the best returns from the materials used. Outside the offices, Mr. Langford (who by-the-by was admirably aided by his assistants—Messrs. Tom J. Noden, F. Leak, C. Cuthbertson, and C. Leese, Foreman—in explaining the features of the works) pointed out that they have been so planned that extensions can be made in parallel lines with existing plant northwards, so that the general appearance of holders, purifiers, and retort-houses in straight lines is very pleasing to the eye, and, while the land is fairly well covered, there is no feeling of being cramped for want of room. Most of the buildings are in plain brickwork of local make, and suitable for an atmosphere somewhat charged with smoke.

AN ARTISTICALLY DESIGNED BUILDING.

An exception as to plainness of style is found in the new engine and exhaust room, which was erected last year. It is of Mr. Langford's own design, and classical in its conception. We congratulate him upon it. The front facings are composed of Ruabon terra-cotta; and it is an interesting example of a room splendidly lighted, although there are windows only on the one side. The body of the room is lined with white glazed tiles, which reflect light on each side, while the dado, 5 feet high, is composed of beautiful green tiles. The frieze is of ivory tiles, relieved with green. The ceiling is of panelled pitch pine and varnished, fitted with three ventilators, in which expanded metal is used, and from the centre there is suspended a cluster Graetzin lamp. The floor is also neatly tiled in red, black, and buff. Excepting the tiling, all the work was carried out by the department's own men. One interesting feature in the room is an old engine that

was scrapped some years ago. This has been cleaned, fitted together, put into working order, and on the end an air-compressor has been placed, and the compressed air is found very useful for painting holders, raising liquids, &c. Compressed air is always a valuable agent on a gas-works. The engines and exhausters (Gwynne's and Beale's and Waller's, and in duplicate) are kept in perfect condition; the cylinders being cased in blue steel lagging.

Provision has been made for future extension when necessary. New workshops, show-rooms, and stores have recently been erected—comprising on the ground-floor a well-equipped smithy (fitted with an electric motor for blast purposes), stove and fitting shop, general stores, carpenter's shop, and storekeeper's office. Upstairs are fittings and stores, show-room, meter testing room, and meter stores. Each room is admirably lighted and well ventilated.

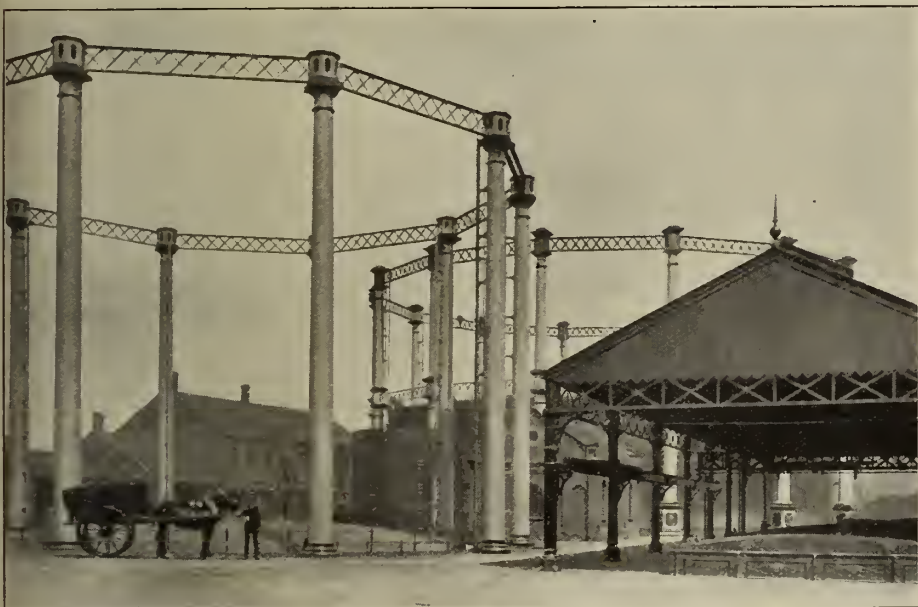
PURIFIERS AND PURIFICATION.

We are following the plant in irregular order, as it happened to come under observation. The purifiers, it was observed, number six, 24 ft. by 22 ft. by 5 ft., covered with a substantial shed, which has been extended during the last two years, to enable oxide to be revived in wet seasons, with which the Potteries have a good acquaintance. Purification costs have been

gas through the condensers, &c.—thus ensuring perfect mixing, and no possible chance of the gases stratifying. Mr. Langford believes that this practice accounts for his low oil account, and that the water gas by its admission to the hydraulic main picks



Longton Corporation Gas-Works—A General View of the Plant.



In this Second View of the Plant, the Works' Offices are seen in the Rear.

up some portion of the hydrocarbons of the coal gas that might otherwise be lost to the gas.

The retort-house, which is very light and airy, is on the stage-floor plan, with horizontal retorts and regenerative settings. Formerly there were nine retorts per bed; but the ninth has for some years been discontinued. They were also formerly stopped in the middle. The divisions have been removed; thus making through beds, and preventing much loss through undue scurfing and other defects. The retorts are now set in eights, two outside tiers of three, and a central one of two. The house can easily be extended when needed. The old retort-house has been constructed into a coal-store, containing at present 1000 tons of coal, while a third portion is partitioned off for the carburetted water-gas plant.

Carbonizing results and other particulars were given in the President's address as recorded in the "JOURNAL" for March 9 last. But we may say here that it was noticed that the heats were high, that comparatively light charges are used (hardly $3\frac{1}{2}$ cwt. per mouthpiece), and that the charges are five-hour ones. The make

much reduced by splitting up the gas in each purifier—one half of the gas going through the top layer of oxide, and the other half down through the lower layer. By this method, the oxide is more equally charged with sulphur, and the purifiers are not changed so often—one purifier, on an average, passing over 100 million cubic feet before being changed.

CARBURETTED WATER GAS AND RETORT-HOUSE OPERATIONS.

A description of the Humphreys and Glasgow carburetted water-gas plant on the works was given in the paper read by Mr. Langford before the Gas Institute in June, 1901. It comprises two sets, each of 300,000 cubic feet capacity per diem. Since the reading of the paper, a steel platform, raised and lowered by hydraulic power, has been erected, communicating directly with the retort-house floor, so that hot coke can now be run direct into the generators; thus getting an extra 10 per cent. duty and a saving in labour costs. Ordinarily, about 10 per cent. of water gas to the total production is made; but Mr. Langford changes the proportion to suit the market conditions. The carburetted water gas is now taken by a 6-inch main into the retort-house, and by 4-inch pipes along either side of the settings, from which 4-inch pipes, through $1\frac{1}{2}$ -inch tubes (each fitted with a cock for facility in regulation), the water gas is admitted into the hydraulic main, and travels thence with the coal



The Background to this View shows the Electricity Generating Station and Boiler-House and Shaft.

[The extension of the Plant this year will bring the frontage of the Generating-Room in line with that of the Boiler-House.]

of gas per mouthpiece is about 9300 cubic feet—at all events that was the figure for one day last week; and the make per ton averages 12,300 cubic feet. The figures quoted earlier in this account shows the quantity of gas per ton that the department is

actually paid for. West's manual chargers and rakes still do excellent duty. It was remarked that two 8-inch Parkinson and Cowan governors are used, one at either end of the retort-bench; and the gauges on the walls show the level pressure conditions that are maintained through their use. Away at the exhauster-house, the steam is governed, but there is no intermediate governing. Besides the governors assisting in realizing a good production of gas, Mr. Langford mentioned that stopped pipes have little or no part now in the experiences at Longton. Dillamore tar-towers are used. The house is light and airy (the Engineer believes in cleanliness); and at night time are lighted by Graetzin cluster inverted lamps, which, so far as illuminating conditions are concerned, turns night into day. These lamps, notwithstanding the unpropitious conditions of a retort-house, only require cleaning about once a fortnight.

It should be mentioned here that nearly all North Staffordshire coal is used at Longton. It is brought direct into the works from the railway on sidings flanking either side of the retort-house. Through bottom doors in the waggons (which are the Committee's own property), the coal is dropped into covered coal-breakers, and elevated to the coal-hoppers in the retort-house. When the hoppers are full, a side shoot sends the coal into the coal-store. There was some question as to whether the lifting of the coal for store was economical; but the answer is that hand labour for putting into store would be more expensive.

In the basement of the retort-house, an old pump was noticed which is used for pumping water from the brook running by the works. For works purposes, by this means, water costs practically nothing. The two Lancashire boilers, 27 ft. by 7 ft., supply steam for all works' purposes, and are fitted with Wilton's patent furnaces.

BREEZE AND COKE.

The visitors noticed the entire absence of breeze on the works; and the reason adduced in reply to inquiry is that none is made, through every care being taken not to handle the coke. For this purpose, a coke bank, made up with rubbish and brick-paved on top, has been built at the end of the retort-house on a level with the charging-floor, which is 9 ft. 6 in. above the railway metals, and on a level with the top sides of railway coke-trucks. The bank is the same width as the end of the retort-house (74 feet). The coke is drawn from the retorts into iron barrows, varying in height suitable for the bottom or upper mouthpieces. It is then run outside to the coke-bank, cooled there, and, by pulling a lever, the bottom of the iron barrow opens, and deposits the coke on the bank. The coke is then pushed over into the railway waggons or carts as required, and is practically free from breeze, unless at the times when coke is thrown from the top of the bank for storage purposes. While speaking of the despatch of residuals, it may be said that, in sending away surplus tar, the tar-pumps deliver it direct into 14-ton railway tanks.

For some years efforts have been constantly made by Mr. Langford to obtain a local demand for coke. Formerly the greater bulk had to be sent into other districts; thereby giving annoyance to other undertakings and at the same time injuring their coke markets. The tables are now turned; and at least 90 per cent. of the coke sold is used locally. It is found that a mixture of coal and coke for the firing of potters' ovens, especially in the early stages, is a great benefit, although more is paid for coke than for coal. Speaking of potters' ovens, the President has still standing the one upon which he made the experiments detailed in his Presidential Address. He has not yet been able to pursue the trials.

SULPHATE OF AMMONIA WORKS.

These are of the ordinary type. The method of dealing with fumes is simple, inexpensive, and satisfactory to the Government Inspector. The fumes after passing through condensers are conveyed into oxide of iron without being confined in purifiers. Then when the heap is too large to work properly, the fumes are diverted by the use of a hydraulic seal valve into another spare heap of oxide, and the foul heap is then spread out for revivification. This system has been in operation for nine years, with very satisfactory results.

MISCELLANEOUS ITEMS.

Before leaving the gas-works, there are two or three miscellaneous items deserving record. Since Mr. Langford has been in charge of the works—ten years—the number of consumers has been increased from 3500 to about 6700. The price of gas has been reduced from 3s. 4d. per 1000 cubic feet to 2s. 6d.; and the contribution in aid of the rates is now £3000, against £500. No additions have been made to capital account. The carburetted water-gas plant, railway waggons, and general additions have been paid for entirely out of revenue.

THE ELECTRICITY WORKS.

Introductory to a brief reference to the electricity plant, it may be said that the Corporation in 1897 received notices from two private Companies of their intention to apply for Provisional Orders, to authorize them to supply electricity within the borough. The result was that a Provisional Order was applied for, empowering the Council to provide their own works and plant. The Gas Committee were appointed to act for both undertakings; it being thought desirable that the administration of the two works should be by the same Committee, and under the one management. Mr. Langford thereupon reported on the site, and finally prepared the plans of the buildings and machinery. The then existing work-

shops offered the only available site allowing of future extensions; and this was utilized. The works were opened in October, 1901, and have since been under the same Committee, management, and staff.

The growth of the output of electricity has been gradual; but, during the past year, the increase has been such as to necessitate an extension of plant. An extra 300 kilowatt generating set is in consequence to be installed, and the generating room enlarged. The interior walls of the generating room are a beautiful example of local tiling work, with arches of exquisite faience tiling.

The existing plant consists of two 150 kilowatt sets, driven by high-speed compound engines; steam being supplied by Babcock and Wilcox tube-boilers, fitted with chain-grate stokers. The chimney stack is a feature. It is 156 feet high, with 6 feet clear shaft right through. It stands on a 25½ square feet base, of 13 feet solid concrete resting on railway metals, laid grid fashion, so that it cannot shift. The battery is by the Chloride Electrical Storage Company; and the mains are laid solid on the Callender principle. Current is supplied for lighting on the maximum-demand principle of 8d. and 2d.; or customers may choose a flat-rate of 6d., less 5 per cent. Current for motive power is supplied at from 2½d. to 1½d. per unit, according to quantity. The works for the year ending March 31, 1908, earned a profit sufficient to pay interest and sinking fund charges, and leave a net profit of £20.

Incidentally, Mr. Langford remarked that one of the advantages of running electric works under one Committee, one staff, and one management is that there is no occasion to conduct competitive canvassing. There are the supplies. Consumers can have which they require. For instance, customers are not canvassed who already use gas-engines, and urged to use electric motors. The change would entail the cost of a new service and main, and but little profit, if any, in the end; while there is a profit in the gas supplied for power. The finances of the town are benefited in this way. From the engineer's point of view, however, the electricity works give much more trouble and cause more anxiety than the gas-works.

NEW COKE-OVEN PLANT AT THE APEDALE COLLIERIES.

The members, having taken the cream off the interesting features of the gas and electricity works, bent their steps to the railway station, whence a special train was to take them to the Apedale works of the Midland Coal, Coke, and Iron Company, Limited. They were not long covering the distance between the town and the property of the Company, who had, by request, provided them with what was to many a novel item in the programme. To say that coke-oven practice does not interest the gas engineer is to say something that is not true; the eager manner in which inspection was made of the complete plant for dealing with coke, gas, and residuals, and the manner in which inquiries were pressed during the inspection were the manifestations of an intense interest and pleasure.

On the Midland Coal and Iron Company's own railway sidings, hard by the new coke-oven plant, the special train pulled up; and there to meet the visitors were the genial General Manager (Mr. William Hill), Mr. W. Barber, Chief Colliery Manager, Mr. J. Cook, Chief Engineer, Mr. W. Surtees, Manager of the Works, Mr. Withers, Mr. Slaney, Mr. Lowndes, and other members of the staff.

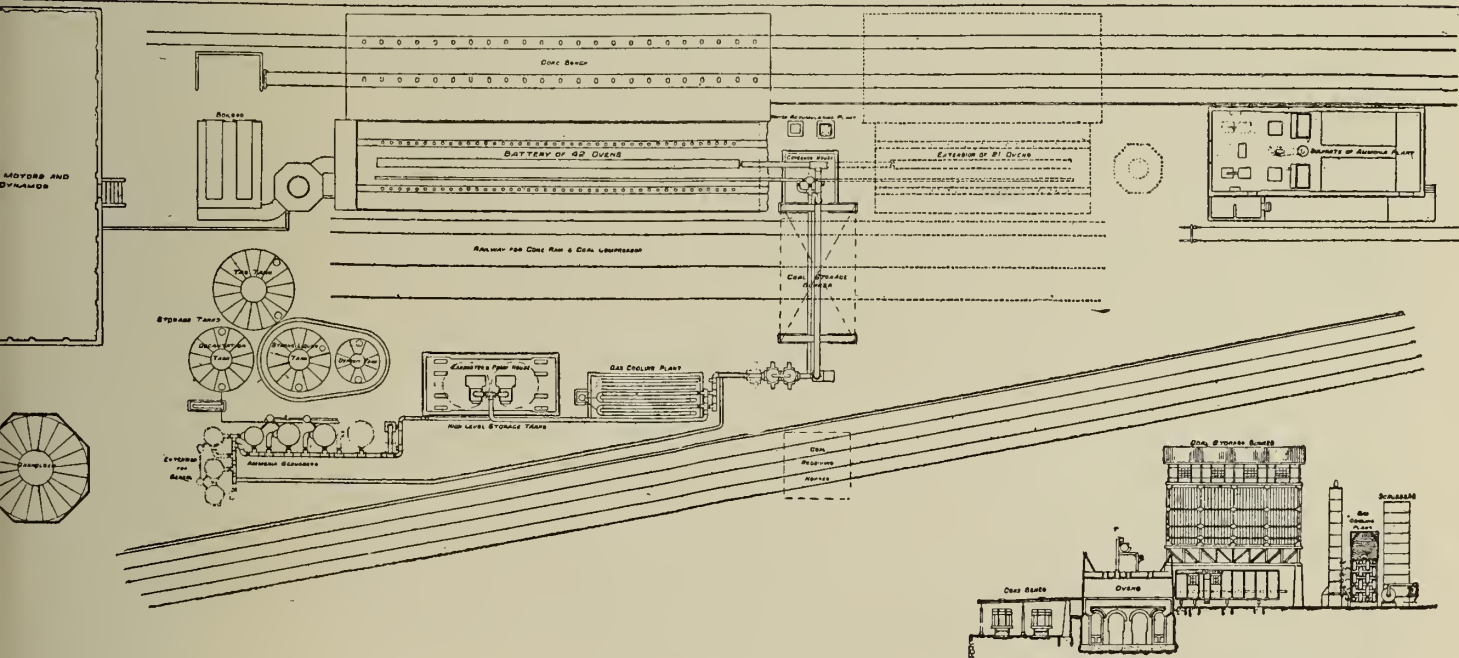
The members learnt a great deal about coke-oven working through the aid of these gentlemen before they left the place. Formerly coking was done in "Beehive" ovens situated in close proximity to the blast-furnaces, and distant about half-a-mile from the Apedale group of collieries, where the central washery is installed. The whole of these have, however, been put out of service since the new coke-oven plant was started. This new plant (which, together with the auxiliary machinery, was supplied and erected in its entirety by Messrs. Simon-Carvès, of Manchester) at present consists of 42 coke-ovens of a total capacity of 1000 tons of coke per week, together with bye-product plant for the recovery of tar and ammonia, and the transformation of the latter into sulphate. At present, the benzol is not recovered; but space is provided for the necessary plant when the price of the product is such as to warrant the initial expenditure. Provision is made for considerable extensions without in any way interfering with the general lay-out of the plant, or necessitating additions to auxiliary machines, which are all installed in duplicate, providing at the present time a stand-by in each case. The whole installation, down to the smallest detail, constitutes an excellent example of a modern coking plant, and, so far as it has been carried, a bye-product plant also.

The general arrangement is very compact. Coal is brought by hopper-bottomed trucks from the washery, and discharged through a grating into a hopper at the ovens, from which hoppers it is raised by a bucket elevator to the storage bunker. The elevator (electrically driven by a 35-horse power Westinghouse motor) is fitted with sliding doors to permit the coal being discharged into any portion of the bunker, which has a storage capacity of from 500 to 600 tons. The bunker is carried on a strong bridge structure built over the ram and compressor rails, with a clear span of 52 feet. This will enable the ram and compressor to pass underneath to the extensions to be added later on. From the storage bunker, the coal is fed through slides to the charging-machine. The stamp for compressing into the charging-box the slack to be pushed into the ovens is electrically driven by a 10-horse power Westinghouse motor. The railway for the stamp



General View of the Coke-Oven Plant at the Apedale Collieries of the Midland Coal, Coke, and Iron Company, Ltd.

GENERAL PLAN.



ELEVATION..

is a departure from the usual practice—being carried on the bunker instead of on the charging-machine. Current for operating the stamp is taken from three overhead naked wires.

The charging-box and ram are fixed upon one frame running upon four lines of rails, the ram being fitted with a tilting tail-end to enable it to clear the bridge carrying the coal-bunker. The charging-box, which has a capacity of 10 tons, travels in front of the oven to be charged, and the front of the box is removed. One of the sides is then eased back by means of a hand-wheel working on a worm-and-pinion. The compressed charge then rests upon the “peel,” by means of which it is fed into the oven. The back of the peel is drawn back, the oven-door closed and wedged, the peel is drawn out, and the charging operation is then complete. All the motions of the peel, ram, and travel of the machine are operated by a Westinghouse 40-horse power motor, by means of disengaging clutches, which are conveniently placed in the motor-house above the ram. In the event of the mechanical charger being, from any untoward circumstance, put temporarily out of action, provision is made for charging the ovens from the top by means of hoppers, and levelling by hand.

The ovens are of the Simon-Carvès 1906 type, with regenerators, and specially designed to produce the maximum amount of surplus gas possible. The surplus is shown by actual measure-

ment to amount to 75,000 cubic feet per hour, corresponding to 60 per cent. of the total make; the other 40 per cent. being used for heating the ovens. The whole of the oven doors are operated from one end of the battery by means of a hand-winch, working a travelling chain and lifting carriage.

The coke-bench, consisting of a steel girdered frame, covered with concrete and cast-iron plates, is carried on a series of cast-iron columns above the loading-lines. The bench is provided with specially-designed charging-holes, with covers to prevent the quenching water percolating through. Gripping is done on the bench. Very little is, however, required; the Company's coking coal being of a high quality, with the result that the smalls are of a negligible quantity. This special arrangement of benches, it is claimed, reduces the labour costs of loading below those of any other existing type. The quenching water is delivered at the constant pressure of 100 lbs. This is secured by means of an accumulator with a 10-inch ram, which is served by two steam-driven pumps, one being a stand-by. When the desired pressure is attained, and no more water is required, the rising ram lifts a weight, and automatically stops the pump, which is again started when the falling ram releases the weight. The water is taken from a well which is fed by gravitation from the reservoir. Surplus water from the coke-bench drains off on to the settling

beds, and thence through a series of channels flows back to the reservoirs, which are of an extensive character.

The gas is drawn away from each oven by a separate ascension-pipe through isolation valves into the collecting main, which runs the full length of the battery. The gases are then passed through three annular air-coolers arranged in series; the gases passing up No. 1, down No. 2, and up and down No. 3, which is divided in the centre, and thence through a serpentine cooler. The latter consists of a series of horizontal pipes, over which a continual stream of water is passing, which water, draining into a well, is pumped to a cooling-tower above the serpentine, to be cooled before re-using. From here the gases pass through the tar-extractor—which is on the Pelouze principle, except that it has a horizontal rotating basket—and on through three ammonia scrubbers.

A small portion of gas is tapped off from the feed main to the ovens, and passed through a purifier for use in the laboratory. The gas which is returned to the ovens is heated by being passed through two of the annular coolers, and then through a governor to ensure it being kept at a constant pressure at the ovens. The warm gas passes along a common main above the ovens, over each of which is a separate valve to regulate the supply of gas to either end of the oven wall; the gas being accurately measured to each of the vertical flues by means of regulating-cocks on the front of the ovens. The air supply is also regulated from the front of the ovens. Reversal of the gas and air supply is effected by winches installed at the end of the battery.

With the exception of the pumps for supplying the accumulator at the coke-bench, the whole of the necessary auxiliary plant, including the exhausters, is installed in one building, which is two storeys high; the upper being used for laboratory and office, and the roof supporting the high-level storage tanks for water and liquor. Steam is raised in two gas-fired Lancashire boilers, each 30 ft. by 8 ft., with a working pressure of 100 lbs. The stack, which serves both the ovens and boilers, is 170 feet high.

Adjacent to the scrubbers is a large storage tank for the strong ammonia, and also a low-level tank, for collecting the tar and ammonia from the various parts of the plant, from which it is pumped to a decanting tank, where the water is drawn off to be used at the scrubbers, and the tar passed to the storage tank at the siding. The strong ammonia is pumped to the high-level tank feeding the sulphate plant. With the exception of the ammonia still (which is of special design) this is of the usual type, including solid-plate lead saturators, centrifugal dryer, &c.

As already stated the surplus gas amounts to 75,000 cubic feet per hour. At present this is being used to raise steam at the colliery boilers. It is the intention of the Company, however, to instal gas-engines as the prime-movers. The power-house has been designed with this view, and will be extended to accommodate gas-engines of 1500 kilowatt capacity, which will generate power for all purposes excepting winding at the Company's three groups of collieries—Apedale, Podmore Hall, and Chesterton. The first section consists of two two-crank non-compound vertical steam-engines of 130 kilowatt each, built by Bellis and Morcom, driving by direct coupling two three-phase alternating current sets of 130 kilowatts, at 375 revolutions a minute, 550 volts, 25 periods, supplied by the General Electric Company. The excitation and lighting current is generated by a 35 kilowatt motor generator, supplied by the General Electric Company, and one 20 kilowatt steam set direct coupled to a Browett engine, and supplied by the Phoenix Dynamo Company, Limited.

The members did not miss any one section of the plant, nor did they lose a single feature of the demonstration of the entire operations that was made for their edification. They scrambled up on to the platform at the side of the charging-box to watch the stamp busy at its compressing work, which it was doing from one end of the box to the other, with its pair of rams, with a mechanical seriousness and regularity that was almost ludicrous. It would not be far from the truth to say that the slack used for the coke-ovens was at one time a drug on the market; now a splendid coke is derived from it, as well as gas and other valuable products. After watching the preparation of a charge, the members mounted the coke-bench to see a wall of incandescent coke being pushed from one of the ovens, played upon by hose, and finally quenched and broken down into large pieces. Then back again to the charging machine they went; and, into the oven that had just lost its charge, they saw the wall of freshly compressed slack travelling in to fill the void. One thing that struck the visitors was that there was such a small number of men about though the operations are so large; and, on inquiry, they found, as a natural consequence, that labour costs are small. Other parts of the plant were inspected; and then the time had arrived for the return journey to be made to Longton.

DINNER BY INVITATION OF THE MAYOR.

Shortly after Longton was reached, the visitors, the Gas and Electricity Committee, the gentlemen who had received the visitors at the Apedale Colliery, and others were the guests of the Mayor at the Town Hall. The dinner was excellently served, and was on a generous scale. His Worship was in the chair; and on his right hand side were the President and Mr. Charles Meiklejohn (whose services as late Hon. Secretary of the Midland Association were to receive tangible recognition on this occasion), and on his left the Rev. H. Rowe, Mayor's Chaplain. There must have been some 90 guests in the company.

After dinner, the Mayor again expressed his delight at having around him so many gentlemen interested professionally in industry; and then he submitted the loyal toast. Time pressed on account of the train service from Longton; and his Worship kept the toast-list going in a remarkably business-like style, but through it all enjoying thoroughly the evident pleasure of those about him. Mr. B. W. Smith, of Walsall, in suitable terms, proposed "The Town and Trade of Longton;" and response was made by Mr. J. W. Beswick. Then the Chairman proposed "The Midland Association of Gas Managers;" and above all other remarks this one met with the warmest approval of those present: "Your President has been a credit to our Council and to the Gas Committee." There was hearty cheering on the President rising to respond; and his first words were those of thanks for his flattering reception. Then followed expressions of thanks to the Mayor for his generosity, and to the Gas and Electricity Committee. No Gas Engineer or Manager (observed the President) had a better Committee than he had. Whatever he brought before them, they thoroughly thought over and sifted before adopting it; but he had nothing of which to complain. From, he added, the technical point of view, perhaps the greatest event of the day had been the visit to the Apedale Collieries, to see the new coke-ovens. They, as gas engineers, had seen something there to set them thinking, and probably they had found something there upon which they might improve. "Kindred Associations" was the next toast; and this was in the capable hands of Mr. Samuel Glover, in the unavoidable absence of Mr. Fletcher Stevenson. In the course of the speeches, much had been said about the smoke of Longton; and Mr. Glover expressed the hope that those present might live to see a scheme of heating potters' kilns by gaseous or other solid fuel, by which the work would be done better, and without polluting the atmosphere. He knew that the kilns of one of the highest class potters were to-day being heated with smokeless fuel, and was doing the work more reliably and cheaply than before. The President of the Manchester Institution (Mr. J. W. Morrison) and the President-Elect of the Eastern Counties Association (Mr. John Young) responded.

PRESENTATION TO MR. CHARLES MEIKLEJOHN.

An interesting incident, crowning seventeen years' service to this Association in the position of Hon. Secretary, occurred at this part of the proceedings.

The PRESIDENT said: Mr. Mayor and gentlemen, As representing the members of the Midland Association of Gas Managers, I have now to perform what to me is a most pleasant duty, and I feel it also to be an honour. I have on my right-hand side a gentleman who has served the Association for seventeen long years as Hon. Secretary, and who has done the work in a manner that has gained for him the esteem, and affection I may say, of every member of the Association. When my friend took the office, the members of the Association numbered something like 60; to-day, I believe we number something like 110 or 112. Mr. Meiklejohn has given a great deal of time to this work. He has sacrificed himself, and his time and money, for the interests of the Association. Let me add that, in doing this, he has been performing a service for the whole gas industry of the Midlands—whether private company or municipal undertakings. Mr. Meiklejohn has kept his character unblemished; he has also retained throughout his long tenure of office the respect and esteem of every individual member. Gentlemen, that is a great thing to say. For a man to occupy an office for over seventeen years, and to be universally held in the highest esteem and respect is a credit to him, and is certainly a great satisfaction in this instance particularly to the members of the Association. One of the pleasantest items of the programme to-day is this, that you members of the Association are giving some tangible form to your regard for Mr. Meiklejohn, for the services he has rendered. Mr. Meiklejohn, believe me, it is with the greatest pleasure that we hand to you to-day a small token of the regard and esteem in which you are held at the close of the long and faithful service rendered to the Association, and also of the interest you have taken not only in the Association as a whole, but in every individual member. I am pleased this presentation has fallen in my year of office. The most pleasant event in my presidency will be the handing to you of this token of our regard for your faithful services.

The gift took the form of a handsome silver tray, on which was inscribed—

PRESENTED TO
Mr. Charles Meiklejohn
 BY THE MEMBERS OF THE
 MIDLAND ASSOCIATION OF GAS MANAGERS
 IN RECOGNITION OF HIS VALUABLE SERVICES
 AS HONORARY SECRETARY.
 May 20th, 1909.

The tray weighs 175 oz.; and in design it is in keeping with that of the tea and coffee service presented to Mr. Meiklejohn at the time of his marriage.

Mr. MEIKLEJOHN, in reply said: Mr. Mayor, Mr. President, and gentlemen, I scarcely know how to express my feelings on this momentous occasion. This is not the first time I have been indebted to the kindly feeling and goodwill of the members of the Midland Association of Gas Managers. I recollect the fact that

a few years ago, when I was about to get married, you united in giving me a present, and in wishing me happiness in embarking on that new departure in life. You have again, after seventeen years' service, marked, in the kindest possible manner, your sympathy and regard. You will understand, Mr. Mayor, that I have taken a wise step in retiring from office, lest the members might be tempted to find some other ground for making a united testimonial. It has been to me a work of love and extreme pleasure to assist in the objects of the Association during those seventeen years; and I would here like to acknowledge not only the kindness I have received from the members of the Association, and the yeomen service the members have done in advancing the interests of the Association, but the generous and broad-minded way in which the Directors of my Company have supported me in my work for the Association. It has not been a great demand on my time; but whenever it has happened that the meetings of my Directors have clashed with those of the Association, there has never been any question by my Directors as to altering their meetings to enable me to attend those of the Association. (Cheers.) Not only during the year that I was President of the Association, but at all times, my Directors have taken the deepest interest in the welfare of our organization; and, on one occasion, they invited you to Rugby when no one was in office in connection with our Company. Therefore I feel the greatest gratitude to my Directors for their interest. I hope what my Directors have done, and what the Longton Gas and Electricity Committee have done, will encourage other Boards and Gas Committees to do likewise. I express my deep thankfulness to you for your great kindness. I shall cherish this memento, not so much for its intrinsic value, as for what it represents in your thoughts, and the kindly feeling, sympathy, and goodwill towards me of which it is the evidence.

There were two other toasts—"The Longton Gas and Electricity Committee," proposed by Mr. J. Ferguson Bell, of Derby, and responded to by Mr. W. Hulse, the Vice-Chairman of the Committee, in the absence through ill-health of the Chairman (Mr. Alderman E. Brookfield); and "The Chairman," proposed by Mr. Charles Meiklejohn, and responded to by his Worship. The principal points of Mr. Meiklejohn's speech in this connection are given earlier, in this report of the day's proceedings, in sketching the career of the host of the day.

This ended one of the happiest "outings" of the Association.

Meeting of the Institution of Gas Engineers.

In the "JOURNAL" for the 16th of March, we gave a few particulars in regard to the annual meeting of the Institution of Gas Engineers, which will be held at the Institution of Mechanical Engineers, Storey's Gate, from the 15th to the 17th prox., under the presidency of Mr. Thomas Glover, the Engineer and Manager of the Norwich station of the British Gaslight Company, Limited. We learn from the Secretary (Mr. Walter T. Dunn) that the following communications will be submitted:—

- "Carbonizing," by Mr. J. Ferguson Bell, of Derby.
- "The Efficiency of a Gas in Relation to Incandescent Lighting," by Mr. Arthur M. Forsbaw, M.Sc., of Birmingham.
- "A Study in Working Costs," by Mr. Herbert Lees, of Hexham.
- "Carbonization in Chamber Settings," by Dr. Rudolf Lessing.
- "Report of the Gas-Heating Research Committee, and Explanatory Note," by the Chemist to the Committee, Mr. E. W. Smith, M.Sc., of Leeds.
- "The Relative Capital Accounts of Gas Undertakings Owned by Companies and by Local Authorities," by Mr. Arthur Valon.
- "Some Advantages and Disadvantages of a Hot-Coke Conveyor," by Mr. Robert Watson, of Doncaster.

On the evening of the opening day, the President and Mrs. Glover will give a reception at the galleries of the Royal Institute of Painters in Water Colours, Piccadilly; and on Friday, the 18th, there will be an excursion to Norwich, where the party will be invited to luncheon by the Directors of the British Gaslight Company—the arrangements for the afternoon being undertaken by members and officers of the Norwich Corporation.

Comparisons of Gas and Electric Light.—At the first annual meeting of the Indiana Gas Association, Mr. J. Earl King, the Superintendent of the retail department at the Chicago office of the Welsbach Company, read a paper on "High Candle Power Illuminants," in which he gave the following comparative figures in regard to the cost per hour of gas and electricity: Four-light gas-cluster, 299-candle power, 1'33c.; three-light gas-cluster, 240-candle power, 1c.; four-light tungsten lamp, 223-candle power, 2'4c. The prices were worked out on the basis of gas at \$1 per 1000 cubic feet and electricity at 10c. per kilowatt.

The High-Pressure Gas-Lamps near Blackfriars Bridge.—Attention having been called to the fact that the two high-pressure gas-lamps had been removed from the rest on the northern approach to Blackfriars Bridge, it may be of interest to state that the lamps in question—which are the pioneer lamps of their kind for street lighting in the City of London, having been put up in 1901—are only temporarily away, on account of the works which are being carried out in connection with the public subway at the place named. The tunnelling operations necessitated the temporary removal of the rests; but, in a short time they will be restored, and with them the two four-burner gas-lamps that have for so long efficiently lighted the approach to the bridge.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting at Bamford.

THE One Hundred and Fifty-Sixth Quarterly Meeting of the Institution was held last Saturday at Bamford, in Derbyshire. It was a glorious May day; and no one seemed to regret that for once the business on the agenda was crowded into the smallest possible space of time. The meeting place for the day was the Marquis of Granby Hotel at Bamford, about 12 miles from Sheffield and 32 miles from Manchester. The programme included an inspection of the extensive reservoirs and dams that are being constructed in the Derwent Valley for supplying water to Sheffield, Derby, Nottingham, and Leicester. About a hundred members were present.

After luncheon—the President (Mr. J. W. Morrison, of Sheffield) occupying the chair—a short business meeting was held, and then the party were conveyed by rail up the Derwent Valley, and, under the guidance of Mr. Morrison and Mr. D. L. Serpel, the Assistant-Engineer to the Derwent Valley Water Board, they viewed the works now in progress there; most of the time being spent at Howden, where the top reservoir of the scheme will be situated. The *cicerones* had no light task in answering the numerous questions put to them at various points of the journey; and on the return to the Bamford terminus of the Board's private railway, a hearty vote of thanks was accorded Mr. Serpel, who, in responding, said it had afforded him much pleasure to conduct the party over the ground and give explanations on the different points raised.

THE BUSINESS MEETING.

The business meeting was held in the hotel—Mr. MORRISON presiding.

THE HON. SECRETARY (Mr. W. Whatmough, of Heywood) read the minutes of the previous meeting; and they were approved without discussion.

MR. E. A. HARMAN (Huddersfield) then submitted a paper on "Slot-Meter Consumption"—see p. 524. At the close of its reading,

THE PRESIDENT suggested that, as the time at disposal was limited, discussion on the paper should be deferred to the next meeting.

This course having been agreed to,

THE PRESIDENT moved a vote of thanks to Mr. Harman for his communication.

MR. S. GLOVER (St. Helens), in seconding the proposition, expressed regret that the members were unable to discuss then the points raised in the paper, particularly as he understood Mr. Harman had come fully prepared for the fray. However, between now and the next meeting they would have time to consider the paper, and probably be in a better position to tackle what he (Mr. Glover) considered were the defects in Mr. Harman's system as to prepayment meters.

The motion having been carried,

MR. HARMAN briefly acknowledged the compliment.

THANKS TO THE WATER BOARD.

Before the members separated after tea,

THE PRESIDENT, referring to the visit they had paid to the works of the Derwent Valley Water Board, pointed out that they were much indebted to Alderman T. R. Gainsford, the Chairman of the Board, and to Mr. Sandeman, their Engineer. In proposing a vote of thanks to these gentlemen for permission accorded to the Institution for an inspection of the work in progress, he reminded the meeting that Mr. Robinson, who was associated with Mr. Sandeman, was well-known in the gas world by reason of his connection with Leicester.

MR. S. GLOVER, in seconding the motion, said it had been a very instructive day for the members; and he paid a high compliment to the gentlemen who had acted as guides in the inspection of the works.

The vote having been heartily accorded, the business concluded; and the remainder of the evening, till train time, was spent in the grounds of the hotel.

The following is a description by Mr. Morrison of the

DERWENT VALLEY WATER-WORKS.

As the result of a prolonged parliamentary contest in 1899, the Derwent Valley Water Board was constituted, consisting of thirteen members—Sheffield and Derby each appointing three, Leicester four, Nottingham two, and the county of Derby one—with a standing Arbitrator.

The works authorized are on a very extensive scale, and twenty years are allowed for their completion. There will be five reservoirs and a service reservoir, with about 100 miles of aqueduct and 20 acres of filter-beds. Two of the reservoirs will be above Derwent Hall, two in the Ashop Valley, and the fifth at the junction of the Ashop and Derwent, extending from Ashopton towards Bamford. This will be the lowest and largest of the reservoirs, and will be chiefly used for compensation purposes.

The total collectable yield of the watershed is about 50 million gallons per day, of which 33½ millions will be available for supply to the constituent authorities in the following proportions:—

	Gallons.
County of Derby	5,000,000
County of Nottingham, until the year 1930	1,000,000
Sheffield	6,800,000
Derby	6,800,000
Leicester	9,700,000
Nottingham	3,900,000

The existing and authorized water-works of the respective authorities provide for 36½ million gallons per day, which will be increased by 33½ million gallons from the Derwent watershed; bringing the total up to 70 million gallons per day.

The population deriving a supply of water from the Derwent and existing schemes in the year 1911 is estimated at 1,670,000; and it is further estimated that the number will be increased to 3,182,000 in the year 1958—the date at which it is assumed that a further supply will have to be obtained.



Construction of Roughing Filters, Bamford.



Pipe Laying Through Yarncliffe Wood, Section "A" Derwent Aqueduct.

The total cost of the scheme is estimated at upwards of £6,500,000; and it is to be borne by the four Corporations in the statutory proportion to which they are entitled to the water.

The expenditure on reservoirs and works to be borne jointly by the constituent authorities is estimated at £5,500,000; for utilizing the supply through a tunnel under Stanage Edge to Sheffield, £425,000; for the extension of a pipe-line to Sawley, for Leicester, £600,000; and for another to Derby from the reservoirs south of Ambergate, £120,000.

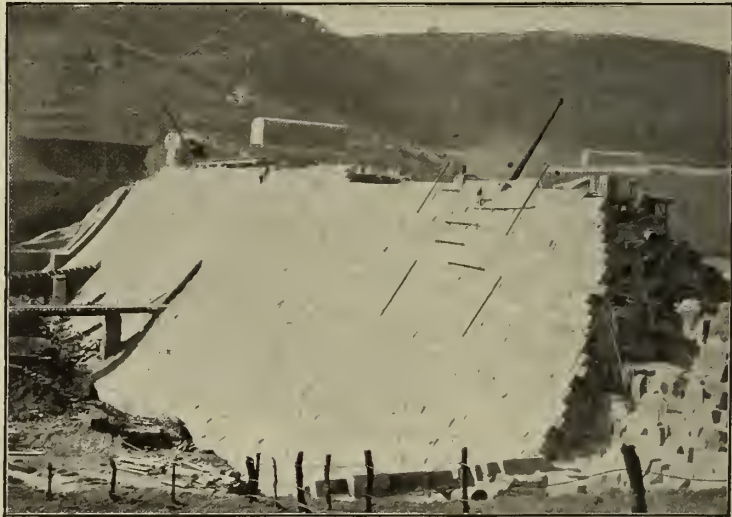
The cost of an extension of a pipe-line from the Ambergate reservoirs to Nottingham has not up to the present time been determined.

[We are indebted to Messrs. PAWSON AND BRAILSFORD, of Sheffield, for the use of the illustrations of the Derwent Valley Water Board's works.]

Each reservoir will be two miles in length; thus giving ten miles of lakes. Their capacity will be, roundly, 10,000 million gallons, and they will receive the rainfall from 31,694 acres. The following are the names, extent, and capacities of the reservoirs:—

Name.	Approximate Area. Acres.	Capacity. Gallons.	Feet Above Sea.
Howden	157 ..	1,886,000,000 ..	870
Derwent	168 ..	2,000,000,000 ..	776
Hagg Lee	178 ..	2,160,000,000 ..	806
Ashopton	141 ..	1,472,000,000 ..	675
Bamford	242 ..	2,500,000,000 ..	585

The works will be constructed in three instalments. The first, consisting of the Howden and Derwent reservoirs, will yield 13 million gallons daily for supply purposes; the second, which is the Hagg Lee reservoir, is estimated to yield 10½ million gallons per day; and the third (the Ashopton and Bamford reservoirs together) will provide a further quantity of 10 million gallons of water.



Derwent Dam.

Checking the Waste of Water.—According to "Engineering Record," a waste-water examination of more than ordinary interest has recently been conducted at East Orange (N. J.) by the Pitometer Company. Some time ago, Mr. A. A. Reimer, the Engineer of the Water Department, reported that the consumption and waste there were dangerously close to the maximum supply. By the adoption since then of the air-lift system for certain wells, the amount of the supply will be increased somewhat; but as all the water has to be pumped, it is desirable, for financial reasons, to keep the waste as low as practicable. Mr. Reimer advocated the immediate purchase of enough meters to place one on each service; and the report of the above-named Company indicates that this recommendation has an unusually strong basis in the widespread distribution of the waste. The night flow in the conduit which delivers water to the city is 64 per cent. of the daily average—a fact showing very clearly that a large

amount of water is being wasted. By subdividing the city into four districts, and gauging the supply of each independently, it was learned that the waste was practically uniform throughout them; there being only a few blocks where indications showed that excessive waste was localized. These few places can be investigated easily by night inspection with an aquaphone; but it is another matter to check waste distributed uniformly over nearly 7000 services. The measurements taken by the Company indicate that the mains are in good condition, and that the average waste of 50 gallons per head must be sought in the defective plumbing on private premises. The character of the population is mainly residential; and it is questionable whether an attempt to restrict the waste by frequent house-to-house inspection would be regarded with favour by the people. Under such conditions, the metering of all services is considered as being particularly desirable.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Barry.

THE place selected for the May Meeting of the Institution was Barry; and there the members, to the number of about thirty, assembled last Wednesday. The fine weather with which the Institution were once more favoured, a discussion on a topic which is now uppermost in the minds of gas managers generally, and last, but not least, the hospitality and hearty welcome extended to them by the Chairman of the Urban District Council and the members of the Gas and Water Committee, and the attention shown to the visitors by the Engineer and Manager, Mr. T. E. Franklin—all contributed to make the meeting a very pleasant one. The District Council were represented by the Chairman (Mr. D. Lloyd) and Mr. Griffiths; the Chairman of the Gas and Water Committee (Mr. J. T. Hogg) being unfortunately detained in London in connection with the proceedings on the Glamorgan Water Board Bill, which business was also responsible for the regretted absence of the Hon. Secretary (Mr. Octavius Thomas), whose duties were performed by Mr. E. H. Swain, of Pontypridd. Barry is a growing place, and no doubt has a great future before it; and therefore the outlook for the gas undertaking (which enjoys a steadily progressive business) is a bright one. Building operations are at present being rapidly carried on; and a more flourishing condition of affairs generally exists now than for many years past. The make of gas, which last year was 158 million cubic feet, has been increasing for quite a long time at the rate of 10 million cubic feet per annum. When the Company sold the undertaking to the Council thirteen years ago, they were only making about 30 million cubic feet of gas per annum.

The Meeting.

The Council had kindly placed the Gas and Water Offices at Barry Dock at the disposal of the Institution; and the business meeting was held here, under the chairmanship of the PRESIDENT (Mr. Thomas Acland, of Llanelly).

MINUTES OF LAST MEETING—REPORT AND ACCOUNTS.

Mr. E. H. SWAIN (of Pontypridd), who acted as Hon. Secretary, said that Mr. Octavius Thomas had written regretting his inability to be present, as he was detained in London in connection with the proceedings on the Glamorgan Water Board Bill. Mr. Swain then read the minutes of the last meeting; and they were confirmed. Subsequently he read the accounts for the past year, which were also adopted. These showed receipts amounting to £25 14s. 6d. for the year, and a balance in the Treasurer's hands (with the sum of £15 2s. 3d. brought forward) of £22 7s. 10d. The fourth annual report of the Council was to the effect that during the year three members had joined the Institution, nine had resigned, and one had died—leaving a membership of 48 at the end of the year. The Council recorded with deep regret the death of Mr. Thornton Andrews, who took a keen interest in the Institution. They recommended a donation of £5 5s. from the funds of the Institution to the Livesey Memorial Fund. The report was adopted.

ELECTION OF OFFICE-BEARERS.

The following were the officers elected for the ensuing year:—

President.—Mr. A. H. Brookman, of Tenby.

Vice-President.—Mr. J. C. Pennington, of Colwyn Bay.

Hon. Treasurer.—Mr. Henry Morley, of Cardiff.

Hon. Secretary.—Mr. Octavius Thomas, of Pentre.

Members of Council.—Mr. H. D. Madden, of Cardiff; and Mr. A. W. Branson, of Caerphilly.

Hon. Auditors.—Mr. J. M. Small, of Merthyr Vale; and Mr. F. C. White, of Treharris.

NEW MEMBERS.

The following new members were then elected: Mr. Reginald G. Clarry, of Swansea (rejoined); Mr. James Robb, of Beaufort; Mr. Sydney Murray, of Pontcymmer; Mr. C. H. Carder, of Cardiff; Mr. L. G. Langford, of Abertillery; and Mr. W. Turk, of New Tredegar.

THE LIVESLEY MEMORIAL FUND.

THE PRESIDENT said he had now to ask the members to consider the question of subscribing to the Livesey Memorial Fund. He thought he was correct in stating that all the District Institutions of Gas Engineers in the country had already subscribed; and he had no doubt their Institution would follow this example, and agree to give a sum of £5 5s.

Mr. DAVID JONES (Dowlais) said he had much pleasure in proposing this; and Mr. G. MAYNE (Penrhiwceiber) seconded.

Mr. SWAIN said a letter had been received from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, asking whether the question of subscribing to the fund would be considered at the next meeting, and giving a list of the Association subscriptions already received.

Alderman THOMAS CANNING (Newport) said he was pleased to support the mover and seconder of the resolution. He thought that the Institution could do no better than follow the example that had been set by so many other Associations all over the kingdom, and honour the memory of one whose name would remain as a very great honour to the gas profession throughout the whole of the British Islands. He was quite sure, too, that the good work done by Sir George Livesey in many respects and in varying fields would long remain, and would be productive of good effect for all who were engaged in the profession to which Sir George was decidedly an ornament and a great pillar of strength. They would be honouring the name of a great man, to whom several of those present who knew him for many years personally were really affectionately attached; and they would be doing something more besides. They would be assisting to enable the profession generally to establish a worthy and fitting memorial to Sir George by endowing a professorship for research into the more abstruse problems of their business.

The resolution was unanimously agreed to.

THE QUESTION OF AFFILIATION.

The next item on the agenda was to consider a notice of motion by Mr. Edward Jones, of Burslem, "That this Institution affiliate with the Institution of Gas Engineers."

Mr. SWAIN said he had received a letter from Mr. Jones, who apologized for not being able to attend the meeting, on account of pressure of work. He, however, sent on the rules of the Institution and a few remarks regarding the subject of affiliation. In the course of the latter, it was pointed out by Mr. Jones that members of an affiliated body who were qualified to become members, associate members, or associates of the Institution would be eligible for election without entrance fee during a period of twelve months after affiliation. The terms of affiliation were set forth in the "Transactions" of the Institution for the year 1904, where there appeared a report of the special meeting, when the five English Associations and one Irish Association became affiliated, and arrangements were made for the affiliation of others which it was hoped would come about in due course. There were now seven District Associations affiliated with the Institution; and the Wales and Monmouthshire Institution was the only one left outside. While they were only a young Institution (which was primarily the cause of their not falling into line earlier), there appeared to be every reason why they should not defer the matter longer, but affiliate, and thus complete the organization of the Institution of Gas Engineers. There was a great deal to recommend it; and in the interests of the profession and of the industry, they should all be thoroughly united. The Institution Council was doing good work; and there was no reason why they should not participate in its government and benefits. In conclusion, Mr. Jones said that he had the utmost confidence in urging that the Wales Institution should complete the scheme of amalgamation by affiliation with the Institution of Gas Engineers.

THE PRESIDENT remarked that they had heard what Mr. Jones had to say; and he would be glad if someone would propose that they affiliate with the parent Institution. They would have nothing to lose but everything to gain, both individually and collectively, by affiliation.

Mr. A. H. BROOKMAN (Tenby), in moving that they become affiliated, said it was quite unnecessary for him to recapitulate the arguments that Mr. Jones had so ably set forth in his letter; but there was one thing he would like to mention (to young members especially), and that was the simple fact that by affiliating they would be able to become members of the parent Institution without the payment of an entrance fee. This was a very great advantage. The question of the non-payment of a fee would affect about thirty members of this Institution; so that the £5 5s. they had to pay for affiliation was a small sum. Of course, this was an annual fee; but they would always have members going in, and the usual charge was a guinea a member, so that they would save a considerable sum in this respect.

Mr. MAYNE: Does this cover both fees? I take it a member pays his subscription?

Mr. SWAIN: If this meeting decides to affiliate, any member who desires to enter the Institution of Gas Engineers can do so within twelve months without the entrance fee of one guinea. He will have his annual subscription to pay, of course.

Mr. H. D. MADDEN (Cardiff), in seconding the motion, said it was a right move. They would not only strengthen themselves as a District Association, but also strengthen in a way the parent Institution, by this combination; and more especially was the step desirable if they were the only Association outstanding. They should fall into one long line with the parent Institution.

The proposal to affiliate was then heartily agreed to.

APPOINTMENT OF A REPRESENTATIVE ON THE COUNCIL OF THE INSTITUTION OF GAS ENGINEERS.

THE PRESIDENT proposed, Mr. J. C. PENNINGTON (Colwyn Bay) seconded, and Mr. BROOKMAN supported, a motion that Alderman Canning be elected to represent the Wales Institution on the Council of the Institution of Gas Engineers; and this was carried with applause.

Alderman CANNING said he thanked the members very much

indeed—not for the office conferred, but for the honour done him. He added that the appointment extended only over one year; and then he had no doubt another Past-President, or some other member, would take up the work. He had some reluctance in taking any more burdens upon himself; but he found it was the unanimous desire of the Council that he should act, and he felt it was his duty to comply with this wish. He would do his best to represent the Wales Institution; but he was quite sure there were others who could do so better.

THE DEATH OF MR. THORNTON ANDREWS.

The PRESIDENT said that the Council had already sent to Mr. George Andrews a letter of sympathy with himself and other members of the family on the death of their father, Mr. Thornton Andrews; and Mr. Andrews had replied thanking them. He (the President) wished now to propose that the members should pass a vote of condolence with Mr. George Andrews and the family on the death of Mr. Thornton Andrews. He was sure everyone would agree with him that they lost a good and faithful representative of the gas profession when Mr. Thornton Andrews died. He was, he believed, the oldest Gas Manager in Wales; and at the time of his death he had been in the service of the Swansea Gas Company for more than fifty years. Speaking from his own knowledge of him, he was always willing to do everything he could to assist others in the profession in any possible way. He would ask Mr. Swain to read the letter received from Mr. George Andrews.

Mr. SWAIN said it was addressed to Mr. Octavius Thomas, and dated April 19: "I am in receipt of your letter of the 15th inst. conveying to me the resolution of sympathy with myself and other members of the family on the death of my father. Please convey to the members of the Council our best thanks for the kind resolution, which I will hand to my brothers and sisters.—Yours faithfully, George Andrews."

Alderman CANNING said that having been for so many years connected with the late Mr. Thornton Andrews, and knowing him as well as he did, and feeling so much his death, he would like to say how he personally regretted the sad event. He agreed with what the President had said—namely, that they lost by the death of Mr. Thornton Andrews an esteemed and very distinguished member of their profession—one who for a long time carried on the Swansea Gas-Works with the greatest credit to himself, and with profit to those who had the good fortune to employ him. In addition to this, his thoroughness and straightforwardness of character, and the determination with which he maintained what he believed to be the rights of his Company against all comers, entitled him to the admiration and regard of his colleagues in the profession. Many of the members would remember how cordially Mr. Thornton Andrews welcomed the Institution to Swansea, and how from the beginning he stretched out the hand of friendship to the new organization. He had therefore the very great satisfaction of seconding that this vote of condolence (which was only a confirmation of what the Council had already done) should be sent to Mr. George Andrews and to the other members of his family under these distressing circumstances.

The resolution was carried, by the uprising of the members in a body.

THE PROPOSED CALORIFIC POWER STANDARD.

A discussion was then opened by the President on the "Proposed Calorific Power Standard," and was joined in by several of the members. A report of this will be found on next page.

SOME POINTS OF GAS-WORKS ECONOMY.

It was arranged in the programme that there should also be a discussion opened by Mr. J. H. Canning, of Newport, on "Some Points of Gas-Works Economy;" but owing to the time for adjournment having arrived, it was agreed, with Mr. Canning's consent, to defer this discussion until the September meeting, when it would be placed first on the *agenda*.

PLACE OF NEXT MEETING.

Mr. BROOKMAN said that, as the President-Elect, he was going to ask the Institution to hold their September meeting in Tenby. Perhaps it was asking the members to take rather a long journey from home; but still they had to consider that the Institution was composed of members who lived from one end of the Principality of Wales to the other, and it was therefore only fair they should hold their meetings in the different counties. It was an awkward place to get to; but the trains would allow them to spend four or five hours there. Both his Directors and he would be very pleased to welcome the members if they would visit the town.

The PRESIDENT proposed that the next meeting be held at Tenby, and thanked Mr. Brookman for extending the invitation.

Mr. J. M. SMALL (Merthyr Vale) seconded the motion; and it was carried unanimously.

VOTES OF THANKS.

The PRESIDENT proposed a hearty vote of thanks to the Chairman and Committee of the Barry gas and water undertaking for the use of the room in which they were holding the meeting. It was, he said, always gratifying to find Committees or Boards of Directors taking a lively interest in Institution meetings, and rendering what assistance they could in the way of lending rooms,

&c. He asked Councillor Griffiths, who was present, to convey the vote to the Chairman and members.

The vote having been accorded,

Councillor GRIFFITHS said it would be a pleasure to comply with the President's request. Speaking personally, he felt, after being privileged to be present among the members that morning, that the very least any body of men—whether connected with a public undertaking or a private company—who had a suitable room available could do was to place it at the disposal of an Institution of this sort.

Alderman CANNING proposed a vote of thanks to the President for the manner in which he had conducted what had been a successful meeting. They had come to certain important resolves. The determination to affiliate, for example, was a good progressive resolution.

Mr. MADDEN seconded the vote of thanks to the President, not only for his occupation of the chair, but for the manner in which he had fulfilled the other tasks imposed upon him. He believed Mr. Acland had not been in the best of health, and had come there that day at some trouble to himself. They trusted he would be better than he had been during the past two or three months.

The vote having been cordially passed,

The PRESIDENT thanked the members, and said it was a pleasure to him to do what he could to further the aims of the Institution. He had even, for the purpose of attending a Council meeting, cut short by a week the leave of absence which had been granted him on considerations of health.

THE LUNCHEON.

The members then proceeded to Culley's Hotel, Barry Dock, where they were entertained at luncheon by the Chairman of the Urban District Council (Mr. D. Lloyd) and the Chairman (Mr. J. T. Hogg) and members of the Gas and Water Committee. Mr. Lloyd was in the chair, and was supported by Mr. Griffiths and other members of the District Council; but unfortunately Mr. Hogg was detained in London on the business of the Glamorgan Water Board Bill.

After lunch, a short toast list was gone through. Mr. Lloyd having proposed "The King," Mr. Griffiths submitted "Success to the Wales and Monmouthshire District Institution of Gas Engineers and Managers." He said that, from being present at the meeting that morning, he had seen that the chief object aimed at by the Institution was the imparting of knowledge one to another; and this was an object that should be fostered. He had been struck by the unanimity with which the members had voted a sum of money to the Livesey Memorial Fund. With a knowledge of the gas industry extending over only two years, he had gleaned that Sir George was regarded by the gas managers of this country as being at the head of the profession; and it had pleased him to see the donation so heartily agreed to. He coupled with the toast the names of the President and Alderman Canning; and these gentlemen, in responding, made due acknowledgment of the hospitality displayed towards the Institution by their hosts, and expressed the wish that the gas and water undertakings of the town might prosper. The President proposed "The Chairman and Members of the Council of Barry;" and Mr. Lloyd, in reply, said he hoped the business meeting had been profitable, and that the visit to the gas-works would be interesting. He hoped this would not be the last time that they would see the Institution in Barry.

VISIT TO THE GAS-WORKS.

After lunch, the members proceeded to the gas-works, over which they were shown by Mr. T. E. Franklin (the Engineer and Manager) and Mr. R. L. Aspinall (his Assistant). The works are at present unequal to the demand that is put upon them; the output in view at the time they were built having been nothing approaching the 158 million cubic feet which were sent out last year. Therefore Mr. Franklin, who has only been at Barry a little over twelve months, has drawn up a scheme of proposed extensions, alterations, and renewals, which has been submitted to the Council. An instalment of the work has been already agreed to; and a loan is to be applied for, in order to provide, forthwith, two new boilers, a sulphate plant, a new exhauster, &c. This will doubtless be followed in due course by an extension of the gas making plant, and other matters. Perhaps a water-gas apparatus, instead of further coal-gas plant, may be decided upon. But as to this, no determination has yet been come to. The provision of the sulphate plant, Mr. Franklin estimates, should result in a net increase in profit of from £400 to £500 a year—the ammoniacal liquor being at the present time disposed of by contract to an outside firm. The cost of the scheme he recommends (without including the extensions of the gas-making apparatus), he puts at from £7000 to £8000. Unfortunately, Barry has already a heavy capital account; and Mr. Franklin, in his report, says that this position of affairs is due to the fact that whatever profit has been made in the Gas Department for the last thirteen years has been handed over in aid of the Water Department, which has always been worked at a heavy loss—a total sum of £29,700 having been thus expended. Consequently, no suitable provision has been made for a reserve fund, and the gas-works generally have been "starved." By way of illustration, he refers to the fact that the selling price of gas at Widnes is less per 1000 cubic feet than the Barry capital charges (nearly 1s. 4d. per 1000 feet of gas sold) alone amount to.

To come to the gas-works themselves, there are at present two

retort-houses—one for inclined, and the other for horizontal retorts. The horizontal beds are, however, worn out; and the question now to be decided is what should be substituted for them. All the gas is being made in the inclined retort-house in a general way; but if any of these retorts have to be shut off, the horizontals have to be requisitioned, and a sum of £400 more was spent in labour last year owing to this having to be done. All the inclined retorts had to be repaired at one time; and the whole of the make during that period had to come from the old horizontals. The inclined retorts consist of eight beds of sixes; and six-hour charges are employed. The coals used are Mairos and Raglan from South Wales, with just a little Broughton and Plas Power from North Wales. Of course, it would pay to use other coals, were it not for the heavy carriage involved, which would, practically speaking, add again the pit price of the coal to the eventual cost.

No enrichment is now employed. Cannel was formerly used; but Mr. Franklin has given it up since he started retort-house governors, by which means the quality is kept so regular that no cannel is needed. Here, as in other places, the retort-house governor is a great success. Now no complaints are received about the gas; whereas there used to be many. The illuminating power is fixed at 15 candles; but there are no other restrictions at Barry, so that all the purification is carried out by oxide. The present price of gas is 3s. net per 1000 cubic feet for all purposes; the charge having been reduced 10 per cent. last year.

In a corner of the retort-house stands a tar-tower, "home made," but, of course, on the Dillamore principle. This has only been in use some six months; but great things are expected of it. Since these changes Mr. Franklin has experienced a substantial increase in the make of gas per ton. It was noticed during the inspection that as the coke comes from the retorts it falls on to a plate conveyor, and is immediately quenched by water-sprays. It is then taken by another plate conveyor and thrown into any part of the yard, or into storage hoppers under which there is an automatic weighing-machine to weigh hundredweights into bags. Here it may be parenthetically remarked that there is a good sale for coke in the town; it being seldom found necessary to send any away. At present, the water thus used in front of the retorts for quenching the coke is found rather expensive, as it is allowed to run to waste; about £4 a week being spent thus in water, which is charged by the Water Department at 9d. per 1000 gallons. One of Mr. Franklin's projected improvements is to fix an overhead water storage tank to which the water that has been used can be raised, and so be utilized over and over again. It will be pumped up from a settling-tank in the cellar of the house (which is already constructed), in which the water will first collect and deposit the particles of coke mechanically carried over. There are two holders on the works—one, of 600,000 cubic feet capacity, on the Gadd and Mason principle; while the other is an ordinary two-lift holder, of about 300,000 cubic feet capacity. How extensive is Mr. Franklin's scheme of improvements will be understood when it is mentioned that it includes a sulphate plant and house, a tar and liquor pump, boilers and boiler-house, a water-softening plant, an exhauster, an exhaust steam heater-condenser, a station-meter, an overhead water-storage tank, a circulating pump, an overhead liquor-storage tank, overhauling and repair of existing washing and scrubbing apparatus, a duplicate coal elevator, conveyor, and engine, a coal testing plant, repairs to the Gadd and Mason holder, alterations to stores and fitting shop, new mess-rooms, further carbonizing plant, and some miscellaneous items. He has, therefore, a busy prospect before him.

After the inspection of the gas-works, some of the members visited the Barry Docks and Island.

Visit of the Junior Institution of Engineers to Rugby.

In connection with the visits for the present session of the Junior Institution of Engineers, an excursion was recently made to Rugby, where, through the courtesy of the respective Directors, the works of the British Thomson-Houston Company and the Rugby Gas Company were inspected. At the former, the members, on being shown through the shops, had pointed out to them the special features of interest in the machining of the parts and general construction of the Curtis turbines, a number of which, of both the vertical and horizontal types, were in hand, with alternators of capacities ranging from 300 to 3000 kilowatts. The thanks of the Institution for the interesting visit having been conveyed by the Chairman (Mr. F. R. Durham), the members proceeded to the gas-works. On their arrival, the Engineer (Mr. Charles Meiklejohn) first gave a succinct description of the different sections of the plant and of their mode of operation, and afterwards conducted the party round, and explained in detail the characteristics of each section. By the invitation of the Directors of the Company, the members were subsequently entertained at luncheon at the Royal George Hotel—the Chairman (Mr. A. J. Lawrence) presiding. He expressed the pleasure the Directors felt in meeting them, and wished the Institution continued success in its work. Mr. Durham responded, and referred in appreciative terms to all that had been done to render the visit so interesting and enjoyable. The historic Rugby School was open for visiting in the afternoon, under special arrangements made with the assistance of Mr. H. R. Sanders, a member of the Institution, at whose invitation the members afterwards took tea before returning to London.

THE PROPOSED CALORIFIC POWER STANDARD.

[A Discussion at the Meeting of the Wales and Monmouthshire Institution, May 19.]

The PRESIDENT (Mr. Thomas Acland, of Llanelly) opened a discussion on this subject by reading the following notes.

At the annual meeting of our Institution held at Llanelly, on Sept. 30 last, when I had the honour and the pleasure of delivering my Presidential Address to you, I confined it to purely technical matters, and, as I thought, more especially to those practical questions of utility to gas engineers and managers of works of moderate dimensions, such as exist generally in Wales and Monmouthshire. At that time, nothing of any serious character had occurred to disturb or in any way to upset the ordinary methods which had been in practice almost from time immemorial, of testing gas for its illuminating value or otherwise. But since then (indeed, so recently as the last two weeks) a very important—nay, a most drastic—innovation or change upon the old practice has been made. And as that change or innovation has come about with the sanction of Parliament, it behoves us, as practical business men of affairs, to seize upon the earliest opportunity of educating ourselves upon this question. To-day, therefore, I propose to devote a few moments to questions more or less of a legal character—not with the intention of laying down the law, but simply to launch a discussion, which I hope will be of benefit to us all.

You are, of course, all aware that the Gaslight and Coke Company, who have been expanding at such a rapid rate during recent years, found themselves so restricted that, having reached their limits of supply, they were compelled, in order to carry on that expansion which they deemed desirable in their own interests, and in the interests of the immediate public, to go to Parliament with a view of acquiring the West Ham Company. With the merits or demerits of the scheme of absorption we have nothing to do to-day, and I do not propose making any comment whatsoever upon it; and, but for the matter of vital importance to which I intend referring presently, I would not have introduced into this discussion the names of these two Companies. The Gaslight and Coke Company and the West Ham Company, having presumably come to terms satisfactory to both parties, found it necessary to obtain parliamentary sanction for the carrying into effect of the terms; and they accordingly promoted a Bill. Thereupon the London County Council intervened, with the result that, for the first time in the history of gas making in this country, Parliament, at the intervention of the public, or at any rate of a public authority, have imposed another test in addition to that which had been imposed by the Acts of 1847 and 1871 for ascertaining the illuminating power of gas; this additional test being for the purpose of fixing a standard for testing the calorific or heating power of gas.

I need hardly point out how important and far-reaching in its consequences this new test is likely to be, because, in addition to this being the first time that Parliament has compulsorily imposed such a test upon a gas undertaking, there can be no doubt whatever that it has been done in consequence of the rapid strides which have been made by gas for heating purposes generally throughout the country. At the time when the Act of 1847 was passed, and even so recently as 1871, when the amending Act became law, no such thing as a gas-engine, a gas-cooker, or an incandescent mantle for the production of light was known. It is obvious, therefore, that the successful strides made in this direction by gas must have been enormous to call in the first place for the intervention of the largest and most important civic body in the world on the one hand, and for the recognition by Parliament of the justice of such a demand on the other. Of course, the only reason which the London County Council could advance in favour of getting such a clause inserted in the Amalgamation Scheme was the safeguarding of the public interest; and it was equally obvious that it was only for this reason that Parliament gave its sanction. It is not necessary for me to remind you that, of all the gas manufactured in this country at the present time, the bulk is used for heating, as against to-day the lesser quantity for lighting pure and simple. When the Act of 1847, and also the amending Act of 1871, were passed, the only intention of the promoters and of Parliament was that these Acts should control gas as an illuminant.

Perhaps it would be convenient at this stage if I were to give you the words of the section which has been inserted in the new Amalgamation Act of the Gaslight and Coke Company:—

As from the 1st day of January, 1910, the standard calorific power of the gas supplied by the Gaslight Company within the Administrative County of London shall be 125 calories net per cubic foot [the expression "calories" being hereafter used in this section as meaning calories net per cubic foot]; but the Gaslight Company shall not incur any liability in the event of their supplying gas of a calorific power of not less than 112½ calories. Provided that if within one month after the expiration of a period of three years from the said 1st day of January, 1910, or after the expiration of any subsequent period of three years, either the Gaslight Company or the controlling authority shall desire that such standard calorific power shall be reduced or increased, and shall give to the other party and to the Board of Trade notice in writing of such desire, it shall be lawful for the Board of Trade, after hearing the parties and considering any representations made to them by either of the said parties, by order to reduce or increase the amount of the said standard calorific power, and of the deficiency below such standard

within which the Gaslight Company are not to be liable to forfeiture on either of such amounts, to such extent as to the said Board may seem fit, and the said Board may by such order make all such modifications of this section as may be necessary in consequence of any such reduction or increase as aforesaid, and may also direct the manner in which the costs, charges, and expenses of the said parties, and of the said Board of, and incidental to, any such application, and any inquiry held by, or under the direction of, the said Board in connection therewith shall be borne. The standard calorific power prescribed by the said Order, if made by the Board of Trade, shall, for the purposes of this section, be deemed to be the standard calorific power prescribed by this Act.

As from the said 1st day of January, 1910, sub-sections (2) (3) and (5) of section 5 (as to testing for calorific power, sulphur impurities, and illuminating power with flat-flame burners) of the Act of 1905 shall cease to apply, or have effect so far only as such sub-sections relate to the calorific power of the gas supplied by the Gaslight Company within the county. One testing for calorific power shall be made at each testing-place daily; but in the event of the calorific power being on any testing ascertained to be below $112\frac{1}{2}$ calories, the gas examiner shall forthwith give notice thereof to the Gaslight Company, and a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at that testing-place on that day.

If on any one day the gas supplied by the Gaslight Company at any testing-place is of less calorific power to an extent not exceeding 6 calories than $112\frac{1}{2}$ calories, the average of the testings for calorific power made at such testing-place on that day, and on the preceding day, and on the following day, shall, for the purposes of sub-section (8) of this section, be deemed to represent the calorific power of the gas on such one day at such testing-place.

The Gaslight Company shall not be liable to any forfeiture for defective calorific power where the calorific power on any day of the gas supplied by them is not less than $112\frac{1}{2}$ calories; but where the calorific power on any day of such gas is less than such last-mentioned quantity the Gaslight Company shall be liable to the following forfeitures in respect of such deficiency—that is to say, where the deficiency does not exceed 3 calories, £5; where the deficiency exceeds 3 calories but does not amount to 6 calories, a sum not exceeding £10; for each complete 6 calories of defective power, a sum not less than £25 and not exceeding £100.

Provided always that the controlling authority of any testing-place, having recovered one forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at one testing-place, on any day, shall not be entitled to any further forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at any other testing-place, of such controlling authority on the same day. Provided also that no forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of calorific power was occasioned by an unavoidable cause or accident.

This section was more or less altered when finally adjusted by the Select Committee of the House of Commons in the following way:—

The Company agreed to the imposition of a test of calorific value reluctantly. They objected to the introduction of any test for calorific value on the ground that such a new departure was one that should be effected by a General Act—say, by the amendment of the Gas-Works Clauses Act, rather than by dealing with an individual company. They objected further to the standard fixed—namely, 125 calories per cubic foot—on the ground that such value could not be obtained with any degree of certainty from 14-candle gas. They only accepted the standard on the condition that there should be a margin of 10 per cent. below the 125 calories before any penalties were imposed, and on the understanding that it was not to be expected of them that the standard would be regularly maintained.

A good many questions naturally occur to one when reflecting upon this tremendous innovation imposed by Parliament upon this important gas undertaking in London—the most important and extensive in the world. Is it likely that this test will by gradual steps become so extensively adopted or imposed by Parliament as to make it desirable for Parliament, in the interests of the public and of gas makers, to make it obligatory by Statute? And, if so, what effect is such statutory obligation likely to have upon gas companies? It is no use denying that gas as an illuminant to-day, although still in every way superior to electric light—having held its own successfully notwithstanding all the stupendous efforts which have been made to dislodge it from its primary position—is likely to maintain that premier position. It is of no use denying that the bulk of gas sold to-day is used for heating, and not for illuminating purposes. But, in saying this, I need hardly tell you that I do not in the least derogate gas from its premier position in the illuminating world. It simply means that a new, and until recently an unthought of, use has been found for gas, which has caused not only a revolution in the gas industry, but also the demand for more gas to increase by leaps and bounds. I need hardly point out to you that, on a careful consideration of this new departure, it will be found that, although this is the first time direct parliamentary sanction has been given to the calorific test, yet during the past few years, having regard to the gradual and steady growth of gas consumption for heating purposes, the undoubted tendency of Parliament has been to recognize that a time was coming when not only should every encouragement be given to gas companies to sell gas for heating purposes, but that a period would inevitably arrive when a drastic step in this direction would have to be taken.

The Gaslight and Coke Company have obtained from Parliament sanction to reduce the illuminating power of their gas from standards which had been fixed at 16 candles, to 14 candles, which has had universal recognition as the most suitable standard. Taking the growing practice of the last few years into considera-

tion with this last parliamentary enactment, and looking forward to the future with the eye of experience—there is only one way of judging the future, and that is by the past—I respectfully venture to say that there is every probability of a time approaching in the near future when Parliament will altogether do away with the illuminating test, and will make it a statutory obligation on the part of all gas companies to adopt the calorific test in the same way as the Gaslight and Coke Company have now, for the first time, been compelled to do. Until such a time, be it soon or be it late, gas companies will go on experimenting with the calorific test side by side with the illuminating test; and after running in double harness, and taking advantage of every new discovery, it will come to a question of the survival of the fittest, when every probability points to the illuminating test dying a natural death in the not very distant future.

The PRESIDENT, supplementing the remarks which he had written out, said he had seen the views on the subject of some of the leading gas managers in the country; and from what he could gather, there was a pretty general consensus of opinion in favour of a calorific test for the heating and fuel value of gas. Whether the provision would become at one time general throughout the country, or whether it would filter down through the Provinces as the different undertakings went to Parliament for further powers, he did not know; but he thought it was very likely that before long they must expect an amending Act to the Gas-Works Clauses Act, dropping the out-of-date legislation and incorporating in the new Act all the modern ideas. There were many things now in the Gas-Works Clauses Act which were antiquated and did not meet present-day requirements at all; and if Parliament in its wisdom passed an amending Act, undoubtedly one of the clauses in it would be to make a calorific power test obligatory on all gas undertakings. This, however, was a matter on which he would not take up their time. The point he thought they ought to consider was, “Is a calorific test desirable? Do you want it? Is it likely to come?” If it was likely to come, the only record they had at present was the clause inserted in the Gaslight and Coke Company’s Bill, where the power was fixed at 125 calories, with a reduction of 10 per cent. before penalties could be imposed upon the Company. He did not know whether they might regard this in the light of an experiment only—whether the authorities would wait and see how the new Act would work in practice after Jan. 1 next; but the London County Council at their meeting were very pleased that the clause was inserted in the Bill, and there was no doubt they would watch with interest the operation of it. A wise provision, to his mind, was that after the expiration of three years the Board of Trade might be asked to re-adjust, if found necessary, the arrangement with regard to the fixing of the number of calories. Experimental or not, they might depend upon it that Parliament, once having recognized and accepted the principle of the calorific value test, would not go back upon their work. They would extend it to other undertakings as additional powers were asked for, and so it would come gradually into use. Perhaps it would come more quickly than they believed. But he did not think they wanted two sets of tests. If the calorific test were imposed on all undertakings, they might drop the illuminating power test, and be satisfied with the other. He was not an authority on calorific value. He was in the position of wanting to learn something; and therefore he hoped the members would fully discuss the question.

Mr. A. H. BROOKMAN (Tenby) remarked that before the discussion was opened he would like to say he did not suppose they would have heard anything about the calorific power test had it not been for the attempt to introduce water gas so largely with ordinary gas, and to lower the illuminating power to 14 candles. Gas managers knew that their gas-stoves were as good a calorific test as anyone could have. With gas-fires especially, when the gas was reduced to about 14 candles, the users would very soon tell them what their candle power was. Directly one attempted to introduce a new system into an industry—monopolies such as gas or electricity—it stood to reason that a new test must be applied. It seemed to him the only question was the standard for this test, and the means for testing. Probably Mr. Madden would give them some information as to the different instruments used. He understood there were several, but that some were very much open to error, and the error was large—extending from about 10 to 15 per cent. Therefore they required very careful handling to get proper results. He thought that they would all—and especially those who were taking up the introduction of water gas—have to recognize a heat standard. The only question for the Institution was to arrive at this particular standard.

Alderman THOMAS CANNING (Newport) said he only wanted to offer a word or two as to the general policy of imposing this test. For a long time past it had struck him as being very extraordinary that the London County Council and other county and borough councils who were on the look out for something to test, had settled generally upon the purveyors of gas—whether company or municipal undertakings. He wanted to know why. Who had served the public better than gas undertakings? With regard to this calorific value that was to be looked for in illuminating gas, suppose to-morrow a company like (say) the Mond Gas Company was to start as a rival—as a competitor with the gas undertaking within the bounds of any municipality, or anywhere else they could get a footing—because stranger things had taken place. It was all very well to talk of monopolies and guarantees, and the

rest, under a Gas Act; but he had always found that, in the case of electric lighting, this supposed charter went to the winds at once, directly it was a question of offering something that could really stand up in competition with gas. Well, suppose Mond or a similar gas came along, would there be any test imposed upon it? He ventured to say, "No." The probability was that a company like that would be supplying gas varying from 20 to 25 calories—that was, one-fifth of the maximum of the standard imposed upon the ordinary gas undertaking; and there would be nothing to prevent the company going about and representing their product as being of as many calories as they liked, because nobody would trouble so long as they competed with the gas undertaking established in the district. That would be quite sufficient for the public; and what was sufficient for the public, would be sufficient for those who represented them, or misrepresented them, on the councils. That had been the experience up to now. He could tell them that he had seen electricity developed in opposition to a gas undertaking; and while the authorities took care to impose every restriction that they could think of, fair and unfair, upon the gas undertaking, they never imposed a single one at all upon the electric light concern. He did not argue that they should test electricity as they did gas. They could not test the electric current, for example, because there was no possibility of varying so far as the current was concerned in at all the same way as a current of gas would vary. But there was something that did vary. Voltage might vary, the conditions under which it was consumed might vary, or the filaments might vary; but there was nothing to prevent the purveyor of electric lighting to-day from selling his light on any basis he liked, or on no basis at all. He could say it was 50 candles, or he might say it was 500, if his conscience would stretch so far. The electrician could take the standard of illuminating power prescribed for a gas company, and could say that if the gas was consumed in a bunsen burner with an incandescent mantle, as a certain number of cubic feet were being used, giving a heat of so much, there could only be secured a certain light from the mantle. The electrician knew all about the gas man's standard; but the gas man knew nothing about the electrician's. It was made in Germany, or "made in the moon," for they had not got the slightest inkling yet as to what the real illuminating power of an electric lamp was. Well, now, electricity undertakings throughout the country were in competition with the gas industry—or, at least, they said they were—in regard to heating. They would like to be; but they could not. Very obvious reasons would prevent them from really coming into competition with gas in this direction. The gas people had an article with a first-class calorific power; and the electricians had not. But assuming that this calorific test idea went on, he wanted to know again, if the competition was to be entered into between gas concerns and the purveyors of furnace gases and the purveyors of electric current for heating, was it not only fair that this standard should be universal and applied all round? It would very soon be seen what the superiority was in respect of the commodity which their own industry supplied. Another point he would like to touch upon was that the standard of illuminating power was fixed back nearly in the middle of the last century. A terrific mistake was made by gas engineers at that time. No doubt the science of chemistry was not then so advanced as was the case to-day—or at least, a knowledge of chemistry was not so general among men who lived then as it was now. The consequence was that a man who was not capable of giving advice on the subject got the ear of Parliament entirely. He meant Mr. Samuel Hughes, whose name had been connected with one or two treatises. The outcome was that Parliament had for some years the splendid idea that the proper burner to test gas with was not a burner that would develop the power which the gas had in it for giving illumination, which was the only reason for its existence. Mr. Hughes's suggestion was that they should test gas with the very worst burner in the market—that was, one which could not show its qualities—and Parliament, in its ignorance, took his advice. To that they owed the fact that there was much trouble in regard to illuminating power. The moral of this story was that, whatever standard was imposed now—he did not care what it might be—must be arrived at after due deliberation. Now, 125 calories was equivalent to about 500 B.Th.U.; and he did not know that they should at any time consent, at any rate they should not willingly consent, without thorough investigation, that this should be the minimum—because a standard represented a minimum after all. Therefore—and he was speaking now only upon the question of policy—whatever the standard might be, if it was to be made general, it must be first very carefully considered. They must also know what it was that was to be prescribed as the standard calorimeter for testing this efficiency, so as not to have again the old complaints that were experienced with regard to the Sugg No. 1 argand burner and the wonderful sperm candle—which apparently each person could manipulate according to his own desire. There must be something certain upon this occasion. It must be something scientific if it was to be applied as a test; and, beyond this, it should be imposed impartially on all persons who proposed to supply heat and power. It should not be placed alone on one particular section of a great industry, but upon anyone, and any company, and any local body, any electrical undertaking, and producer gas undertaking, and any other concern which entered the field with a view to supplying heat.

Mr. H. D. MADDEN (Cardiff) remarked that this question of a calorific standard was one which, he thought, they all approached

with some diffidence at the present time. He would, however, very much like to associate himself with some of the allusions Mr. Canning had just made to the standard calorimeter and the method of testing. This was a matter that they would have to turn their attention to in the near future. Whether the new idea would be followed up, they did not know; but they wanted to see that their feet were standing on firm ground before they made any rash move in the matter. They could not fix any ratio between the candle power and the calorific value of a gas. This had already been demonstrated. They knew that it depended upon the composition of the gas they sent out. As far as a calorific standard went, the keeping of the gas at a fairly constant thermal value seemed to be the best arrangement, rather than to have (say) 600 B.Th.U. one day, and 520 B.Th.U. the next, and then jump back again to the former figure. He did not know whether this provision was made to straighten out any such irregularity in value; but it seemed that with all lighting and heating power companies the standard of calorific value should be kept as uniform as possible from day to day. Until the matter had been gone into thoroughly, and a great deal of research had been carried out, he did not see that they could fix themselves to any firm theory. The question of the instruments had been referred to by Mr. Canning. He (the speaker) thought that this was a question they would have to leave for experimental work. There was the Simmance-Abady calorimeter, for instance. They were, to his mind, all very good; but this one was coated and jacketed very much like a steam-engine was jacketed to retain the heat; whereas the Junkers had a polished surface to prevent radiation. The Boys calorimeter was another instrument. Of course, the merits of each one would have to be gone thoroughly into if there was the expectation of a calorific power standard. They would require to know that they were getting 100 per cent. efficiency out of each calorimeter—he thought this was what Mr. Canning meant when he spoke of the different burners. They wanted 100 per cent. efficiency out of the burner; and they would want the same out of the calorimeter. Then there was another thing. Calorimetry was, like chemistry, an exact science. It could not be carried out in a haphazard way, but required to be done very carefully, without draughts, or anything of that kind. The conditions needed to be equal right through. All these matters, he felt sure, would have to be attended to. A further point of interest to everyone connected with the matter was the term "calories." To-day nearly everything was being termed calories. Now for their engine standard they had accepted the "British Thermal Unit;" and, of course, all units of heat and work were based in engine practice on the British Thermal Unit. But there seemed to be an idea prevalent that they should come to the calorie. The conversion could be easily made by the well-known factor of 3.97. Multiplying the calories by this would convert them to British Thermal Units; but they did not want to go backwards and forwards, if they could work direct into British Thermal Units. He thought this was a standard they should try to work to. There was another thing on the question of the calorific power of the gas which might materially affect the matter. He was referring to vertical retorts. How far was the calorific power going to be influenced of the gas that they would make under these conditions? What he had alluded to were some of the questions they would have to look at in following up a matter of very great interest. The questions of carbonization, which was undergoing such radical change, and the multifarious uses of gas for power and other purposes, must all of them be taken into consideration with the calorific value.

Mr. J. H. CANNING (Newport) said he would like to refer to one of the most important points Mr. Madden had touched on. He had hinted that with the new developments taking place in connection with carbonizing processes—the introduction of the vertical retort and other matters—there was a fear that there might not be produced exactly the quality of gas that would conform to the standard. In his (the speaker's) opinion, a standard should not impose restrictions upon the development of an industry. It should rather follow it, where the developments were in the direction of improvement, as otherwise an ill-judged standard might impose an actual penalty upon the consumer. A second point which was very important was the management of the calorimeter. They all knew that the old illuminating power standard was really no exact standard at all. Nobody could define accurately what a candle was. Even the new pentane standard, with all the work that had been expended upon it, had been discovered to be extremely sensitive, for instance, to the smallest variation in the amount of moisture present in the atmosphere. If they were to have a new standard imposed, every care should be taken to see that it was a really accurate and scientific standard. In making calorific tests, he had had some small experience in the use of the Simmance-Abady calorimeter; and it was impossible to get accurate results unless the temperature of the waste gases, the temperature of the inlet water, and the temperature of the air in the chamber where the test was being made were approximately within a degree or two of each other. It was very difficult to see how this approximation was to be produced or maintained in normal working circumstances; and it was still more difficult to imagine any method of correcting for these discrepancies. To sum the whole question up, he thought that, to use a very ordinary expression, they should "be off with the old love before they were on with the new." They did know the evils of the present-day standard; but those of the new standard were,

comparatively speaking, unknown to them. A considerable trial should be allowed of the fresh conditions in London; and he was sure they might trust the Gaslight and Coke Company, with the public spirit that had always distinguished them, to communicate to the gas industry throughout the country, for the benefit of everyone, all possible information with regard to this standard. Then, after it had stood the test of time, they would be in a better position to understand what were its real advantages and its possible drawbacks.

Mr. J. C. PENNINGTON (Colwyn Bay) moved a hearty vote of thanks to the President for his opening remarks, which, he said, had been well commented upon by the various speakers. There was no doubt, as Mr. Madden had said, that this question was practically in its infancy; and they must keep an open mind on the subject for some time to come.

Mr. J. M. SMALL (Merthyr Vale) seconded, and said he would like to ask whether 125 calories would be considered high for ordinary coal gas, or would it be just medium?

Mr. CANNING replied that it would be pretty good.

The vote having been heartily accorded,

The PRESIDENT thanked the members for the kind way in which they had received his remarks. Proceeding, he said that in the case he had referred to Parliament had fixed the calories at 125; and then they allowed 10 per cent., which brought the figure to 112½. Then, again, after the experiment of three years, the Board of Trade might adjust the arrangement; so that everything was subject to practical experiment over a period of three years. This would give the Gaslight and Coke Company and the London County Council full opportunity to see whether any alteration was needed. At Tottenham and Edmonton, about two years ago, the Company agreed with the Local Authorities on a calorific value test—the standard (not a statutory one, but one carrying an agreed forfeiture) being 450 B.Th.U. Of course, it had to be remembered that they were making to-day a composite gas—a mixture of coal and water gas—and they were looking forward to the use of vertical retorts; but if a 14-candle standard town gas was anything like approximated throughout the country, there should not be any great difficulty in making a calorimeter that would form a satisfactory standard for testing such gas. The only place that he knew where the calorific test had been substituted for the old illuminating power test was in the American State of Wisconsin; but he had no details as to how they had found the change had worked there up to the present. He was sure they would all be interested to notice the progress of this innovation, when it was brought into use by the Gaslight and Coke Company.

THEORY AND PRACTICE OF ILLUMINATION.

This was the subject of a paper read a short time since by Mr. T. W. Rolph before the Physics and Chemistry Section of the Franklin Institute. The current number of the "Journal" of the Institute contains the text of the paper, and the following is an abstract.

The author begins by pointing out that, in any branch of engineering, practice usually precedes theory. As practice develops and becomes more widespread, its faults show themselves; and in the attempt to remedy them, theory is evolved. This reacts upon practice and improves it; while practice in turn reacts upon theory, causing a development of shorter methods of predetermining results. In the field of illumination, practice is several thousand years old; but theory is only beginning to be developed. Improvement of the early media of illumination was not accompanied by any great increase in the intrinsic brilliancy or intensity of light per square inch of lighting surface; and, consequently, a number of light sources were necessary when large areas had to be dealt with. Of course, it was a simple matter to place these lights wherever desired; and they could be moved from place to place to alter the lighting of an apartment. With the introduction of gas, and later the electric light, both of which are mostly used at fixed points, faults of location began to be apparent; and their recognition led to the study of this subject as part of the work of the designer of systems of lighting. The result was the development of the theory of illumination. Means of changing the natural distribution of light-sources were introduced; and they were followed by the publication of methods of measuring the intensity of light, and of calculating the amount necessary to obtain the required illumination.

In considering the theory of illumination, the first thing to be taken into account is the purpose of lighting. Its principal object is, of course, to enable the eye to see comfortably the objects illuminated. Hence we perceive at once that we have to deal with two factors—the eye, upon which the effect is produced, and the medium (light) producing the effect. To see any object, we must have light falling upon it, and being reflected from it to the eye. Illumination, as a branch of engineering, is peculiarly distinctive, inasmuch as it involves effects upon a human organ; and in order that his readers might better understand the problem before them, the author describes, by the aid of a diagram, the construction of the eye, and shows how, by means of the iris, the quantity of light to be allowed to pass in is determined. When the illumination is very low, and objects are dimly lighted, the iris is open to its greatest extent; but when the light is very

brilliant, the iris shuts out as much as is possible. It cannot, however, exclude sufficient to prevent a strain upon the retina and consequently poor vision.

For the protection of the eye, several points should be considered in designing systems of lighting. The following are the most common causes of injurious effects: Too little or too much light, glare, flickering or striations, extreme contrasts, and reflection from polished surfaces. The first two of these causes are easily dealt with by the calculations of the engineer. Glare is a common fault, and it has worked untold injury to the eye. The author says some systems of lighting "appear to have been designed with the special object of adding to the prosperity of the oculist." Two simple considerations will furnish the means of avoiding injury: Keep the light-sources as far as possible above the direct range of vision; and diffuse, by a globe or reflector, the light from sources of high intrinsic brilliancy. Flickering, streaks, and striations of light cannot but be harmful to the eye; and the author cites the illumination of a book-keeper's desk as an illustration of the eye-strain caused by contrasts. This can be avoided by placing the light-source not in the middle of the desk or directly in front, but at the side.

After these introductory observations, the author proceeds to deal with the calculations necessary for arriving at the correct intensity and distribution of illumination; considering first the fundamental units of light—candle power, lumen, and foot-candle—and illustrating his remarks by diagrams. He then goes on to show the great improvement which can be obtained by properly calculating the lighting system of a room. The photometric curve of a bare lamp reveals the fact that practically the same amount of light passes above as below the horizontal. The former is useful only in illuminating the ceiling, and for lighting the lower part of the room by being reflected downwards; and when it is considered that the rays which pass upward are ordinarily reflected two or three times before reaching the lower part of the room, it becomes evident that the light is very largely wasted. Recent tests carried out by the author in collaboration with Mr. V. R. Lansingh,* on the effect of light and dark walls, ceiling, and floor, show that, under conditions by no means extreme either way, a difference of about 4½ to 1 can be obtained in the illumination resulting from the same lamp. In addition, when the efficiency of incandescent lamps is considered, we have the choice between carbon filament lamps in ordinary use, consuming 3.5 watts per candle, and tungsten lamps (recently introduced) which consume 1½ watts. It is possible, therefore, to obtain a difference of 13 to 1 in the cost of securing illumination by simply varying conditions which might appear trivial to one who is not familiar with the problem. This, the author remarks, is a remarkable state of affairs, and is without a parallel in other branches of engineering. We propose to give the rest of the paper almost in full.

Up to about ten years ago, practically no attempt was made to design a lighting system, to obtain uniform illumination of any desired intensity. The first method of calculating illumination was the "point-by-point" method, and consisted in assuming a certain lighting system, then finding the illumination at typical points in the room by means of the formula $I = CP \div d^2$ where I is the flux-density in foot-candles, CP the candle power, and d the distance in feet from the light-source to the point considered. Then if the lighting system was not good as shown by these calculations, it was changed, and the calculations were repeated. This was a rather laborious procedure; but the few men who used such calculations soon became experienced enough to design a system with little actual figuring, and they used the point-by-point method largely for checking.

Recently, however, a much shorter method of calculation, called the "flux" method, has been introduced. Its development is largely due to the work of Messrs. Cravath and Lansingh. By this method the flux, or quantity of light emitted from the light-source in useful directions, is used as a basis rather than the candle power or light-intensity in any direction. With small light-sources, the lumen or unit of quantity of light is the flux of light emitted in unit solid angle by a light having an intensity of one candle power in all directions. It so happens that this quantity of light, divided by the area of the surface which it strikes, gives the average foot-candle intensity of illumination on this surface.

This is a very convenient fact, and enables us to obtain the average foot-candle intensity in a room by simply knowing the total number of effective lumens and the area of the room. By "effective lumens" is meant the total quantity of light striking the plane of illumination, or, in other words, the total light generated minus that absorbed by the ceiling, walls, floor, and lighting accessories. The total number of effective lumens must be based upon some estimate as to what proportion of the light is effective; but we can work within a small limit of error when we know the photometric curve of the light unit and the conditions of the ceiling and walls. For example, with light ceiling and dark walls and prismatic intensive reflectors, we know that the effective light is the equivalent of the light emitted from the unit, up to about 75° from the vertical. We can find from the photometric curve the number of lumens produced by the light-source in this zone. The total lumens necessary is the product of the intensity of illumination desired and the area of the room. Knowing the lumens necessary and the effective lumens from each light-source,

* See "JOURNAL," Vol. CV., p. 621.

it is an easy matter to determine the number of sources required. These must then be placed in such a way that the illumination will be uniform. But this will not be difficult for one who is familiar with photometric curves. Mr. Norman Macbeth has determined the lumens per cubic foot of gas per hour for a large room with light ceiling, dark walls, and inverted gas-burners with prismatic reflectors. The value is 104. After the total watts or total cubic feet of gas per hour necessary have been determined, they must be divided up among the number of units desired, spaced in the proper manner. This method of calculating illumination promises to prove exceedingly valuable.

A paper of this kind is not complete without some consideration of various methods of equipping light-sources. Such equipment may be divided into three general classes—globes, reflectors, and shades. Globes are enclosing or partly enclosing accessories, which may or may not have a favourable effect upon the distribution of light obtained from the light-source. Reflectors change the distribution of light by means of reflection; and shades, as their name implies, have as an object the decreasing of the light intensity or the addition of some desired decorative effect. As a rule, they do not have any very favourable effect upon the distribution of light.

There are several kinds of enclosing globes in ordinary use; the principal ones being prismatic, opal, ground glass, and art glass. Neglecting the question of appearance, prismatic globes are superior to opal or ground glass, since their absorption is considerably less, and they are designed to send a large part of the light rays in a really useful direction. Prismatic globes such as the holophane, when designed and used correctly, absorb from 10 to 14 per cent. of the light. Tests on incorrectly designed prismatic globes have shown an absorption as high as 34 per cent. Opal absorbs from 25 to 60 per cent., depending upon the density. In order to obtain a desirable appearance, opal globes should never be used unless they are sufficiently dense to hide the outline of the lamp filament. Ground glass absorbs from 20 to 40 per cent. Art glass has a very high absorption, but is valuable in obtaining decorative effects.

There are a large variety of reflectors on the market, among which the most common are prismatic, opal, mirror, metallic, and coated. Reflection from any surface is of two kinds—regular or specular reflection and diffuse reflection. When a ray of light is regularly reflected, the angle of incidence is equal to the angle of reflection. With diffuse reflection, the light striking the surface is broken up into a large number of rays which leave the surface in all directions. Most surfaces give both regular and diffuse reflection with one kind predominant. Each kind of reflection has its advantage for certain cases. Certain types of distribution of light can be obtained only with surfaces giving specular reflection. On the other hand specular reflection with filament lamps often produces bright streaks or striations in the illumination of a surface. These can be eliminated by using frosted lamps, and in some cases bowl-frosted lamps. Completely frosted lamps are usually undesirable, because frosting reduces the life of the lamp about 50 per cent. Where the reflection is diffuse, striations are not usually met with.

With prismatic reflectors, it is impossible to direct downwards all the rays of light. This quality is not objectionable, however, for general illumination, since it is desirable to have a certain amount of the light pass upward in order that the ceiling and upper walls may not be in darkness. Prismatic reflection is specular reflection. It is therefore possible to direct a light ray in any direction; and a prismatic reflector can be constructed to give practically any desired distribution of light. Mirror reflectors differ from prismatic reflectors in that they do not allow any light to pass upward. Reflection here is specular also, and therefore such reflectors can be designed to give nearly any desired distribution. The fact that they allow no light to pass upward makes them objectionable for general illumination, though a system of indirect illumination recently introduced makes use of mirror reflectors.

Opal reflectors are, as a general rule, found to be fairly efficient; but they differ from prismatic and mirror reflectors in that the reflection obtained is diffuse and not specular. This means that only photometric curves of a general rounded shape can be obtained. Opal reflectors having a depolished interior surface have recently been introduced. This surface practically eliminates striations in the illumination obtained. These reflectors present an attractive appearance, and have a good efficiency when used with clear lamps. Metal reflectors can be obtained in a large variety of styles and sizes. Their principal use is for factory lighting, though iron reflectors with a coating of white enamel are used considerably for streets. Reflectors for factory lighting are usually of aluminium, brass, or steel. With such reflectors, a diffuse reflection is highly desirable. This is usually obtained by means of a depolished aluminium surface or by aluminium paint.

Illuminating engineering covers so broad a field, that this paper can do no more than touch upon a few of the essential features. Though the work of the illuminating engineer is comparatively new, it has proved so valuable that the development of the science and art has been exceedingly rapid. The literature on the subject has already assumed large proportions, and each year sees additions of great value. There is much work yet to be done before illuminating engineering is fully recognized as an important factor by all parties concerned; but at the present rate of advancement this complete recognition is not far off.

NATIONAL CONSUMPTION OF WATER.

At the Meeting of the Royal Statistical Society on April 27, Mr. W. R. BALDWIN-WISEMAN presented a long paper on "The Increase in the National Consumption of Water," of which he read and summarized the principal portions—prints having been supplied to the members.

After having given some interesting historical particulars in regard to water supply, the author passed on to deal with the growth of the population in England and Wales, which, he said, was shown by the advance from 2·25 millions in 1377, to 5·24, 8·89, and 32·53 millions respectively in 1710, 1801, and 1901. Great as this increase had been, it had been still greater in the case of urban populations, which had grown from 1·24 millions in 1696, to 10·93 and 25·05 millions respectively in 1861 and 1901. These enormous increases were exceeded by the rate of increase in the population supplied with water from established works in the various decennial periods of the Nineteenth Century. London, he pointed out, had increased from an area of 0·3 square mile in 1200 to one of 117 square miles in 1908; while the annual supply of water at present was about 82,125 million gallons. Similarly, Liverpool had increased in area from 0·1 square mile in 1300 to 27·8 square miles in 1905, and the population had grown in the same time from a few hundreds to 739,000 people; while a population of about 907,000 were now dependent on the Corporation water-works for a supply of about 10,801 million gallons a year. Manchester also had extended its municipal boundaries, so that from an area of 9·3 square miles in 1841 they now embraced an area of 31·1 square miles, with a population of about 649,000; while a population of about 1,250,000 were dependent for their annual supply of 14,615 million gallons on the Corporation water-works.

In conclusion, the author emphasized the desirability of steps being taken at an early date to form some central authority charged with the duty of water conservancy in its widest application; and for this purpose they should engage in a close and exact study of the water resources of the country. Such an authority could, he said, co-ordinate its work with, and also supervise, that of water supply and sewage disposal authorities; also that of river conservancy, rivers pollution and fishery boards, county councils, and other authorities who might likewise furnish some annual returns. The water supply data collected by the officers of the Geological Survey might also be handed over to this authority. It should collect systematic data on rainfall, &c., and should also invite voluntary contributions of data as to the water levels at various periods, together with a continuous record of the quantities pumped from various private wells. The authority should publish an annual report, and there would thus, in the course of a few years, be available a mass of well-digested and reliable information, which would aid and guide all interested in an economical development of the water supply of urban areas or of estates; while at the same time there would be a special department available to advise Parliament as to the economy or otherwise of the schemes of water supply, sewage disposal, and river regulation laid before it—thus ensuring for future generations the mechanism for the most efficient and economical administration of the national water resources—a matter of the most supreme importance.

The paper was accompanied by a mass of valuable tabulated statistics, showing the estimated population of England and Wales in the pre-censal period; the distribution of the population in pre-censal and censal years and at the taking of the last two census returns; the population in 24 towns at various times from 1085 to 1908; the area within the municipal limits and water-supply districts at different times; the water supply in certain towns and districts; and the rate of increase in the annual water supply in various periods.

The paper was followed by a discussion, in the course of which approval was expressed of the author's suggestion in regard to the formation of a central authority; Dr. H. R. Mill specially urging that the collection and tabulation of rainfall statistics, which is now carried on under his supervision, as Director of the British Rainfall Organization, should be in the hands of such a body. At the close of the discussion, thanks were accorded to the author for his valuable communication.

Explosion Waves in Gases.—At the recent conversazione of the Royal Society, Professor Harold B. Dixon, F.R.S., exhibited some interesting photographs showing the generation and nature of explosion waves in gases. They were taken on films moving with a uniform downward velocity (between 50 and 80 metres per second). The explosions, started by electric sparks, travelled along horizontal glass tubes. The photographs obtained are thus compounded of the horizontal movements of the flame and the vertical movement of the film. This analysis reveals the slow initial movements of the flame, the sudden setting-up of the explosion wave, and the remarkable effects of "reflected waves." Explosive gas mixtures were also fired by rapid compression with a steel piston. The photographs showed clearly that the gases are fired at a single point, and that they are not instantaneously fired throughout.

COKE-OVEN GAS AND GAS-ENGINES.

In the "Bulletin" just issued (for February last) of the French Society of Civil Engineers, a paper by M. Cuvellette, on "The Direct Use of Coke-Oven Gas in Explosive Engines," takes up about fifty pages. The contribution is a comprehensive one over a considerable field, which is likely to become increasingly important in one way or another. In view of this, and also because of the intimacy of the gas-retort and coke-oven problems, the following much condensed abstract of the article is given.

The problem of the direct utilization of gas from certain industrial operations—blast-furnaces, coal carbonization, and the like—came to the front about 1898, with the appearance of the large gas-engine for blast-furnace gases, due to the combined efforts of M. Delamare-Deboutteville and engineers of the Société Cockerill. On Nov. 20, 1899, such an engine of 600 H.P. was started at the Seraing Works. The results were striking. The thermal yield of the gas-engine was found to be 30 per cent.; while that of the steam-engine was not more than 12 per cent. The metallurgical industry at once saw that here was an important development. A blast-furnace of 100 tons daily output of metal would provide a disposable horse-power of about 2000. At first, there was exaggeration. A young industry, like young humanity, has illusions and great hopes. The drawbacks of dust-laden gases were not realized; and it was thought that special purification was not indispensable. This was a serious mistake; and at one time it seemed as if it would prevent the new engine being a success. But to-day these difficulties have been overcome. Centrifugal fans, the admission of water into the dust, followed by finishing apparatus, reduce the amount of dust to 0.02 gramme per cubic metre. The power of such engines is now reckoned in hundreds of thousands of horse-power; and one American steel works, the Illinois Steel Company, has 120,000 H.P., and before long will have 250,000 H.P.

A priori, the case of coke-oven gas should be comparable to that of blast-furnace gas, notwithstanding their great difference in calorific power. One ton of metal made in a blast-furnace corresponds to 4500 cubic metres of gas at 900 calories, half of which escapes. The usable amount is $900 \times 2250 =$ (say) 2,000,000 calories. The coke necessary for the production of this ton of metal requires $1\frac{1}{2}$ tons of coal, releasing 450 cubic metres of gas at 4500 calories. If 40 per cent. of this volume was disposable, as it would be with regenerative ovens, the surplus gas contains 720,000 calories. This figure may be increased by about one-half, for coke is used for other purposes—cement, sugar, &c.—and so, under favourable conditions, a thermal energy of about half that of blast-furnaces may be reckoned as available. Needless to say, the coke-oven gas-engine is far from realizing this position at present; but progress has been made, and will continue in the future.

DIFFERENT TYPES OF COKE-OVENS.

The carbonization of coal for the production of coke is carried on in a closed vessel—being effected at a very high temperature and continued sufficiently long to eliminate all volatile matter from the coal. Up till recently, there were baker's ovens or beehive ovens, two types of which there are still numbers in England and America, but which are bound to disappear: (1) The ordinary coke-oven (fig. 1), in which all the gas produced passes

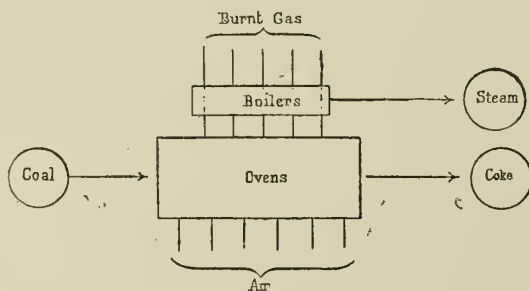


Fig. 1.—Outline of Ordinary Coke-Ovens.

through the walls of the oven after leaving the carbonizing chamber, and at the outlet of the flues is led under the boilers. Thus, coke and steam are obtained, but no surplus gas. (2) The regenerative bye-product oven (fig. 2), in which the gas is sent into

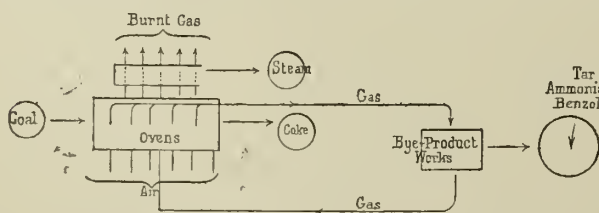


Fig. 2.—Outline of Regenerative Bye-Product Ovens.

a works where the bye-products condensable at ordinary temperature, such as tar, ammonia, and benzol, are obtained. The gas then returns to the oven for the carbonization of the coal;

and the burnt gases, as in the preceding case, are used under the boilers to produce the steam. Thus are obtained coke, tar, ammonia, benzol, and steam; but no surplus gas.

At the beginning of the coke-oven industry, coal having 20 to 21 per cent. of volatile matter was employed; but with the great developments and demands for coke of recent years, richer coals, having 30 to 32 per cent. of volatile matter, have had to be used. [In 1885, the production of cast iron by the principal countries was about 20,500,000 tons; in 1906, it was 58,450,000 tons, almost three times as much.] From M. Bousquet's "Les Fours à Coke Modernes," the following figures are taken, representing the number of calories produced by carbonizing 1 kilo. of dry coal—i.e., the number of calories given off by burning the gas made by the carbonization of this one kilo. of coal: Eschweiler coal, 1904; Baaker Mulde, 1900; Erin, 1913; Osterfeld, 1934; Holland, 1938; Pluto, 1913; Mathias Stinnes, 1985.

In the Pluto mine, the division of the heat produced per kilo. of coal was: Heat produced, 1400 calories; heat used, 660 calories, or 47 per cent.; heat disposable, 740 calories, or 53 per cent. The 660 calories used were divided up as follows:—

Lost by radiation	246.5 c., or 35 per cent.
Taken by the coke	135.5 c., or 20 " "
Taken by volatile matter	180.2 c., or 30 " "
Taken by gas burnt, independent of the boilers.	99.0 c., or 15 " "

This disposable heat of about 50 per cent. can be utilized in two different ways. It can be consumed altogether in the oven-flues and a larger amount of steam raised, or part of the gas can be separated for other purposes and only what is strictly required for the operations led to the ovens. By this means is obtained what in English is known as the "surplus gas," which has filled an important place in the technical literature of recent years. Engineers gave it their attention for two reasons—first, that if this gas was utilized in an engine there would be an advantage to increase the amount of it; and, secondly, because of new ideas which certain gas technicians, more particularly in England and America, believed about 1900 to be advantageous. M. Marquisan has recently fully considered this second aspect of the question.* One started from the idea that the gas-retort had had its day, and that the coke-oven would supply the model for a gas-oven fulfilling all requirements and engaging the attention of the gas industry. There were already some examples of coke-ovens in coal districts providing the lighting of towns (Cie. de Blanzy at Montceau-les-Mines, the Erin Colliery at Castrop, &c.).

To make town gas in a coke-oven can be achieved in two different ways, according to the heating of the ovens. Either a part of the gas of the carbonizing can be used, or gas can be made in a producer. It is the second method which shows a tendency to prevail—e.g., in the ovens at Munich; but it was the first which was originally considered, and which gave rise to the idea of such surplus gas being used for lighting purposes. What then, in the carbonization of coal, is the amount of gas which can be allocated for another purpose beside that of heating regenerative bye-product ovens? It would be a great mistake to suppose that the above figure of 53 per cent. represents the surplus gas. After some calculation, it is said that with coals having even 20 to 21 per cent. of volatile matter, there is no surplus gas. With coals of 25 per cent. of volatile matter, M. Reumaux, in various tests at the Mines de Lens, has found an excess of 12 per cent. under the following conditions:—

Coal in oven	7 tons; 25 per cent. volatile matter.
Moisture	10 per cent.
Ash	9 " "
Three burners	7 air inlets per oven.
Temperature of air	320°
Temperature of gas	50°
Duration of charge	36 hours.
Thickness of flue walls	13 centimetres (5 1/8 ins.)
Production of 325 cubic metres (11,662 cubic feet per ton) of purified gas of a density of 0.482 per (metric) ton of coal carbonized.	

With coal still richer in volatile matter, the quota disposable is higher, and may be 20 per cent. But exaggeration is to be avoided; and if higher figures are given, as at Halifax (by M. Dumuis: "The Use of Coke-Oven Gas for Lighting, Heating, and Gas-Engines": Comptes Rendu de la Société de l'Industrie Minérale, June, 1900) with ten Semet-Solvay ovens $\times 9 \times 170$ metres $\times 0.420$, carbonizing 4500 kilos. of coal in twenty-four

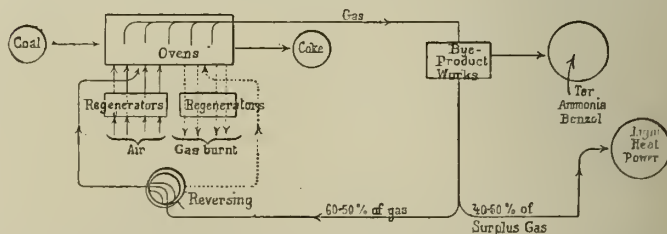


Fig. 3.—Outline of Regenerative Bye-Product Oven, with Regenerators.

hours, giving 32.26 per cent. of surplus gas, regard must be paid to the duration of the working. In the last hours of carbonization, the quantity of gas given off is below that which is required

* See "JOURNAL," Vol. CII., p. 629.

for heating. The proportion of gas disposable can therefore be increased by stopping the working sooner; but the coke made would be less carbonized and of less value for use in a blast-furnace.

But there is a means of increasing the production of surplus gas. This is by applying to the coke-oven the principle of the Siemens regenerator, a combination which was first effected in 1881 and was due to Hoffmann, the inventor of the Otto-Hoffmann oven. The gas from such ovens is, as before, treated in bye-product works. But from there only a part of it returns to the ovens; the remainder, being the surplus, can be used for lighting (as at Glasport, Boston, Rheinelbe installation at Gelsenkirchen), heating at a distance (as in the Lackawanna Iron and Steel Company's works at Pittsburg), or, lastly, for motive power. An oven so designed is called a regenerative bye-product oven, with heat regenerators, to distinguish it from types (1) and (2) previously mentioned. The outline of it is shown in fig. 3. At first, both gas and air were made to circulate in the regenerators, as in the Martin oven or the Siemens glass-furnace; so also in the original Otto-Hoffmann ovens. But heating the gas was soon given up. There was serious danger in heating up a gas so rich in hydrogen as coke-oven gas. Further, it was not necessary, as the combustion of air and gas, without preliminary heating, was enough to attain the necessary temperature; and it was a saving in gas, not a high temperature, that was desired. Also with the high calorific power of coke-oven gas, there was less reason for heating it than with producer gas, of which the calorific power is from three to four times less. Now only the air is heated; and these regenerative ovens are distinguished as cold-air ovens or hot-air ovens.

REGENERATIVE OVENS.

Regenerators may be arranged in two ways—collectively for a bench, or separately for each oven. Of the former type, are the Otto and Coppée ovens; of the latter, the Koppers ovens. Fig. 4 shows an

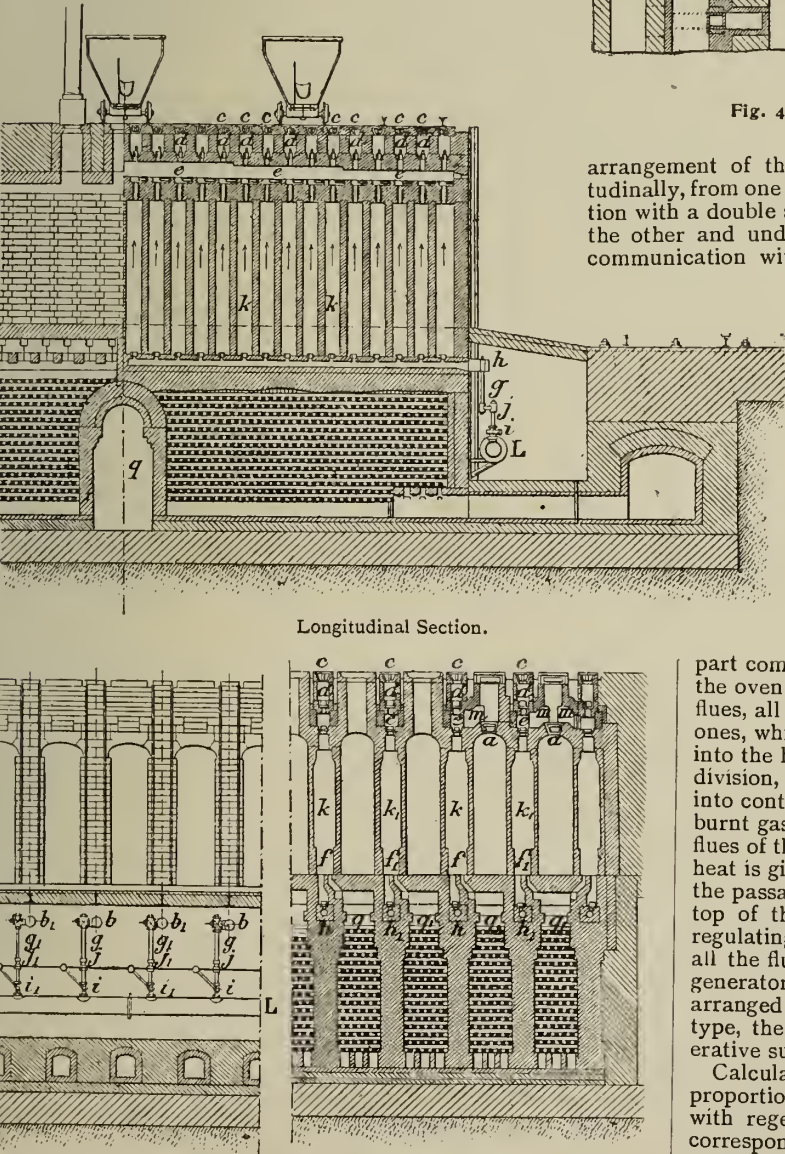


Fig. 4.—Sections of "Otto" Regenerative Ovens.

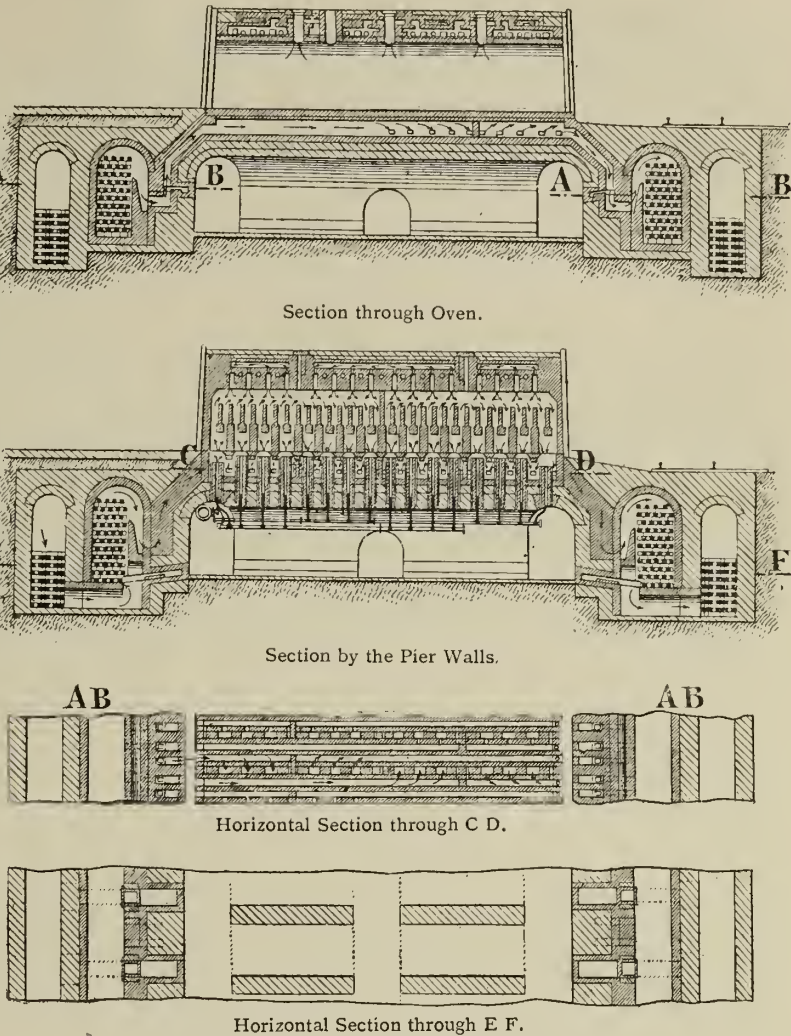


Fig. 5.—Section of "Koppers" Coke Oven.

arrangement of the Otto ovens. The regenerators are arranged longitudinally, from one side to the other of the bench. They are in communication with a double system of horizontal flues placed from one front wall to the other and under the floor of the ovens. These flues are likewise in communication with the points at which the gas issues. The whole is arranged so that at any given moment only one half of the vertical flues are supplied with gas. The burnt gases go up the flues, pass down again through those next to them, reach the second horizontal flue, and from there the regenerator of the other side of the oven, and so to the chimney. When the regenerator, where the air circulates, is cooled down to a certain degree, a reversion takes place. The other half of the flues is, in its turn, fed with gas and air, and the cooled bulk receives the burnt gases, which return the calories taken up by the air in the first operation. In the Otto oven, there are about sixteen vertical flues.

Fig. 5 shows the construction of a Koppers oven with a special regenerator to each oven. The whole mass of the oven is divided into two parts by a horizontal plan at the height of the floor. The lower part comprises the regenerators, and the upper part consists of the oven itself. The division-wall of the ovens has thirty vertical flues, all of the same section, with the exception of the two end ones, which are rather larger. The gas arrives at *g* and passes into the horizontal ducts *h* and *h*₁, arranged at the bottom of each division, and are distributed in the flues *k*. It is there brought into contact with the hot air arriving through the openings *f*. The burnt gases collect in the horizontal passage *e*, pass down the flues of the other half, and through the regenerators, where their heat is given up before reaching the chimney. Every half-hour the passage of the gas and air is automatically reversed. At the top of the flues are small fire-brick dampers *e*, which allow of regulating the chimney draught so as to get a uniform pull over all the flues. In the first Koppers ovens, the capacity of the regenerators per oven was 2.4 cubic metres; and the bricks were so arranged as to give a contact of 33.6 square metres. In the latest type, the capacity is 5.48 cubic metres per oven, and the regenerative surface is about 76.7 square metres.

Calculations show that if with an ordinary waste-gas oven the proportion of surplus gas is either nothing or 10 to 20 per cent., with regenerators it would be 35, 41½, or 48 per cent. in each corresponding case. These figures are realized in actual working. One oven can carbonize 8 tons in 36 hours. At 300 cubic metres of gas per ton of coal (10,765 cubic feet), the excess would represent 640 cubic metres (22,600 cubic feet) per twenty-four hours,

or 26·6 cubic metres (say, 940 cubic feet) per hour. It is easy to get the kilowatt-hour with 1 cubic metre of gas at 4000 calories; per oven there would be about 25 k.w.h., and each ton of coal carbonized would produce 120 kilowatt-hours.

The author then proceeds to explain the practical necessity of specially purifying the gas for its use in gas-engines; but as these observations are largely similar to coal-gas purification, they need not here be further dwelt upon. But he gives some figures of the purifying surface required that may be quoted:

Power of Engines.	Purifying Surface.	Surface per 1000 H.P.
600 H.P. ..	27 sq. metres ..	45'0 sq. metres
1500 " ..	32 " " ..	21'3 " "
1840 " ..	32 " " ..	17'8 " "
3000 " ..	60 " " ..	20'0 " "
3600 " ..	240 " " ..	40'0 " "

Attempts have been made, especially in England, to effect great simplification and saving by wet purification; but not with much success. At the Mathias Stinnes Mine, near Essen, the gas is passed through a washer filled with water pregated with hydrated oxide of iron, forming a precipitate of sulphate of iron. When the deposit is sufficient, the apparatus is changed; being worked up by compressed air to revivify the oxide. But it is not a practical success. It is to be hoped, however, that the costly and cumbersome purifier-boxes are not the final solution of the problem.

Next is considered, from the mechanical point of view, the use of coke-oven gas in gas-engines. Coke-oven gas is distinguished from lighting gas by its having fewer heavy hydrocarbons and less methane, and more hydrogen and nitrogen. The following analyses are given:—

Coals.	H.	CH ₄ .	C _m H _m .	CO.	CO ₂ .	N + O.
Eschweiler . . .	56'7	22'4	1'3	5'5	2'0	12'5
Consolidation . .	48'9	35'8	3'2	7'2	0'7	3'7
Rheinpreussen . .	55'4	31'16	0'83	4'48	1'9	11'3
"	45'6	24'4	0'7	5'5	2'9	20'7
Hibernia	48'0	22'0	2'0	5'5	2'0	29'6
Lens	58'0	20'0	1'5	6'0	3'0	11'5

The lower calorific power (latent heat not included) varies from 3600 to 4000 calories. At Lens, contrary to the general view, there is great regularity in the calorific power of the gas at different hours of the day; the variation generally being less than 5 per cent.

The essential conditions of good working with engines using coke-oven gas are: (a) To use a perfectly purified gas; (b) to have perfectly clean cylinders and explosion chambers; (c) to have an experienced staff of workmen to look after them.

The following diagram (fig. 6) is instructive, as showing the average composition of the different gases used in gas-engines.

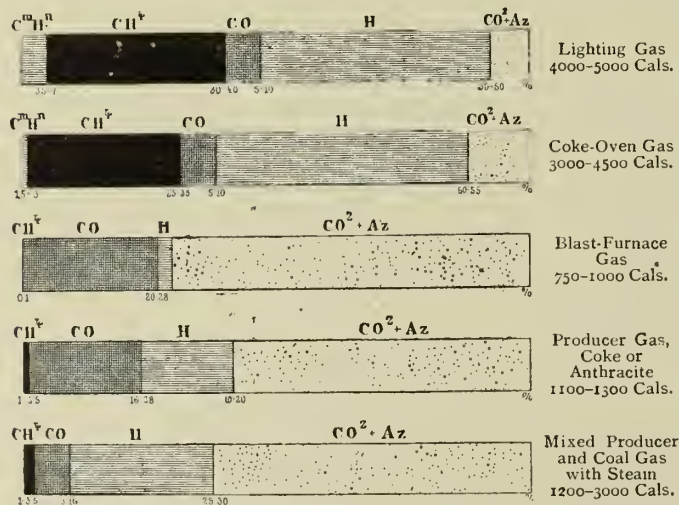


Fig. 6.—Average Composition of Gases Used in Engines.

Several pages are next devoted to mechanical details of gas-engines for use with coke-oven gas, their regulation and economical working. Lastly, short descriptions are given of actual installations at work, such as those at Lens; detailed figures of the plant being set out, together with a general plan of the works.

The whole contribution of M. Cuvelette, dealing as it does with a somewhat novel and an increasingly important subject, is well worthy of attention by all interested in the developments of coal carbonization.

Vertical Gas-Retort Syndicate, Limited.—Under this title, a Company was registered on the 13th inst., with a capital of £5000 in £1 shares, to manufacture under licence from the Dessauer Vertikal Gesellschaft, m.b.H., of Schöneberger Ufer, 25, Berlin. The principal subscribers for shares are Mr. Charles Hunt, who takes 1400, and Mr. Samuel Cutler, who has 1000. Mr. Clifford Hunt is Secretary of the Syndicate, whose registered office is No. 17, Victoria Street, S.W.

SLOT-METER SYSTEM.

By EDWARD A. HARMAN, M.INST.C.E.

[A Paper read before the Manchester District Institution of Gas Engineers, May 22.]

The subject of this paper becomes of greater importance every year. Since the introduction of the system, its development has been phenomenal, requiring an evolution and a revolution in distribution and collection.

It is safe to affirm that the fostering of the slot-meter business has brought about an entire change in the relations between gas undertakings and their consumers. Instead of an attitude of independence towards consumers, and of indifference as to what uses were made of gas, one of active interest has taken its place. Every effort is now made to demonstrate the advantages of gas, and authorities interest themselves in ensuring that the most up-to-date and efficient appliances can be readily obtained. The supply of cookers, fires, wash-boilers, and the maintenance of incandescent burners upon easy terms, afford a sufficient illustration of this modification in the policy of gas authorities.

The author considered that a short contribution might perhaps be of service in eliciting experience upon many points of importance. One advantage the subject possesses is that managers of small works are as competent to discuss it and add valuable information thereon as those in charge of larger undertakings. He, therefore, proposes to state his own experience in a few facts which may form a basis for consideration, rather than a treatise upon the whole subject. No originality is claimed; but if any of the methods described in this paper, or brought out in subsequent discussion, are found suitable for adoption elsewhere, a useful purpose will have been served.

It will be generally recognized that different districts require different treatment; and it is with the object of obtaining the experience of other districts that this paper is submitted. Some systems used in one part of the country would be quite useless if tried in another, and *vice versa*. The author is not so infatuated with the slot-meter system as to be blind to its defects, and many objections might be named. To the working classes the introduction of the slot-meter system has proved an inestimable benefit, by putting within their reach a safe illuminant, and thus abolishing the dangerous petroleum lamp.

A dozen or more years since, the general attitude of gas authorities towards the system was hardly serious; but to-day few undertakings can afford to ignore it. In August, 1896, as an experiment, the Huddersfield Corporation purchased five dozen slot-meters, since which date up to the end of March last, the number fixed amounts to 15,624.

Form "A" shows the progress of the system for the past twelve years.

FORM "A."

Year Ending March 31.	Number of Slot Consumers.	Number Added in Year.	Gas Sold through Slot-Meters.		Per Cent. of Total Sold.
			Cubic Feet. Thousands.	Cubic Feet Per Meter.	
1897	425	425	802	1,890	0'15
1898	1,259	834	6,127	4,870	1'23
1899	3,197	1,938	23,714	7,420	4'40
1900	4,595	1,398	44,533	9,690	7'70
1901	5,651	1,056	59,151	10,470	10'53
1902	7,033	1,382	79,314	11,280	13'97
1903	8,476	1,443	90,986	10,730	16'18
1904	9,893	1,417	111,699	11,290	19'11
1905	11,505	1,612	130,179	11,315	21'52
1906	12,713	1,208	149,935	11,715	24'02
1907	13,651	938	169,998	12,450	24'83
1908	14,717	1,066	191,900	13,040	26'46
1909	15,624	907	214,299	13,715	28'75

The Huddersfield Corporation do not supply any internal gas-fittings, but lay the service pipe, and fix a meter and cooker free of charge. It will be seen that either the landlord or the tenant must instal the necessary internal gas-fittings according to requirements.

It is generally found that a gas-cooker is desired; and at the present time there are 12,424 slot cookers in use. Many slot consumers prefer to hire a larger cooker, as the ordinary stove-hire rentals are very reasonable.

When a new consumer applies for a supply of gas through a slot meter, an agreement is negotiated binding payment for all gas consumed at the customary charge of 30 cubic feet per 1d. (excluding the rebate). It also stipulates that 48 hours' notice be given when desirous of ceasing to burn gas, as per agreement Form "B." For exchanging an ordinary for a slot meter, a charge of 2s. 6d. is made.

FORM "B."

AGREEMENT FOR PREPAYMENT METER AND COOKER.

Huddersfield 190

To the Huddersfield Corporation Gas Department.

Please supply gas to the above premises at the rate of 30 cubic feet for one penny as registered by the automatic meter—this charge to include

FORM "C."—Name of Street.

Date.	Name of Consumer.	No. of House.	Size of Meter.	No. of Meter.	Date. Meter Indication.	Cash in Box.	Date. Meter Indication.	Cash in Box.	Date. Meter Indication.	Cash in Box.	Date. Meter Indication.	Cash in Box.

FORM "D."

Date.	Indications.	Consumption.	Money Value. £ s. d.	Date Collected.	Cash in Box.	Short.	Over.	Remarks.

FORM "E."—Prepayment-Meter Cash-Book.

Date.	Folio.	NAME.	Consumption.	Amount Due.	Cash in Box.	Total Consumption.	Total Amount Collected.

the rent of the meter, cooker, fittings, &c., which will remain the property of the Corporation. I undertake not to disconnect, nor allow any person other than a servant of the Corporation to disconnect, or remove them.

I hereby agree to pay a minimum amount of six shillings per annum into the meter (in lieu of rent), failing which, I guarantee to pay the balance upon demand.

In the event of my leaving the premises before the expiration of a year, providing the cash paid by me into the meter-box does not amount to six shillings, I agree to pay the balance forthwith.

I also agree to keep the cooker and apparatus clean and in thorough working order during the whole time it is in my possession, and further agree to pay for any damage which may be done to the same—ordinary wear and tear excepted.

I agree to your inspectors entering my premises at all reasonable times to collect the money, inspect, repair, or renew the meter, cooker, fittings, &c.

Before leaving the premises, I undertake to give you 48 hours' notice.

In case of any defect in the automatic arrangement of the meter, whereby gas passes without prepayment, or by which an incorrect quantity is given for a penny, I agree to be charged by the meter index.

Signed _____

Date _____ 190

The Corporation, by the undersigned, engages to supply the gas upon the terms and conditions above mentioned.

Witness _____

The slot-meter collectors' duties are so arranged that one man does not empty the same meter on two consecutive occasions. Thus each inspector constitutes a check on the indication previously taken. The inspector first enters the indication of the meter in a book provided for the purpose. He then takes the money from the box, and makes it up into five-shilling bags, for which there is a ready demand from the shopkeepers in the district. Paper bags are provided, which each inspector after filling has to initial. The inspectors leave the works at 8.30 a.m. and return about 4.30 p.m.

The meter indications are entered from the inspector's book, Form "C," into the meter books; the consumption cast out; and the amount due, together with the cash actually received, entered in separate columns, Form "D." At the same time the consumer's name, the gas consumed, cash due and received, are entered in the slot cash-book, Form "E." Four clerks thus dispose of the work of eight inspectors in forty minutes. In the case of any disparity between the amount collected from the meters and that brought into the works, the inspector is held responsible.

The system of disposing of the copper to the various tradesmen has proved to be a practicable working arrangement, not only in preventing the trouble of a large quantity of copper having to be dealt with at the office, but also in accommodating the shopkeepers with change.

FORM "F."

Year ending March 31.	Amount Collected.	Price.
1897	£133	25 cubic feet per penny.
1898	1,021	do.
1899	3,308	From April, 1899.
		30 cubic feet per penny.
1900	6,123	do.
1901	8,133	do.
1902	10,905	do.
1903	12,510	do.
1904	15,513	do.
1905	18,080	do.
1906	19,492	From January, 1906.
		33 cubic feet per penny.
1907	21,642	do.
1908	22,210	From April, 1907.
		36 cubic feet per penny.
1909	22,322	From April, 1908.
		40 cubic feet per penny.
	£161,392	

Form "F" shows the prices charged for gas from March 31, 1897, and also the amount of money collected from the slot-meters. It will be observed that the price first charged for gas was 25 cubic feet per rd.; and the quantity was increased in April, 1899, to

30 cubic feet per rd.—the meters being altered to give this quantity. In January, 1906, the number of cubic feet per rd. was increased to 33.

Previous experience having proved that to alter the mechanism of the meters was a formidable task, it was decided to adopt as an experiment a discount system of rd. for every rs. deposited in the meters. In April, 1907, the gas supplied was increased to 36 cubic feet per rd.; and the discount returned was increased to 2d. for every rs. deposited in the meters. In April, 1908, the number of cubic feet per rd. was further increased to 40; and a discount of 3d. in the shilling allowed.

It may be mentioned that the discount or rebate system is exceedingly popular. The reduction in charges would not have been appreciated so much if the meters had been adjusted to pass the gas actually charged for. The return of 5s. for every £1 paid into the meter is an apparent and tangible reduction. To those familiar with the dividend system in vogue with the Co-Operative Societies in Northern towns, this point will be fully appreciated.

Cases of tampering or breaking into the meters are few and far between. The consumer, having a monetary interest involved in the meter, is careful to give due notice of removal or anything wrong with the meter.

Another great advantage derived by the gas authorities is the provision made by consumers for access to be had to their meters, when the inspector is due in any district. The trouble in obtaining access to the gas-meter in houses which are often locked up during the daytime is well known.

Form "G" shows the statement of gas sold for all purposes. The total quantity sold for all uses in the year 1897 amounted to 516 million cubic feet; and in the year 1909, to 745 million cubic feet—an increase of 229 millions, or about 44 per cent. It will be noticed that the increase is only a trifle more than the gas sold through the slot-meter system during the year ending March 31 last.

FORM "G."—Year ending March 31, 1909.

Gas sold for lighting purposes at 2s. per 1000	235,132,800 cubic feet.
Gas sold for stoves and power at 1s. 6d. per 1000	247,263,400 cubic feet.
Gas sold for stoves and power at 1s. 2d. per 1000	368,400 cubic feet.
	247,631,800 cubic feet.
Gas sold through slot-meters at 2s. per 1000	214,299,700 cubic feet.
Gas sold for public and private lamps	48,336,000 cubic feet.
Total gas sold	745,400,300 cubic feet.
Increase over previous year	20,397,300 cubic feet.
Increase per cent.	2'81

Total number of gas consumers through ordinary meters	12,925
Total number of gas consumers through slot-meters	15,624
	28,549

One great advantage the slot-meter consumer derives is the absence of a gas account; and another is that in the event of any serious leakage in the gas-fittings only a limited quantity of gas can escape before the supply is shut off. Consumers are also assisted in checking the quantity of gas used, which leads to the prevention of waste.

That the system has disadvantages and difficulties still to be overcome does not need emphasizing. The method of payment by its very nature involves a complicated system of house-to-house visitation frequently for small amounts of money. Awkward moments arise when an exciting search has to be made for a penny to prevent the house being plunged into darkness. In some towns banks have refused to accept the copper. This has caused a difficulty in changing it, and the gas authorities have been compelled to accumulate large quantities—necessarily involving

a loss of interest. The accumulation of money (in a slot-meter) inclosed in most cases by a frail tin box is undesirable; but, as already pointed out, this difficulty has been entirely overcome in Huddersfield by the adoption of the discount or rebate system.

Fortunately in Huddersfield there is only one charge for gas through slot-meters; but the author is alive to the difficulties experienced where a scale of differential prices has to be adopted for the use of gas cooking-stoves, fittings, &c.

It is apparent that the system of changing the copper upon the district does away with the provision of hand-carts, mechanical coin counters, &c.

Occasionally, the prepayment part of a meter fails to cut off the supply of gas when the measured quantity has passed through, and the meter will deliver gas without money being inserted. A clause, therefore, is included in the slot-meter agreement to deal with this deficiency, as will be seen upon reference thereto. When such a contingency arises, a demand note for the amount owing is made out to the consumer.

It has also been found desirable to have a clause in the agreement providing that a minimum amount of 6s. per annum must be paid into the meter by the consumer (in lieu of rent), failing which, the balance must be paid on demand.

The Huddersfield Corporation have adopted a system of paying for the meters out of revenue.

The prices of gas supplied through ordinary meters are as follows: For lighting purposes, 2s. per 1000 cubic feet; for stoves and engines, 1s. 6d. per 1000 cubic feet—both prices subject to 5 per cent. discount for payment within one month.

The gas accounts are rendered three times annually—January, April, and October. Thus the ordinary consumer has the advantage of four and seven months' credit respectively; and as the meter indications necessarily have to be taken some considerable time before the end of the month concerned, it practically amounts to a credit of five and eight months respectively for a portion of the gas consumed. Compared with this, it will be borne in mind that the slot-meter consumer actually prepays for gas, which is an important consideration. At the end of the meter-indicating-period, the ordinary consumer has at least one month's credit; while the cash from the slot-meters is already in the bank.

Under present conditions, the convenience and comfort afforded to all classes of the community who desire the use of slot-meters are great. The fact that some undertakings do not supply slot-meters, cookers, and service-pipes free of charge does not, in the author's judgment, cancel this fact. To what extent a gas undertaking is justified in supplying free internal gas-fittings is an open question, and must depend largely upon local conditions.

All the slot-cookers supplied by the Huddersfield Corporation have a badge affixed attesting their ownership.

As regards the cost of collection, the idea universally prevalent is that it is enormously heavier in the case of slot-meters than with ordinary ones. In the author's opinion, this is a fallacy. It is quite true that if the monetary value alone is taken into account, then the cost may appear heavier. The cost of inspection and collection is certainly not heavier in the case of a consumer taking a million cubic feet than 1000 cubic feet. But to be strictly correct, the basis of comparison should be "per consumer;" and if this be considered, then it can be shown that the cost of a slot consumer for inspection and collection is not greater than for an ordinary consumer. It must be remembered to reckon "per consumer" and not "per 1000 feet of gas sold."

A little over ten years since, in the "JOURNAL OF GAS LIGHTING" (Dec. 20, 1898, p. 1420), a letter appeared from the author expressing his full satisfaction with the adoption of the slot-meter system; and after a further ten years' experience, he corroborates the same.

EFFECTS OF COMPRESSION ON

CARBURETTED WATER GAS.

At the Annual Meeting of the Illinois Gas Association, a paper was submitted on the "Effects of Compression and Transmission on the Candle Power and Heat Units of Gas." It was in two parts. The first was by Messrs. H. E. Bates and J. R. Rafferty; and it was read by the latter. The following are some extracts from it.

The opening paragraphs were devoted to some general remarks on the composition of gas, which led the authors to the statement that the only constituents which were probably affected by the pressure used in their tests were the illuminants; and they said the reason for this might be emphasized by drawing the distinction between a gas and a vapour. Having determined in a broad way the probable composition which the illuminants approach, the authors proceeded to consider what factors affected them, so far as their tests were concerned. They then gave the following particulars in regard to the tests.

A 3 H.P. vertical engine ran a compressor by means of a belt. The compressor was connected by a short length of pipe to two 30-gallon galvanized iron tanks, in which the gas was compressed. The tanks were so connected that the pressure in each was the same at all times, and was indicated by a gauge. A thermometer

on the tanks showed the temperature of the compressed gas, and cocks on the bottom of each tank provided means of removing any condensation that might be formed. A Williamson high-pressure governor on the outlet from the tanks regulated the pressure of the gas; and the latter was further regulated by passing it into a meter-prover. The outlet to this was connected by two branch pipes to a Junkers calorimeter and to a 110-inch bar photometer. The branch pipe to the calorimeter was also connected to a Morehead burette, so that a gas analysis could be made. The gas used in all the tests was carburetted water gas; and all tests were conducted in the following manner.

The candle power and the heating value of the normal gas were taken, and then the gas was compressed to the desired pressure, the inlet-valve closed, and the gas allowed to stand for about an hour, until it had cooled down to the room temperature. After standing for an hour, whatever condensation may have been formed was removed, and then the compressed gas passed through the Williamson governor into the meter-prover. Thence it passed at constant pressure into the branch pipes leading to the photometer and calorimeter.

Tests were made at three different pressures each day; and, as the normal gas during any one day was fairly constant, one complete analysis each day was made, and the carbon dioxide and illuminants determined in the gas after each compression. After testing the gas at any one pressure, and before compressing to a different pressure, the outlet and inlet valves were opened, and gas was pumped through the system. This purged the tanks and pipes of all gas and condensation which may have been left from the previous test, and thus prevented the new gas compressed from taking up any of the condensation, which would nullify the test. The piping was so arranged that the gas entered the storage-tanks near the bottom, and was drawn out at the top. By this arrangement, whatever condensation deposited, due to the compression of the gas, settled on the bottom, and could be withdrawn. This prevented the gas mechanically taking up the condensation again when the pressure was released.

Simultaneous readings of candle power and heat value of the gas were taken. A No. 7 Bray burner, of the slit-union type, was used, burning gas at the rate of 5 cubic feet per hour. It was intended to remove the condensation, and then obtain its vapour tension; but on subsequent removal of the condensation, the amount obtained was only a trace, which was too small to make any determinations. This was contrary to what we had expected; but the small quantity obtained was due, no doubt, to the size of the containing tanks; each one holding only 6½ feet of gas.

Gas of different candle powers was tested: One of 21, one of 22, and one of 24 candle power. The reason for taking such a course was to affirm or refute the idea, held by many experienced gas men, that the higher the candle power of the gas the larger the drop on compression. The following table gives the candle power and heat value drop for the different candle power gases:—

21-Candle Gas.			22-Candle Gas.			24-Candle Gas.		
Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P.	Drop in B.Th.U.	Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P.	Drop in B.Th.U.	Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P.	Drop in B.Th.U.
5	0'58	7*	5	0'40	5	5	0'79	19
10	0'93	6	10	0'90	7	10	1'20	15
15	1'44	4	25	2'10	16	25	1'70	22
20	2'04	14	55	3'30	19	35	1'76	6
30	2'40	16	80	3'45	19	50	2'50	16
40	2'80	20	85	3'50	16	60	2'49	20
45	2'81	8	100	3'28	27	65	2'81	11
70	2'95	15	..	..	..	80	3'02	32
75	3'30	12	..	..	..	90	3'23	37
100	3'25	17	..	..	..	..	..	..

* In this one instance we obtained an increase in B.Th.U. when the gas was compressed.

The figures given in the next table indicate the percentage drop in candle power and heat value:—

21-Candle Gas.			22-Candle Gas.			24-Candle Gas.		
Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P. Per Ct.	Drop in B.Th.U. Per Ct.	Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P. Per Ct.	Drop in B.Th.U. Per Ct.	Pres- sure, Pounds Per Sq. Inch.	Drop in C.-P. Per Ct.	Drop in B.Th.U. Per Ct.
5	2'70	1'06*	5	1'80	0'73	5	3'30	2'63
10	4'43	0'89	10	4'05	1'01	10	5'11	2'14
15	6'86	0'59	25	9'62	2'35	25	7'06	3'08
20	9'50	2'09	55	14'90	2'80	35	7'43	0'85
30	11'23	2'34	80	15'60	2'81	50	10'60	2'28
40	13'30	3'05	85	15'60	3'31	60	10'50	2'82
45	13'50	1'19	100	15'24	3'92	65	11'70	1'54
70	14'10	2'25	..	..	..	80	12'57	4'42
75	15'60	1'77	..	..	..	90	13'63	5'20
100	15'50	2'53	..	..	..	..	..	..

* Increase.

The first table shows the variable results obtained in our heat-value tests. While the candle power decreased uniformly with the pressure, the heat value did not. By consulting the heat-value results given, we have a different state of affairs from that

which obtained when we considered our candle power data. Whereas the luminosity of the 24-candle gas experienced less drop than the 21-candle or the 22-candle gas, the conditions are reversed in considering the heat values. In other words, the loss in heat value was greatest with the gas of high candle power. The variability of these heat-value figures must limit the conclusions drawn to a very general character. They indicate that the condensation obtained at the same pressure for the three gases is not of the same character. At any rate, the condensate of the 24-candle gas possesses hydrocarbons which have a lower candle power and higher heat value than those found in the condensate of the 21-candle gas. If we assume that the 24-candle gas contains more complex hydrocarbons than the 21-candle gas—and we have good ground for the assumption—we can imagine why the heat-value drop was largest with gas of high candle power, for these complex illuminants have a very high heat value, and a low vapour tension. They are, therefore, easily condensable; and the gas that loses most of them suffers most in heat-value.

In conclusion, we may summarize the results obtained by compressing carburetted water gas:

- 1.—The candle power of carburetted water gas decreases as the pressure increases from 0 lb. to 100 lbs., temperature remaining constant.
- 2.—The loss in candle power due to compression of gas of high candle power is not so great as that obtained from compressing gas of low candle power.
- 3.—The loss in candle power due to the compression of water gas is greater between 5 lbs. and 60 lbs. pressure than between 60 lbs. and 100 lbs. pressure.
- 4.—The heating value of water gas decreases as the pressure increases from 0 lb. to 100 lbs., temperature remaining constant.
- 5.—The loss of heating value due to the compression of water gas is greater for gas of high candle power than for gas of low candle power.

FÉRY'S SPIRAL PYROMETER.

Some particulars are to hand of this new form of pyrometer, beyond those contained in the paper read last February by Mr. G. C. Pearson, of Birmingham, before the Midland Junior Gas Association, and reported in the "JOURNAL" at the time—see Vol. CV., p. 457-60. This modification of his well-known pyrometer has been designed by Professor Ch. Féry, of the Ecole Municipale de Physique et de Chemie Industrielle, Paris, in order to overcome some of the defects that have been found to exist when the instrument is employed for works' tests, as contrasted with laboratory use. One of the disadvantages referred to is the fact that a galvanometer has always to be used in conjunction with it, which necessitates a comparatively level spot on which to

place the galvanometer, and the employment of leads to connect the pyrometer to the galvanometer.

Realizing this drawback, Professor Féry has produced an instrument which, while having practically all the advantages of the old one, does not require either a galvanometer or leads. The instrument is a complete unit in itself; and only those who have had to take the temperatures of a gas-retort with the older type can fully appreciate what this means.

The principle and construction of the new instrument are extremely simple. Instead of the heat rays being concentrated on a thermo-electric couple, as in the earlier form, they are focussed on a small bi-metallic strip made of two metals rolled into the form of a spiral, which unrolls when heated, owing to the largely different coefficients of expansion of the metals used.

Fig. 1 shows the spiral enlarged; its centre being fixed while its outer free end carries a light aluminium pointer, which, as the

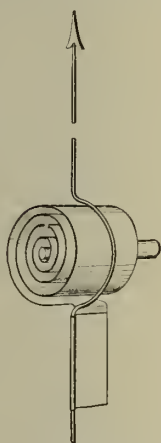


Fig. 1.—The Spiral (four times full size).

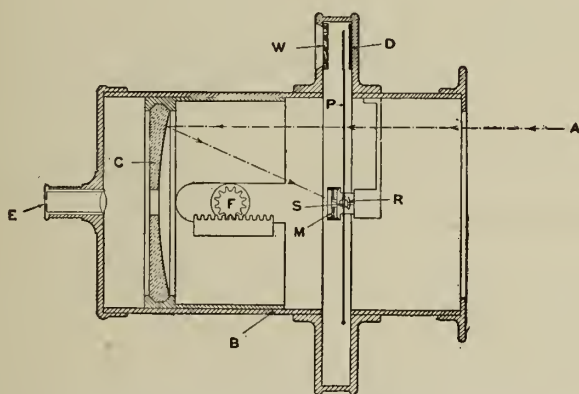


Fig. 2.—Section through the Pyrometer (one-third full size).

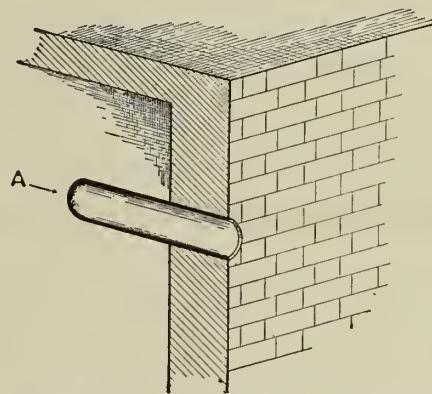


Fig. 5.—Showing Method of Testing Furnace.

spiral unfolds, moves in front of a scale calibrated in temperature. The spiral is very small—actually measuring less than one-eighth of an inch (3 mm.) in diameter, and 5-64ths of an inch (2 mm.) wide. It is blacked, so as to absorb as large a quantity of heat as possible. Any radiation passing through its convolutions is at once reflected back on to it by means of a small mirror (not shown) placed behind it.

Fig. 2 shows diagrammatically a sectional view through the instrument. A is one of the heat rays which, coming from the furnace or hot body, strike the concave mirror C, and are reflected to a focus on the small spiral S. The pointer P moves in front of the scale D; the observation being taken through the glass window W. A shutter (not shown) is provided in front of the instrument, to screen off all radiated heat until it is desired to take a reading.

In order to eliminate errors which may arise through changes in the actual temperature of the instrument, an adjustment is provided by which the centre rod supporting the spiral may be turned, and thus the needle set to the zero on the scale. It is important that this zero adjustment should be made immediately before taking any observation; the shutter in front of the pyrometer being closed while the setting adjustment is made by a small knob on the side of the instrument. On opening the shutter and exposing the instrument to the heat rays, the pointer rises rapidly to some point on the scale and then pauses. This point is the temperature of the hot body. It will be noticed, as the instrument as a whole gets hotter, that the pointer creeps up slowly; and if the pyrometer is left in position for a comparatively long while, a second zero reading must be taken and a correction applied for the new zero reading.

Extreme scientific precision is not claimed for this new instrument, but an accuracy of between 1 and 2 per cent. is said to be readily obtainable.

The table of results given by Mr. Pearson in the paper already referred to (see p. 460 of the "JOURNAL" for Feb. 16 last) showed the results of comparative tests between a standardized Féry



Fig. 3.—Front View of the Féry Spiral Pyrometer, Showing Scale and Pointer.



Fig. 4.—The Pyrometer Mounted on its Tripod.

thermo-electric radiation pyrometer and the new spiral type of instrument. The figures are of particular interest, as they were made by an observer who had practically no experience with the new instrument, and were taken in a retort-house in full operation. The two pyrometers were focussed on the same point in the retort, and the readings were taken simultaneously.

The instrument is portable, and is supplied with a light, rigid wooden tripod. Fig. 3 shows the front view of the pyrometer with the temperature scale and pointer. As at present constructed, the instrument is made with three different scales, which

will, it is believed, cover most commercial requirements. These scales are:

- (1) 500° to 1100° C., which will cover practically all annealing, hardening, and case-hardening temperatures.
- (2) 500° to 1400° C., covering practically all the temperatures met with in gas-works, the pottery trade, &c. It is, on the whole, the most generally useful range.
- (3) 500° to 1700° C., covering any temperature in a steel-works.

In order to get true temperature readings with this and all types of radiation pyrometers, the condition which should be fulfilled is that the hot body sighted-on should be contained within a chamber the walls of which are at approximately the same temperature as itself. This condition is, of course, fulfilled in most practical cases—such as in taking the temperature of the inside of a gas-retort, fire-box, annealing, hardening, or muffle furnace, &c. The error caused by the fact of the furnace door being open when sighting is negligible—especially as the instrument is calibrated under these same conditions.

If it is desired to take observations without opening the door of the furnace or making any opening in the wall, the arrangement illustrated by fig. 5 may be adopted. A cast-iron or fire-clay tube is built into the furnace wall; the tube being closed at the end A, which is inside the furnace, and open at the other end. Since the tube takes up the temperature of the furnace for some distance along its length, it fulfils sufficiently closely the required conditions of a closed chamber with walls at the high temperature; and therefore by sighting on the blind end A, the true temperature is registered without allowing any cold air to find its way into the furnace, or any flame to come out.

In measuring the temperature of any body which is not inside a closed chamber with hot walls, the reading obtained will be lower than the true temperature of the body. The amount by which the reading will be low depends chiefly on the nature of the surface of the body itself. For instance, in the case of a block of carbon, it will be very small, since carbon is what is known as "black body;" while in the case of a crucible of copper with a clean surface, the reading will be perhaps 100° or more below the true temperature. Although no definite figures can be given for this apparent error (as it depends on local conditions), yet, if the conditions remain the same, the error will be a constant one; so that it may be determined once for all experimentally by measuring the temperature of the body first inside and then outside the furnace.

This new Féry spiral pyrometer is being constructed in this country by the Cambridge Scientific Instrument Company, of Cambridge.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

The Seventh Annual Meeting of the Association was held on Friday at the Cripplegate Institute, Golden Lane, E.C.—the President (Mr. W. J. Liberty) in the chair. The business of the evening was the adoption of the report and balance-sheet, and the election of officers for the ensuing year.

After the transaction of the formal business, the President gave a *résumé* of the past session. In the course of this he said that the membership was 123, representing 21 gas undertakings. The session had been remarkable for the amount of work accomplished, and the number of fresh features started. A Joint Meeting of the Junior Gas Associations was held in London last August. Several works were then visited; and a drive was taken through the most important parts of London. In the afternoon, there was a meeting at the Franco-British Exhibition, when the Association's patron, Mr. H. E. Jones, gave an address; while the Gaslight and Coke Company received the members at tea in the Gas Section of the Exhibition. At that meeting, a Joint Council was formed to meet annually and discuss how best to further the interests of the juniors throughout the country. A Joint Council meeting was held at Manchester in February, at which the Association was represented. It had been decided during the year to publish in a separate volume for the first time the "Transactions" of the Association; and it was hoped that the possession of such a record of the work done would be appreciated by the members—the payment of the current subscription entitling them to have a copy free. The Livesey Memorial Fund had been taken up by the members; and the sum of £4 4s., made up of individual subscriptions, had been forwarded to the Secretary of the Institution of Gas Engineers. The thanks of the Association were extended to the authors of papers and addresses, as well as to the Engineers and others who (on the occasions of the various visits) had so kindly entertained the members and given them so much valuable information. During February, a very successful Association dinner was held, which helped to bring the members into closer touch with each other. In conclusion, he remarked that the past year had been one of progress in the gas industry generally. Many were the changes taking place; and fortunate were the members who were in training in the profession during this time of transition and new development.

The result of the election of officers was as follows: Senior Vice-President—Mr. L. F. Tooth. Junior Vice-President—Mr. T. F. Canning. Council—Messrs. J. G. Clark, F. Ainsworth, D. J. Winslow, K. Sproston, J. R. Gale, P. J. Smithers, E. Sears,

and H. Rothwell. Mr. J. G. Clark having relinquished the Hon. Secretaryship after three years of office, Mr. S. A. Carpenter was elected in his place; while to the office of Hon. Treasurer vacated by Mr. Carpenter, Mr. J. Hewett was elected. Mr. E. Merry was re-elected Hon. Auditor. Owing to the resignation of Mr. W. A. Barnett as Senior Vice-President, Mr. W. J. Liberty was, on the recommendation of the Council, unanimously re-elected by the Association as President for the year ensuing.

The Association passed a special vote of thanks to Mr. Clark for his services as Hon. Secretary during the last three years; and a Sub-Committee was formed to give effect to the resolution in a concrete form. Mr. Carpenter and Mr. Merry were also thanked for carrying out the duties of Hon. Treasurer and Hon. Auditor respectively.

Association of Water Engineers.

The fourteenth annual general meeting of the Association will be held in Durham from the 10th to the 12th of June, under the presidency of Mr. Robert Askwith, M.Inst.C.E., the Engineer of the Weardale and Consett Water Company. According to the circular issued by the Secretary (Mr. Percy Griffith, M.Inst.C.E., F.G.S.), the business will be transacted in the Town Hall, and the proceedings will be opened with a welcome by the Mayor, Mr. J. F. Boyd, J.P. Papers on the following subjects have been promised:—

"Steam-Driven Pumping Plant for Deep Wells and Boreholes," by Mr. Alfred Towler.

"Working Results of Pumping-Engines Operated by Producer Gas," by Mr. D. Hastings Irwin.

"The Selby New Water-Works," by Mr. Percy Griffith and Mr. Bruce McGregor Gray.

"Public Water Supply for Fire Extinguishing," by Mr. C. W. S. Oldham, the Borough Water Engineer of Ipswich.

On the afternoon of the first day, a visit will be paid to the offices, workshops, meter-repairing, and fittings-testing departments of the Newcastle and Gateshead Water Company, which will be inspected under the personal guidance of Mr. A. L. Forster, M.Inst.C.E., and the President-Elect, after which tea and light refreshments will be provided by the Directors of the Company. In the evening, the annual dinner of the Association will be held at the Masonic Hall. Next day, there will be a visit to the Waskerley and Tunstall storage reservoirs of the Weardale and Consett Water Company. A description of the works, by the President-Elect, will be circulated among those who take part in the visit, which will occupy the entire day, and include a drive of twelve miles. A light luncheon will be provided by the Directors at Waskerley, and tea by Mr. and Mrs. Askwith at Tunstall. Ladies will be cordially welcomed at the opening of the proceedings, as well as at the visits to works.

We have received from Herr R. Oldenbourg, of Munich and Berlin, "Der Gasrohrleger und Gaseinrichter," by Herr Friedrich Kuckuk, Manager of the gas, water, and electricity works of the Heidelberg Municipality. It is the second edition of a work originally published in 1904; and the revised text contains 388 illustrations. The book will be noticed in an early issue.

At the recent meeting of the Iron and Steel Institute, Mr. J. Cruickshank Smith, B.Sc., submitted a report on the value of physical tests applied to protective coatings for iron and steel. He pointed out that the durability of these coatings depended as much upon physical as upon chemical laws; and he emphasized the importance of properly proportioning the pigment and vehicle, as also the fact that they should not be readily separable. New tests were described for determining the uniformity and thickness of the film, seldom more than 100th of an inch; also its strength, as determined in a breaking-machine known as the "Filmometer," and its hardness and permeability by vapours and gases.

"Practical Testing of Gas and Gas-Meters" is the title of a book lately published by John Wiley and Sons, of New York, of which we have received a copy through Messrs. Chapman and Hall, Limited. The author is Mr. C. H. Stone, B.S., M.S., the Chief Inspector of Gas (Public Service Commission) for the second district of New York; and we hope to notice his work fully in an early issue. Meanwhile, it may be mentioned that he says his chief aim has been to "explain clearly, simply, and fully such tests as would be of practical service to the gas manager, chemist, or photometrist, and to make such comments and suggestions as might guide him in his choice of apparatus or process, and assist him to secure accurate and useful results therewith."

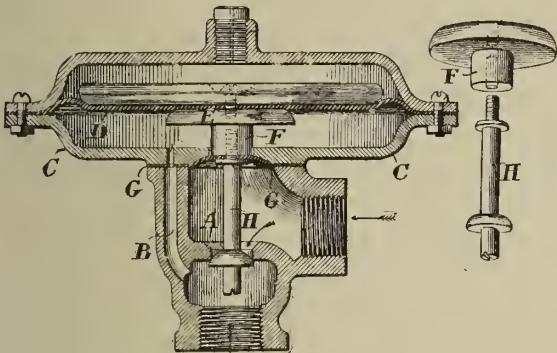
The Chartered Institute of Secretaries have arranged examinations to test the qualifications of those who are desirous of becoming members. The President for the year is Mr. A. B. Pilling, the Clerk to the Metropolitan Water Board; and, when presiding at the annual dinner, held last Friday at the Holborn Restaurant, he referred to the examinations, and, as showing they are no pretence, he mentioned that 24 per cent. of the 222 candidates who presented themselves last year failed to pass. Some 150 candidates have signified their intention of going in for the examination next month—a fact which Mr. Pilling regarded as a striking proof of the growing popularity of the profession, and the success of the principles of articles of clerkship which were instituted some few years ago.

REGISTER OF PATENTS.

Pressure Regulators.

REYNOLDS, M. G., of Anderson, Indiana, U.S.A.
No. 5093; March 6, 1908.

To maintain a uniform pressure in service-pipes independent of the fluctuation of pressure in the main, the inventor provides a regulator embodying a controlling diaphragm in connection with a balancing diaphragm carried by a valve-stem extending from the controlling diaphragm to an intake valve from the main to the service-pipes.



Reynolds' Pressure Regulator.

The inlet and outlet connections are in communication with each other through the port A having a valve seat therein. This body is also provided with a passage B extending upward from the outlet and communicating with an opening through the bottom of the diaphragm case C. Between the top and bottom plates of the case the upper diaphragm D is secured. The top plate of the case has an apertured collar in which a threaded vent plug is secured, with an aperture extending through it. Above the diaphragm is a pressure plate with a threaded aperture E. The lower diaphragm plate is provided with a depending extension F, which is slidingly mounted in an aperture through the bottom of the diaphragm casing, and is connected with the balancing diaphragm G by the valve stem H. This stem is provided at its upper end with a threaded portion and a collar adapted to clamp the balancing diaphragm in contact with the extension F. The diaphragm is also provided with an aperture in alignment with the pressure passage B extending through the valve case to the diaphragm. The lower end of the valve stem H is provided with a valve, preferably of convex form, to engage the edge of the seat in the casing, and provided at its extended end with a slot by which it may be screwed into its connection with the lower diaphragm plate.

In operation, when a large volume of gas is passing through the valve the flow to the regulating diaphragm descends across the lower end of the passage B, producing a suction which reduces the pressure in the regulating diaphragm chamber and effects a higher pressure at the outlet of the regulator. This pressure increases when a large volume is being used, and overcomes the friction in any connected meter to the house piping—thus giving a more uniform pressure at all times to the burner. In order to prevent the increase of pressure pushing the valve open and affecting the low pressure in the service-pipe, the valve is balanced by the diaphragm G connected to the stem H of the valve and the extension F, the lower face of which is of the same area as the gas-orifice A, so that the inlet pressure on the diaphragm will be the same as that exerted upon the valve to open it—thus effecting an equalization of pressure through the regulating diaphragm. In order to prevent gas passing upward around the valve stem and into the upper diaphragm chamber, the balancing diaphragm is used, and the shouldered valve-stem provides means for effectually connecting the diaphragm with the regulating diaphragm. The upper and lower diaphragms are therefore connected together, and with the valve; while the upper diaphragm is in communication with the low-pressure side of the valve, so that an excess of pressure upon this side can force upward the regulating diaphragm and close the valve. Under other conditions, the valve is regulated automatically in its movement, so as to produce a uniform pressure in the house service and protect it from fluctuations in the street main.

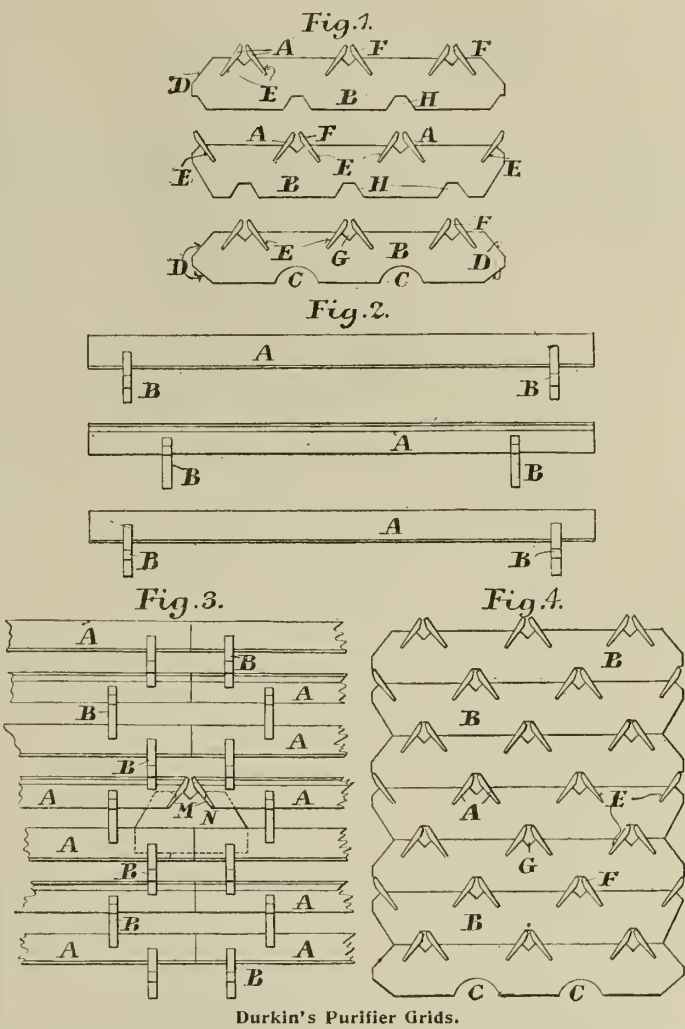
Grids for Gas-Purifiers.

DURKIN, F., of Southampton.
No. 13,656; June 27, 1908.

Grids for gas-purifiers according to this invention comprise a number of wood laths arranged in pairs to form hollow ridges, connected by cross members; the wood laths of each pair diverging outwardly in a downward direction. Several grids, composed, it may be, of a number of sections, are disposed one above another in tiers, and the cross members of the grids above the lowermost grid are recessed to fit on to the ridges of the grids beneath; while the ridges of the several superposed grid sections are so arranged as to lie in vertical planes intermediate of those of the next grid sections above or below them.

Figs. 1 and 2 show (elevations at right angles to each other) constructions of grid sections according to this invention. Figs. 3 and 4 are similar views of a portion of a grid formed of sections, as in figs. 1 and 2, arranged one above another in tiers.

Each section comprises a number of wood laths A in pairs, and cross members B connecting them. The cross members of the lowermost sections that rest on the ordinary form of purifier grid (not shown) are formed with recesses C—say, two at equal distances from their end, which are preferably chamfered at D from above and below to prevent



Durkin's Purifier Grids.

gas slipping without proper contact with the purifying material through any space between the juxtaposed ends of the cross members of grids of the same tier. In the upper edges of the cross members of the grid pairs of outwardly diverging slots E are cut intermediate of the recesses and chamfered ends. Into these slots the laths A are inserted—being of such width that they project above the cross members but do not meet.

The laths are of weather-board section; and the thin edges enter the slots E, while the upper edges are so shaped as to form passages F with inclined sides between the laths of each ridge. Between each pair of slots angular notches G may be formed in the cross members, giving a continuous connection under each line of ridges.

The cross members of the middle grid section are formed with recesses H corresponding in shape and position with projecting portions of the lath-formed ridges of the grid section below, and with the pairs of slots E in their upper edges intermediate of the recesses. At the ends of the cross members there may be single slots, as shown in fig. 1, which receive one lath; the other lath being inserted in a corresponding slot in the cross members of an adjacent section.

The next grid section is formed with recesses H in the lower edges of its cross members corresponding as to shape and position with the ridges of the grid section below it; but its ridges are disposed in positions corresponding to those of the ridges of the lowermost grid section.

Single pairs of laths M (fig. 3), forming ridges connected by cross members N, may be arranged to extend at right angles to the laths A, between the sections of alternate tiers—such additional ridge structure resting on the cross members B of the tier below.

With such grids, it is claimed that purifiers can be easily charged with a much larger quantity of purifying material in a loose condition than when using ordinary grids, and present a large surface to the gas with about the usual back-pressure; and no special care is necessary in filling to prevent the slipping of gas through the purifier without being properly acted upon by the purifying material though a comparatively free passage for the gas is afforded.

Hot-Plates for Gas Cooking-Stoves.

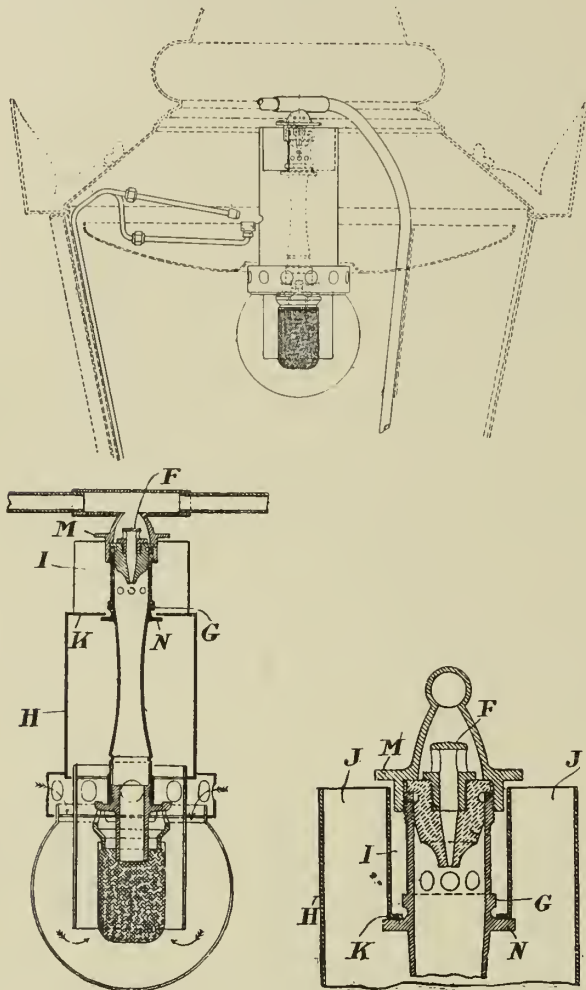
MAY, W., of East Ham, Essex.
No. 15,412; July 21, 1908.

This invention consists of a radiator or receiver (into which the heat from the gas-jet draws), of shallow tray-form, having an enclosed top and with an opening in the bottom at one end or corner sufficiently large to encircle the gas jet or ring. In the top of the receiver a second opening is formed, immediately over the opening in the bottom. In this manner, the heat enters the receiver at the bottom and strikes immediately on the bottom of any vessel which may be placed over the opening at the top of the radiator. The heat which would otherwise become lost is thus enclosed within the radiator, and is carried to the bottom of a second or third vessel, which may be placed over a similar opening to the first one on the top of the radiator. Suitable legs at the corners of the radiator support it when used for the circular gas-rings.

Inverted Incandescent Street-Lighting Burners.

CARPENTER, C. C., of Old Kent Road, S.E.
No. 18,248; Aug. 31, 1908.

This invention has reference to means by which incandescent gas-burners of the inverted type may be adapted for use in lamps for street lighting; the object being "to provide a burner which can be readily lighted and extinguished, and can at the same time be easily detached and taken to pieces for cleaning and inspection."



Carpenter's Inverted Burner for Street Lamps.

The burner is shown in elevation, and sectional elevation, and also an enlarged section of the head of the burner.

Into the top of the burner-tube a loose nipple fits resting by a flange and held in position and made gas tight by the shoulder of the T-piece into which the burner-tube is screwed, and which T-piece serves as a channel for the gas. The nipple is provided with a baffle F, to prevent dust or other obstructions falling in. On the upper part of the burner-tube an octagonal projection G is provided for a purpose to be presently described. The burner-tube is surrounded by a cylindrical outer casing or chimney H having a walled recess I at the top between side openings J, and provided with a plate or floor K, which has cut in it an octagonal opening through which the upper part of the burner-tube can be passed. The T-piece supplying the gas to the burner has provided on its lower edge a flange M.

The height of the walls of the recess of the outer casing is so arranged that when the casing is pushed upwards against the flange of the T-piece the octagonal projection G on the burner-tube fits into the octagonal opening in the floor K of the walled recess of the outer casing; and while in this position it is locked. By this means, if the lower part of the casing is held, it may be used as a box spanner to screw and tighten the burner-tube into the T-piece and make a gas-tight joint. When the burner-tube is thus secured, the casing is supported by resting upon the flange N formed upon the burner-tube a little below the octagonal projection G.

For lighting the burner, a continuous burning pilot-light is arranged external to the casing; and the arrangements for actuating the main and flashing supplies are similar to those described in patent No. 20,341 of 1900.

Gas-Regulating Device.

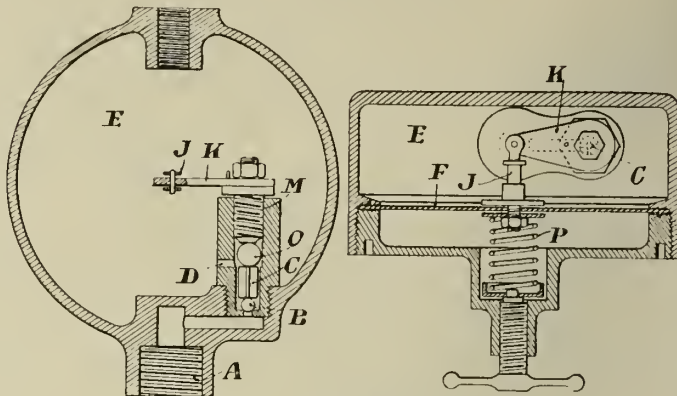
GAUDET, A., of Paris.

No. 19,678; Sept. 18, 1908. Date claimed under International Convention, Oct. 8, 1907.

This invention relates to an improved pressure-regulating device comprising a ball-valve operated not directly by a diaphragm, but the latter adjusts the ball-valve towards or from its seat through the intermediary of gear comprising a lever and screw adjustment.

The gas under pressure is introduced through at A and comes under the ball B, which it raises. The gas then passes around the metal support C (of cruciform shape) and, passing through the opening D,

enters the expansion chamber E, where it exercises pressure on the diaphragm F. The diaphragm, being put under tension by the pressure of the gas, forces the rod J to follow it in its new position. The lever-arm K, connected with the rod by a pin, causes the screw M to turn, and in descending to exercise pressure on the ball O, which, through the medium of the support C, presses the ball B on to its seat, and prevents any subsequent introduction of gas.



Gaudet's Gas-Regulating Device.

The gas having expanded and escaped from the chamber E, the spring P acts on the diaphragm and returns it to its first position, whereby the screw M is caused to turn in the contrary direction through the medium of the rod J and lever-arm K. The screw having been raised again, the ball P can be raised once more and allow a fresh entry of gas. The ball O, which acts as an intermediary between the piece C and the screw M, is chiefly intended to prevent the screw from being wedged on the cross-shaped piece, and thus to make the movement as smooth in the one direction as in the other.

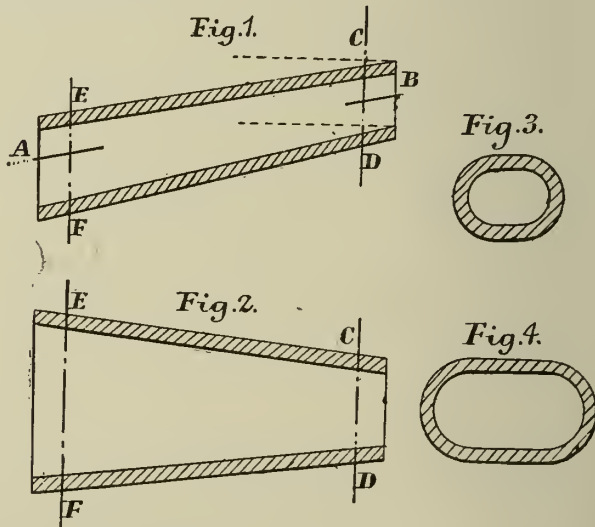
Gas-Retorts.

GENNOTTE, E., of Brussels.

No. 21,489; Oct. 10, 1908.

This invention relates to conical inclined retorts, the vertical section of which increases progressively towards the bottom—the roof of the retort being substantially parallel with the natural batter of the coal.

It is claimed that, *inter alia*, this method of constructing a retort presents the following advantages: The discharging is facilitated, owing to the greater conicity and inclination of the bottom of the retort; the discharging requires less effort on the part of the workmen; and the wear of the retort is less. Owing to the ease with which the furnace can be discharged, a larger charge may be placed in the retort; so that the number of chargings for treating a given quantity of coal is smaller than in the case of retorts heretofore constructed. The advantages which, it is said, follow from those enumerated above are a large reduction of labour, economy in the plant and fuel, while the retort is cooled to a smaller extent.



Gennotte's Conical Inclined Retorts.

Fig. 1 is a longitudinal vertical section. Fig. 2 is a horizontal section on the line A—B of fig. 1. Figs. 3 and 4 are vertical cross sections on the lines C—D and E—F respectively.

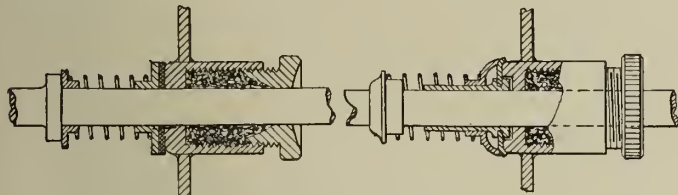
The section of the retort increases progressively, as is shown particularly in figs. 3 and 4. The roof is inclined to the horizontal by an angle which is substantially equal to the natural batter of the coal. The bottom, on the other hand, is inclined at an angle which is greater than the natural batter. In these conditions, "the coal, while encountering an increasingly greater section in its descent, preserves its surface approximately parallel with the roof in such a manner that there is no difficulty in providing a space all along the roof which is not filled with coal and towards which the gases naturally move." The sides might be parallel one with the other; but it is generally better, the patentee points out, to incline them so that the interval between them increases towards the bottom, as represented in fig. 2.

Packing the Spindles of Gas-Meters.

METROPOLITAN GAS-METERS, LIMITED, and FORSTER, J. D., of Nottingham.

No. 23,531; Nov. 3, 1908.

The patentees remark that it has hitherto been the practice to pack spindles used in connection with gas-meters by means of stuffing-boxes; and it has been found that the grease contained in the stuffing-boxes is liable to be attacked by the solvent constituents of the gas flowing through the meter, so that the joints around the spindles become leaky. To obviate this difficulty, they propose to pack the inner end of the spindle within the meter-casing by means of a disc or washer mounted upon the spindle and held against the inner end of the stuffing-box by a spring coiled upon the spindle.



Forster's Packing for Gas-Meter Spindles.

In the first arrangement shown for carrying out the invention, the spindle passes through a stuffing-box fitted in the meter-casing in the usual way, and within the meter is mounted upon the spindle a packing, disc of leather, maintained in close contact with the inner end of the stuffing-box by means of a spring coiled around the spindle. It bears at one end against a stop, and at the other end against a metal disc bearing against the back of the leather packing. This gas which passes through the meter is thus prevented from coming into contact with the grease in the stuffing-box, so that the disadvantage mentioned above is entirely obviated.

The alternative method shown differs from that described above, in that the packing-disc is fixed upon the end of a sleeve rigidly secured to the spindle. Upon this sleeve there is mounted a metal disc which is applied against the back of the packing-disc under the action of a spring in the manner already described.

APPLICATIONS FOR LETTERS PATENT.

- 10,979.—LINES, H. G., "Incandescent burners and globes." May 10.
 10,984.—CHARLTON, G., "Gauges for indicating the pressure of fluids." May 10.
 11,013.—BEDDELL, B. H., and HIRD, M., "Preventing taps from being turned fully off or alternatively fully on." May 10.
 11,040.—HARLÉ, J. B. V. L., "Incandescent burners." May 10.
 11,058.—WRIGHT, J. C., "Grid for gas purification." May 10.
 11,059.—WRIGHT, J. C., "Hydraulic gas-mains." May 10.
 11,063.—ST. JOHN, G. C., "Gas-meters." May 10.
 11,105.—GOODING, W., and MEEK, J., "Bye-pass gas-fittings." May 11.
 11,133.—PEGLER, B. C. H., "Regulating gas." May 11.
 11,142.—DENNIS, F. H., "Acetylene generators." May 11.
 11,143.—HEDGES, K. W., "Gas heating-stoves." May 11.
 11,159.—RICHARDS, R. S., "Carbonization and distillation of fuel." May 11.
 11,167.—HARLÉ, J. B. V. L., "Burners." May 11.
 11,187.—DARLING, C. R., "Temperature measuring apparatus." May 11.
 11,200.—EVANS, C., "Utilizing heat in stoves." May 12.
 11,218.—FIELDING, J., "Gas-producers." May 12.
 11,254.—TRACHSLER, H., and ERNST, F., "Producer gas." May 12.
 11,257.—WALKER, A. B., and DONALDSON, J. H., "Street-lamps." May 12.
 11,265.—GOBBE, E., "Gas-producers." May 12.
 11,307.—DRAYSON, W. B. H., and J. TYLOR AND SONS, LTD., "Liquid meters." May 13.
 11,315.—FISK, J. W., "Mantles." May 13.
 11,332.—HANNAN, J., "Manufacture of oxygen and hydrogen or other gases." May 13.
 11,345.—ELLIS, T. M., "Gas-economizers." May 13.
 11,352.—AKERS, A. E. & C. W., "Globe-holders." May 13.
 11,370.—POTZKAJ, P., "Inverted lamps." May 13.
 11,371.—NÄSSEN, J. F., and BERGSTRÖM, A. E. T., "Lighting and extinguishing gas-lights from a distance." May 13.
 11,442.—GEWERKSCHAFT DER STEINKOHLENZECHÉ "MONT-CENIS," "Ammonium sulphate from distillation gases." May 14.
 11,466.—BROUGHAM, Hon. R. T. D., "Regulating the pressure of gas." May 14.
 11,469.—PÖSCHL, A., "Illuminating device." May 14.
 11,513.—SOLON, M. F., "Regenerative burners and stoves." May 15.
 11,527.—CROSSLEY, K. I., and RIGBY, T., "Gas-producers." May 15.

Spalding Water Supply.—A Local Government Board inquiry into the application of the Spalding Urban District Council to borrow £5000 for water-works improvements was recently held by Major J. Stewart, R.E. The proposal of the Council is to lay new 12-inch mains to Bourne, whence the supply is drawn, as the present mains are in a very bad condition, and the quantity of water obtained is insufficient. The estimated cost of the work is nearly £8000; but the Council already have unexhausted borrowing powers of £3000, and hence the present application for power to raise an additional £5000. It was anticipated that with the new mains not only would the supply of water be greatly increased, but that the present discoloration, caused by the old iron pipes, would be avoided, and the water be received in the state of purity in which it was obtained at Bourne. It was also calculated that the present heavy cost incurred in pumping operations would be saved. There was no opposition to the application.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Local Government Board Audits and the South Metropolitan Gas Company.

SIR,—We notice in your last issue a letter from Messrs. Dinwiddy and Sons, in which they refer to our recent objections before the Local Government Board Auditors to certain payments made to them by various rating authorities in connection with our last rating appeals. The firm in question, while sending you the report of the Local Government Board Auditor at Bermondsey, omit to send you the report of his colleague at Woolwich, which affords ample justification for the course we felt compelled to adopt in protection of the interests of ourselves and other ratepayers. Messrs. Dinwiddy and Sons will doubtless remedy this omission in your next issue, as without it they will not, in our opinion, have placed the entire facts "fairly and without prejudice" before your readers.

CHARLES CARPENTER,

Chairman, South Metropolitan Gas Company.

709, Old Kent Road, S.E., May 22, 1909.

The Relative Cost of Gas and Electricity.

SIR,—In reply to your remarks in "Electricity Supply Memoranda" for the 11th inst., the pleasure you evince in our previous controversies, is, I assure you, reciprocated; for anyone taking up the question of comparative costs with you may be certain of straight and unvarnished, if biased, talk on the matter.

With regard to the names and addresses for which you ask, I regret I must place you in the same category as Mr. Clark.

In reply to your questions: (1) Do I believe that the householders quoted are obtaining a better light from electricity than from gas?—I not only believe it; I know it. (2) Do I believe they obtain with gas only 2·16 candles per cubic foot?—No, I do not; I believe the candle power obtained under the best conditions would be very much higher. But you have forgotten, in your calculations, to make allowance for the saving (one of many) effected by switching-off electric light immediately it is not required—a factor for economy which is no small one in private-house lighting. (3) Incandescent gas-burners were exclusively used. (4) As far as the consumers themselves can tell me, the lighting hours were approximately the same. (5) In those cases where gas-cookers were used, due allowance in the published figures has been made for the gas consumed by the cookers during the time electric light was used; the allowance being made according to the meter readings. (6) No gas, in any one case, is now used for lighting purposes.

For your satisfaction, I would say that, given the best conditions for gas, electric lighting by means of Osram lamps at West Ham rates is, candle power for candle power, about equal. But, and this is the *crux* of the whole matter, best conditions for gas are very rarely obtained in practice. In fact, I contend that the best results from gas lighting are unobtainable unless a gas-lighting expert is resident in each house. How often is the gas and air supply of burners properly adjusted for economical lighting? How often is the mantle properly placed on the burner? How often is the whole apparatus kept clean? How often, for the sake of appearance, is the light wasted in unsuitable shades (a very common fault indeed with gas lighting)? How often, for safety's sake, is the light placed in the worst possible position in regard to the spot where the light is needed?

The above are a few of the conditions which adversely affect the cost of gas lighting. By using electricity, however, the light can be placed in the best possible position; we see that suitable shades are used; and the candle power given depends on the lamp manufacturer and the current suppliers only, and not on the attention given to the lamps by the consumer.

In further evidence of the extremely low cost of electric lighting, I enclose a leaflet which we were obliged to issue, to counteract a growing impression. This leaflet is not an advertising dodge, but is a necessary contradiction of reports spread by persons who have changed from gas to electricity.

In conclusion, permit me to compliment the gentleman who writes "Electricity Supply Memoranda" on the tenacity with which he holds on to the idea that gas is unapproachable for any purpose. I would that the electric supply business possessed but a few of his sort; for the fight for custom with gas would then be a considerably hotter one, and to the advantage of electricity, than it now is.

H. H. HOLMES, Sales Manager,

West Ham Corporation Electricity Department.

Stratford, E., May 17, 1909.

[ENCLOSURE.]

A REPORT WITHOUT ONE ATOM OF TRUTH IN IT.

It has come to our knowledge that a report is being busily circulated throughout the borough, to the effect that, owing to the smallness of the amounts now being paid by many customers for electric lighting (due to the economy of metal filament lamps as compared with the cost of other methods of illumination), it will be found necessary in the near future to increase the present charge of 3d. per unit for current. A report of this character could have been ignored but for the fact that a number of prospective consumers have been thereby actually deterred from installing the electric light. We desire, therefore, to give the widest possible publicity to the fact that, in this or any similar reports, there is not one atom of truth; and at the same time to express our thanks to those of our customers who kindly brought this matter to our attention.

SIR,—May I be allowed, although an interested party, to make some comments on the controversy as to relative cost of gas and electricity, referred to in your issue of the 11th inst.?

No doubt, gas companies will from now on have to contend with more serious competition from electric light suppliers, owing to the introduction of the metallic filament lamps.

No one in his senses is likely to raise the question of comparative

cost of gas and electricity based on candle-power-hours—at any rate, until some more satisfactory invention than at present exists is put forward by our electrical friends.

Advocates of electric light claim economy by reason of (1) Convenience of control, thereby reducing waste of current to a minimum. (2) Smaller units of light; 8-candle power lights being often used.

Owing to the idea that electric light is expensive, the consumer is always careful to switch off his current when not in actual use; and the human element herein indicated is of more effect in keeping down electric lighting cost than is often admitted.

If gas companies, therefore, wish to unquestionably place their position of superiority before the public, they should of necessity do two things: (1) Offer the same convenience of control to gas lighting as electric lighting has. (2) Offer burners giving smaller units of light.

It appears to me, however, the main question resolves itself into satisfying a consumer of light that he is only getting the exact amount of illumination for his purposes, for the time he requires it, and no more.

The introduction of the two features referred to, would enable a consumer to satisfy himself that he was able to organize his lighting by gas on this basis; and the cost, I contend, would be always in favour of gas. But while these facilities do not obtain, I think that our electrical friends are perfectly justified in claiming the right to compare the amount of gas actually used for lighting, whether necessarily or wastefully, against the actual consumption of electric current, and not on the candle-power-hour basis, as is usually insisted on by those interested in the sale of gas.

3, Wynnstey Gardens, Kensington, W.,
May 18, 1909.

A. ST. J. COOKE.

[We have to thank Mr. Holmes for his courteous and complimentary remarks. In regard, however, to the portion of his letter dealing with the questions put to him, if the replies are the best and most convincing that he can make, it is really hardly worth while commenting upon them, but simply leave them to the judgment of readers. But we do not want to lose hold of Mr. Holmes just yet, as it would be interesting, if he will give the opportunity, to prove the value of his figures a little more. We cannot fathom—if the figures are true as quoted in our "Correspondence" columns on May 4, and referred to in "Electric Supply Memoranda" on May 11—his reasons for declining to give the names and addresses for which we asked. Our inquiries would be honestly made; and we fail to see, if the consumers are making the saving suggested, that any harm could come, but rather benefit should ensue, to the West Ham Electricity Department from divulging the information asked for. The results of the investigations would be very faithfully recorded in our columns. But briefly to his inconclusive replies. The answer to the first question shows our correspondent to be a man of decided opinions; but he does not explain the grounds on which he not only believes, but *knows*, that the consumers are now getting a better light than formerly. We shall be pleased to hear the grounds for such positive assertion. The answer to the second question is perhaps the most interesting of all. The equivalent for gas (in one case) of the illuminating performance of electricity, used under the best conditions, and keeping the house in darkness during the hours of artificial lighting excepting where the light is actually being usefully employed, is 2·16 candles per cubic foot formerly consumed; and Mr. Holmes believes that a "very much higher candle power" than this can be obtained for gas under the best conditions. Very well, he admits the potentiality of gas for giving the consumer a "very much higher illumination" than is possible by electricity at a far cheaper price, if the consumer will only go to the trouble of turning a tap and striking a match when the gas is required, and turning a tap again when it is not required—in place of the switching on and off of the electric current. If people are lazy, and are prepared to penalize themselves for their laziness, and will not have a higher illuminating power and a more economical light, then there is nothing more to be said. We cannot, however, understand householders who are so careful about switching on and off electricity to save the expense of illumination by this means, not being prepared to go to a little further trouble to secure a much greater meed in economy. There are on the market several effective switching arrangements for the lighting and extinguishing of gas (one of them providing electrical ignition without bye-passes) that can be installed, and paid for quickly out of the savings to be derived by properly using gas instead of electricity. We come to this as the sum and substance of Mr. Holmes's acknowledgments, that it is only by unbridled wastefulness in the matter of gas lighting, and by a rigorous control and studied economy of illumination in the case of electricity, that the lower accounts for the latter are obtained. The third answer tells us that incandescent burners were exclusively used in the cases quoted by Mr. Holmes; and lower down that cooking-stoves were also simultaneously employed. Only by the recollection of consumers, can Mr. Holmes say that the lighting hours were approximately the same during the relative periods referred to for gas and electricity; but the extent of lighting the houses was manifestly not the same, in view of the reply to the second question. The answer made to No. 5 question is interesting: "Due allowance was made in the published figures for gas consumed by the cookers during the time electric light was used; the allowance being made according to the gas-meter readings." The reading of this would suggest the deductions were made from the electricity

accounts and not from the former gas accounts. We should like to have the opportunity of making a check investigation. It is feared that the registration of gas for cooking, heating, and lighting through one meter, and the account being rendered in the total, give to electricians a peg upon which to hang their arguments when dealing with householders. On the whole, there seems to be a fair amount of guesswork in the foundation of Mr. Holmes's postulatory statements. Our correspondent will make a much better impression if, instead of writing round about the questions in this way, he will furnish the names and addresses of the consumers whose figures he quoted, so that independent inquiries may be made. We suggest to the West Ham Gas Company that they append a statement to the next accounts sent out to the effect that, in view of the assertion of the Sales Manager of the West Ham Corporation Electricity Department, that many gas consumers are not getting from their incandescent burners their possible lighting efficiency, the Company are prepared to give advice free to any consumers who are of opinion they are not doing so, on hearing from them. The letter of our second correspondent—Mr. A. St. J. Cooke—is also welcomed. The Gaslight and Coke Company will, we know, be very pleased to show him the switching-off arrangements that are now, where required, applied to gas; and they can also show him pretty bijou burners consuming about 1 cubic foot of gas an hour, and giving a light of 20 candles, with a remarkably low mantle use and no renewal of the burners for years. With metallic filament lamps, the whole article has to be periodically renewed; with incandescent gas-burners, only the "filaments."—ED. J.G.L.]

Gas Companies' Canvassers and the Card System.

SIR,—Herewith I have pleasure in enclosing copy of a card, the use of which my Company are finding most valuable.

Road	Southdown Rd	Name	Ferguson D.H.
House	No 110	Date	16/4/09
Reported by		Present Address	
Canvasser	A. Moore		
Cooker	No 2	Fires	1 live
		12 months Gas Consumption	60,000/18
DATE CALLED	REPORT	LETTER TO	LETTER FROM
16-4-09	for throughout, 2 own fires, left particulars of date heater 1/2 call again		
9-5-09	Called re water heater. Laid out and turned back accepted same. Gas as soon as possible		
	Note: Pressure low please send to clear service		

Road	Southdown Rd	Name	Miley Canon
House	No 42	Date	14/5/09
Reported by	Chay	Present Address	The Vicarage Fleet
Canvasser	As		Mr. Baskinbroke
Cooker		Fires	
		12 months Gas Consumption	
DATE CALLED	REPORT	LETTER TO	LETTER FROM
	New tenant. Call re gas & water supplies, cook etc		1/5/19

Some time ago I felt that we had not a proper grip over the work of our canvassers; and I was not at all satisfied that we were obtaining the fullest value from their work. Everyone who has controlled canvassers knows that work is seldom obtained from the first visit, as consumers require a considerable amount of time to make up their mind with regard to a new departure. A timely reminder is very valuable; and it was for this that a card was instituted. A certain number of cards are issued to each of our ordinary canvassers every day. On these cards, we enter all the particulars that we have of the gas appliances in use on the premises to which the card applies. The canvasser makes his call; enters the result of that call; and confirms the appliances in use. If there does not appear to be any reason for a further call in the immediate future, the cards are filed under the names of the road to which they apply. If it appears that another call is desirable, the cards are filed away in a calendar file, under the date on which the fresh visit is to be made. We are finding the cards of the greatest possible value; and I send you these particulars as I think they are likely to be of interest and service to your readers. H. W. WOODALL, General Manager, Bournemouth Gas and Water Company.

May 20, 1909.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Aldershot Gas and Water Bill, Ammanford Gas Bill, Yorktown and Blackwater Gas (Electric Lighting, &c.) Bill.

Bills read a second time: Gas Orders Confirmation Bills (Nos. 1 and 2), Gas and Water Orders Confirmation Bill.

Bills reported, with amendments: Eastbourne Gas Bill, Lisburn Urban District Council Bill.

Bills read the third time and passed: Alliance and Dublin Consumers' Gas Bill, Conway Gas Bill, Leyland and Farington Gas Bill, Littlehampton Gas Bill, Pontypool Gas and Water Bill, South Staffordshire Water Bill, Wakefield Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Alliance and Dublin Consumers' Gas Bill, Pontypool Gas and Water Bill, South Staffordshire Water Bill, Wakefield Corporation Bill.

Bill read the first time, and ordered for second reading: Musselburgh Gas Order Confirmation Bill.

Lords Bills read a second time and committed: Bungay Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Workshop Water Bill.

Bills reported, with amendments: Clevedon Water Bill [Lords], Grantham Water Bill [Lords], Harrogate Gas Bill, Oldham Corporation Bill, South Lincolnshire Water Bill [Lords], Watford Urban District Council Bill.

Bills read the third time and passed: Aldershot Gas and Water Bill, Ammanford Gas Bill, Donington Water Bill [Lords], Harrogate Gas Bill, Heckmondwike and Liversedge Gas Bill [Lords], Pontypridd Water Bill, Wells Gas Bill [Lords].

On Monday, the 17 inst., the Gaslight and Coke Company Bill came up for third reading; but Mr. W. Thorne again formally objected, and the Bill was put down for the following Thursday "by order." However, on the motion of the Deputy-Chairman of Committees (Mr. Caldwell) it was then postponed till Thursday, the 3rd prox., when the House will resume after the Whitsuntide recess.

On the second reading of the Gas Provisional Orders Bill, the Committee of Selection were instructed to refer to the Local Legislation Committee a part of the Bill relating to the Prestatyn Gas Order.

On the motion of Mr. Stanier, the Committee on the Frimley and Farnborough District Water Bill were instructed "to inquire into and report whether it would be practicable and reasonable to impose obligations upon the promoters to supply water by measure for agricultural purposes within their limits of supply; and, if so, under what conditions persons should be entitled to demand and receive such supply."

LEGAL INTELLIGENCE.

ASSESSMENT OF THE PETERBOROUGH GAS-WORKS.

Peterborough Quarter Sessions.—Friday, May 14.

(Before Lieut.-Col. E. P. MONCKTON, Chairman, Mr. J. H. BEEBY, Mr. G. H. DEAN, Mr. J. A. HERBERT, Mr. T. C. LAMPLUGH, and Alderman J. B. TEBBUTT, the Mayor.)

An appeal by the Peterborough Gas Company against the assessment of their works was opened last Friday week. The amount in dispute is £1675; the Assessment Committee fixing the rateable value of the property at £4360, and the Company claiming that it should be only £2685.

Mr. W. C. RYDE and Mr. N. NICKALLS (instructed by Mr. W. B. Buckle) appeared for the Company; Mr. H. ST. JOHN D. RAIKES and Mr. H. L. WARD (instructed by Mr. H. B. Hartley) represented the Committee.

The Case for the Company.

Mr. RYDE, in opening, said the appeal was against the rate made on Nov. 4, 1908, and against that part of the Company's undertaking which was contained in the parish of Peterborough Witbin. The gross value of the undertaking was £7000, and the rateable value, as fixed by the Assessment Committee, was in the first instance £4500; but it was found that a mistake had been made with regard to some premises which had been inadvertently included, and the figure was reduced to £4360, against which the Company were appealing. The alteration from £4500 to £4360 made on the 17th of February last was a correcting of accounts rather than a lowering of assessment. The whole undertaking now stood in the various rate books for the different parishes at £4899, which, of course, included the £4360. The Company were doing a considerable business—possibly a much larger one than was the case twenty years ago; but the nature of the business of gas companies in general, and of the Peterborough Company in particular, had been much altered by events which had happened in recent times.

There was, in the first place, the competition of electricity, which had been in existence in the city since 1902. The Company was formed in 1868; but the increase of business since then was no guide whatever. He should submit that a comparison even with the condition of things five or ten years ago was no guide. The Corporation, as he said, were in effective competition with the Company. The number of electrical units sold by them when they opened their electricity works in 1902 was 69,000 odd. In the following year it rose to 133,000; and this went on by constant rises without any break until 1908; when they sold 579,000 units. Having thus multiplied itself nearly ten-fold, and showing every prospect of rising, electricity was a very serious factor for the Company to deal with. But there was another important one. Owing to the competition of electricity and other causes, all gas companies had been led to introduce what was popularly called the penny-in-the-slot meter. The effect of this invention had been to enable the companies to extend their operations so as to attack a field of enterprise which would otherwise be closed to them, and consequently largely to increase the number of consumers. Of course, the prepayment consumers did not use anything like the same quantity of gas per family as a large household; and it was as costly to send a man round to take the proceeds of the sale of 5000 cubic feet of gas as it was to read the index which recorded the sale of 50,000 cubic feet. Consequently the companies' income was largely reduced. But, quite apart from this, there was the much more important factor that gas companies now had to provide all these meters, and in many cases to fit up the houses of the small consumers so as to induce them to take gas. All this involved outlay of capital, which fell entirely on the tenant. Therefore, assuming two companies earning exactly the same amount, one twenty years ago with no penny-in-the-slot meters, and the other, such as the appellant company, with these meters, the rateable values of the undertakings would be entirely different in the two cases, because the one had to provide much more tenant's capital for carrying on the business than the other. It was like comparing the business of a jeweller who had put in valuable fittings with that of the man who dealt in penny papers, and had no stock at all. The Company, who had an increasing turnover, was shown to have a lower rateable value because of the capital outlay which must be incurred in order to earn the proceeds. There was one other factor. The Company had been constantly reducing the price of gas, and by a resolution passed in August last, which took effect on the 1st of October, it was lowered by another 1d. per 1000 cubic feet. The penny-in-the-slot consumer paid 10d. per 1000 cubic feet more for his gas than the ordinary consumer; but for this he got certain things the cost of which was disguised in the extra charge. Dealing with the sum of £4550 which had been set down as representing the 17½ per cent. of the tenant's share of the capital, Counsel said, assuming he opened his works at Michaelmas, he would have to pay his coal and wages bill until Christmas, reckoning that there were no penny-in-the-slot meters, before there began to be any return. Then he would start his clerks going round to ascertain the number of feet recorded. Bills had to be made out and sent to the various consumers, and they had to wait until the money was paid. It was admitted, he thought—assuming that they were all ordinary customers—that up to three months, at any rate, there could be no question that the tenant must find the capital. He must also find it until he had sent out his index readers, sent out the bills, and got in the money. The only question between the parties was how long this interval was likely to be. He said five months; and it was for the Court to say whether this was right or wrong. He had five months' working expenses. The total working expenses for the year, not including rates, was £12,549. In this amount credit had been taken for the residual products sold by the Company as well as the gas; so that the coal bill had been reduced. If they ignored the residuals, including the sale of coke, the total outgoings of the tenant in the course of the year would be £20,751. If all the consumers were ordinary ones, and if five months was the right period before which the tenant could not expect to get in anything substantial from the consumers, then he would have to bear five-twelfths of the total outlay, which would be £8647. This was the figure which the tenant would actually pay away if he got nothing from the coke or from the ordinary consumer. But during the five months he would receive something from his coke. They had assumed that, on an average, coke would always be two months behind; so that at the end of the five months he would have been paid for three months' coke. Therefore from the £8647 they deducted £1775—three months' receipts from coke and other residuals. Turning again to the penny-in-the-slot consumer, Counsel said the collector visited him once every three months. If they assumed that the tenant started with an absolutely empty set of slot-meters on Michaelmas Day, he would not get anything at first, and they must take some sort of average allowance. They assumed that three months' receipts from these meters would be obtained in the first five months. They made a total of £3281, which represented the cash coming in from the business during the first five months, to go against the wages and other outgoings of £8647. This would leave the tenant with a burden of £5366 for the first five months. It was mentioned that the present value of the meters, lamps, cookers, &c., was £17,001; of horses and vehicles, £436; of maps and plans, £50; of the stock of coal, oil, and purifying materials (for eight weeks), £1783. Explaining the last item, Counsel said they must start with full bunkers, and they must never leave them absolutely empty. A fog lasting three days, for instance, would double the consumption of coal, and greatly impede its delivery by the railway companies. If they reduced the stock to less than eight weeks' supply, they were not only in peril of strikes, but were driven to paying the prices which happened to rule at the moment; so that the bargains had to be made beforehand. They had put down £1500 as cash at banker's; and the tenant's capital they said was roughly £26,000.

Evidence in support of the Company's case was then called.

Mr. A. L. Ryde said he had made the valuation for the appeal, basing his figures on the Company's accounts for 1908, from which Counsel had quoted. He had satisfied himself that the figures supplied presented a fair statement of affairs. Witness proceeded to give evidence substantiating Counsel's opening statement. He said the Company took their own fire risk; but, as a matter of fact, they had asked for

rates, and been offered 7s. 6d. per cent. The amount for which an insurance would have to be taken out was approximately £50,000.

Mr. RAIKES (in cross-examination) remarked that what they were dealing with was in effect this: What would a yearly tenant, coming in at a particular date, be prepared to pay in the way of rent? He would say at once that his clients had taken a different date as the basis of their calculations, and had considered what a tenant would have been prepared to pay who came in at the end of June, 1908.

Witness said he had had to do with six or seven gas companies in the last two months, and his experience in each case was exactly the same; the year up to June, 1908, was the best they had ever had.

In further cross-examination, witness said gas companies were limited in the amount of dividend they could pay, its increase depending upon a reduction in the price of gas. His attention being called to the outlay of £900 for a patent stoker which had not been placed to capital account, he said the machine was in the nature of an experiment, and might have been a failure, in which case the Company would not have been justified in charging the outlay to capital. Counsel pointed out that the stock of coal was valued at £1783; and witness explained that it was necessary to keep a heavy stock for such contingencies as fog, strikes, &c. Questioned on the subject of percentage, witness said he did not think any tenant would come in at less than 17½ per cent., consisting of 5 per cent. on his capital, 10 per cent. for profit, and 2½ per cent. for contingencies.

Mr. Corbet Woodall was the next witness. He said he put the rateable value of the Company's undertaking at £3088, or £2689 for their property in Peterborough Within. Examined as to the percentage, witness maintained that a return of £4700 was not too much on an undertaking such as this, into which a tenant would have to bring £27,000. Electricity had very largely taken the "plums" of lighting, such as theatres, railway stations, and music halls; and very often one single current was equal to some 2000 or 3000 prepayment gas installations. When it was reckoned that each of these cost £4 10s., it would be seen what an enormous expense was incurred in getting back what was lost. The prepayment system had largely increased the amount of capital needed by gas companies to obtain business.

Cross-examined as to the cost of maintenance, which he put at 7d. per 1000 cubic feet of gas produced, witness gave two instances that had recently come under his notice where the figure was more than 10d. On Counsel quoting from a list in which many estimates were as low as 4d., witness said he cited the two he had as having recently come under his notice. Counsel pointed out that with about £19,000 placed to the reserve fund, carried forward, &c., the Company were asking that they should be rated at a less sum than in 1900, when they had to take money from their reserve to help to pay the dividend. Witness replied that he did not see anything irreconcilable in that.

In re-examination, witness said the number of slot-meters had increased from 241 in 1902 to 1983 at the end of June, 1908; and a large expense was incurred for repairing those which were broken open by dishonest people. With regard to the stoking-machine to which reference had been made, witness explained that it served a double purpose—it put in coal and took out coke at the same time.

Mr. John Barton, the Company's Manager and Secretary, said that though the output of gas had increased, nearly £100 less wages had been paid, owing to the adoption of the stoking-machine alluded to, which was driven by electricity.

On Mr. Raikes rising to cross-examine,

The CHAIRMAN said it would be better if the cross-examination were taken all at one time. The case would therefore be adjourned till the 27th inst.

Another Kent County Gas Transaction.

In the Chancery Division of the High Court of Justice last Tuesday, before Mr. Justice Neville, an application was made by Mr. Fisher Williams in the matter of the Kent County Gaslight and Coke Company, as to the validity of a conveyance of property. Counsel said the question raised was whether or not certain freeholds comprised in the covenants were validly conveyed. Messrs. Darby and Gyde, two undischarged bankrupts, acquired for £2350 certain gas-works in Kent, which they sold to the Trustees of a new Company for £21,800. In the year 1902, Darby and Gyde, who was then known by the name of Bernard, entered into a partnership agreement, each putting £50 into the venture. The business was then that of stock and share brokers. On March 10, 1906, they took the conveyance of the gas-works, the parties being the owners, a Tunbridge Wells Finance Company, Darby, and others. Darby and Gyde were then trading as Darby and Co., in Louthbury; but it was under the style of F. C. Lawson and Co., of Cranbrook, that the gas deal was arranged. Their names seemed to have been very varied. His Lordship said he noticed that they were paid in cash; and if all their business was as successful as this, he wondered they became bankrupt. Mr. Williams said they were bankrupt before this. The Company continued until 1907, when the usual compulsory winding-up order was made; and it was then discovered that Gyde's real name was Bernard. Darby had been made a bankrupt in Cardiff in 1904 and Gyde in 1900. His Lordship held that the conveyance to the present owner was valid.

Lincoln Water Supply.—Satisfactory progress is reported in connection with the work at Elkeslev, near Retford, for providing Lincoln with a new supply of water. Several members of the Lincoln City Council visited the scene of operations last Wednesday, and witnessed the test pumping at full work. At present a million gallons are being pumped every 24 hours; but the level of water in the bore has only been diminished to 60 feet. This is ample proof that there is an abundant supply, and the analyses of the water are of a very satisfactory character. When the test pumping is concluded, the pipes will be ordered and the other work pushed forward as expeditiously as possible.

MISCELLANEOUS NEWS.

MONTE VIDEO GAS COMPANY, LIMITED.

Big Reduction in the Price of Gas.

The Ordinary General Meeting of this Company was held last Thursday, at Winchester House, Old Broad Street, E.C.—Mr. T. C. TATHAM in the chair.

The SECRETARY (Mr. Henry Kearns) read the notice calling the meeting and the report of the Auditors; and the Directors' report (which was noticed in the "JOURNAL" last week, p. 463) and the accounts were taken as read.

The CHAIRMAN, proceeding to comment upon the various items of the accounts for the year 1908, said that if the shareholders would turn to the debit side of the balance-sheet they would find that the first item showing alteration was the reserve account, which had been increased to £32,000 by the addition of £4000 from the year's profits. He had on previous occasions drawn attention to the need of a strong reserve fund; and he felt that in placing this sum to the credit of the account they were making a wise provision. They would remember that this account at one time stood at £74,000; but it was reduced between 1897 and 1905 to about £24,000, by paying off debentures to the amount of £50,000. The insurance fund remained at £12,500. They insured against the risk of fire all their property in Monte Video that was of an insurable nature—a condition imposed by the trust deed securing the debenture stock—and the Directors thought that the amount as it stood was sufficient to meet any loss of property which was not of an insurable nature. They had placed £4000 to the reserve for renewals, &c., making a total of £6500. It would be necessary towards the end of the year to commence the reconstruction of a retort-house; and as this would be entirely a charge upon revenue, a substantial amount such as he had named reserved would go a good way towards reducing the future charge against the revenue account. The retorts and furnaces would be renewed upon the most modern lines; and the Board anticipated that the better results which they hoped to obtain in carbonization, coupled with the economy in fuel, would quickly justify the outlay. They could not delay the commencement of the work beyond the end of this year; and they intended to take advantage of the smaller make of gas during the summer months out there—from December to March, and so be ready for the following winter's consumption, which they anticipated would be a much heavier one than hitherto, owing to the very low price that was now charged for gas. On Aug. 1 last, the Company reduced the price by 20 per cent. for lighting; and their charge for industrial purposes, for engines, and for cooking was 25 per cent. lower than the lighting rate. The increased sales for the last five months of the year 1908 were on the whole satisfactory. The increase this year to the end of April (the latest date for which they had returns) was above the average for the five months from August to December last; and this, he thought, proved that the policy of cheap gas was appreciated by the public in Monte Video. The Board therefore expected to greatly enlarge their circle of customers. He had before remarked that it was far better for the Company to sell a greater quantity of gas at a reduced price to a large number of consumers, than a small quantity at a high price to a limited number; and at their present low charge there was no need for gas to remain the luxury that it formerly was in Monte Video. Had they sold at the new prices only the same quantity of gas in the five months of 1908 as they did in 1907, there would have been a reduced revenue of £4500. But, owing to the increase in the consumption—induced, he thought, by the lower price—they recovered £2400 of the loss; so that with five months' working at the lower price the reduction in revenue over that period amounted to only £2100—a result which he considered was quite satisfactory. The contingency account showed an increase of £2160—£2000 having been transferred from the year's profits, while £160 represented the increased market value of the investments. He thought this account need not be further increased in the present state of the Company's finances. Sundry creditors at Monte Video figured at £3427 more than in the previous year. This item represented various unpaid accounts for materials, &c., at the end of the year, and included wages accrued for the month of December which were paid in January, and part of the cost of a cargo of coal and the freight thereon, which was not settled until the whole cargo was discharged in January. The increase of £378 in London creditors was due in part to the heavier amount of income-tax accrued and payable to Dec. 31; and it also included the value of goods shipped, but not paid for until January. Turning to the credit side of the balance-sheet, the amount written off for depreciation—£4831—was about £150 less than for 1907; and there had been added £4617 for new mains, meters, and coal-stores, and the cost of another lighter which had been bought. The addition to the coal-stores had been rendered necessary owing to the larger stock of coal that must now be kept, to meet the increased make of gas; and another lighter was necessary to obviate any risk of demurrage in unloading coal cargoes. The stocks of coal were more by £2613, gas-fittings were £970 more, various materials required in the gas-works were £407 more, and stocks of materials, tools, and fittings for the dock and ship repairs were £1798 more. The stock of residual products stood at only £125, as there had been a good demand for them throughout the year. Sundry debtors and outstanding accounts showed the satisfactory decrease of £2288, and stood at £13,339, after deducting all items which were considered to be bad debts. Investments showed a small increase of £176; and they were all taken at their market value in drawing up the balance-sheet. A few changes in the securities had been made during the year. Other property exhibited an increase of £2806, due to payments made on account of the erection of the new offices and show-rooms. They hoped to get into the new premises at the end of this year. The large amount now paid for rent would then be saved; and when the upper portion of the building was let, the return on the capital invested would be a fair one. Shipments afloat, costing £3449, showed a decrease of £2589. They included fire-bricks, clay, a steel roof for the new coal-stores, and goods

of various descriptions. Bills receivable, in hand, and in transit, at £16,000, were £1000 less; while the cash in hand and on deposit was £11,960 more—showing that the Company were in a strong financial position. Dealing with the revenue account, the receipts from gas sold, residual products, &c., were £4823 more; and from the dock department there was an increase of £6842. The expenditure, however, had been increased by £11,842. It had been necessary to carbonize over 1100 tons more coal to meet the increased sales of gas; and the average cost, including freight, &c., was slightly higher than in the previous year. The roofs of the engine, boiler, and meter houses had also been renewed. The net profit from the gas department, after providing for these expenses, and notwithstanding the heavy reduction in the price of gas for five months of the year, was over £500 more than in the previous year. The dock department and sundries had yielded £30,884, or an increase, as he had stated, of £6842. With this large amount of work, taken under competitive conditions, the wages bill would naturally show a large increase. In addition, the Company were put to serious expense through a strike of their boiler-makers, just when things were exceedingly busy. It was necessary to incur heavy expenses in bringing men from Buenos Ayres; but they were quickly influenced by the Union, and almost at once returned. The strike was not successful, and ultimately broke down. The whole trouble arose because the Society insisted that the Company should employ four men who had been discharged for misconduct. In the best interests of the Company the Board could not submit to any dictation as to whom they should employ or whom they should dismiss. It was necessary, therefore, to face the strike, even at the risk of these extra expenses, and of temporarily driving business from the port. Thanks were due to the authorities and police for the assistance and protection that were afforded by them. The various items in the profit and loss account called for very little comment. The bad and doubtful debts were about £250 less; and the small amount that had to be provided this year reflected great credit on the officials. He hoped the time was near when the Directors would be in a position to declare a larger dividend. The expenditure necessary to renew the retort-house was now partly provided for; and the depleted accounts under the several heads he had mentioned had been strengthened, while the working capital was sufficient. They could not as yet tell for certain what the result of this large reduction in the price of gas would be at the completion of the year; but he had every reason to hope that it would increase the net profits. But whether it did or did not, he thought the shareholders would agree that the policy was the best one for the Company to adopt. He was addressing many old shareholders who had accorded to the Board their support throughout the troublous times through which the undertaking had passed; and they must feel, as he did, that the policy of the Directors had placed the Company in a strong financial position, and that when they were able to increase the dividend it would be in the confident belief that they would be able to maintain it. Old shareholders would remember that, when the Company lost the whole of the public lighting of Monte Video—which at one time produced £23,000 a year—they were placed in a very difficult position; and the commercial position of Monte Video, owing to revolutions and political troubles, did not for some time lend itself to the prosperity of a gas company. But notwithstanding this, the debenture debt had been paid off to the extent of £50,000, and the position of the Company improved generally. He concluded by moving the adoption of the report and accounts.

Mr. ROBERT MORTON seconded the motion.

Mr. E. PARKER YOUNG, while congratulating the Chairman on making an optimistic speech, said he thought the Board could have easily given them a dividend of 4 per cent., instead of 3½ per cent. He asked if the Municipality had paid what they owed.

The CHAIRMAN: There is no debt now; and under the Articles of Association you have no power to move an increased dividend.

Mr. R. GILES: Is the reduction in the price of gas a voluntary act on the part of the Board, or caused by the municipal authorities?

The CHAIRMAN: It is an entirely voluntary act on the part of the Board, not only to maintain, but to increase our business. We have competition with the Government electric light undertaking which is very keen.

Mr. YOUNG: Cannot you instal electric lighting?

The CHAIRMAN: We could; but it is not worth while. Continuing, he said that the feeling which guided the Directors was that when they increased the dividend, as they hoped they would do, they did not want to go back again. The progress which the Company had made during the past ten years, under by no means favourable circumstances, was something that the shareholders should be satisfied with. He did not for a moment say that 3½ per cent. was an adequate return to get out of a South American Gas Company. But it was not fair to take an abstract proposition like this without considering the particular circumstances. Of course, the Company were heavily capitalized; and they lost their concession. They really had the right to supply electricity; but it was no use fighting the Government, and the Board did the best they could.

The resolution was then carried *nem. con.*

The CHAIRMAN proposed the payment of a dividend for the half year to Dec. 31 of 8s. per share, less income-tax, making, with the interim dividend, 3½ per cent. for the year.

Mr. CHARLES HUNT seconded the motion, which was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. MORTON, Mr. John Mews was re-elected a Director of the Company, as was also Mr. Hunt, on the motion of the CHAIRMAN, seconded by Mr. MEWS.

Proposed by Mr. T. WILKINS, seconded by Mr. GILES, the Auditors (Messrs. G. Sneath and L. E. Halsey) were also re-appointed.

On the motion of the CHAIRMAN, seconded by Mr. MORTON, a vote of thanks was passed to the staff both at home and in Monte Video; and on the proposition of Mr. J. BENNETT, seconded by Mr. YOUNG, a similar compliment was accorded to the Chairman and Directors.

Gas Profits at Leigh.—The gas undertaking of the Leigh Corporation made a gross profit of £12,700 on the past year's working, and a net profit of £3238. In the previous year, the net profit was £850. There was an increased consumption of 500,000 cubic feet of gas, and the receipts from coke also increased.

THE PUBLIC LIGHTING OF CALCUTTA.

Offer by the Oriental Gas Company.

The Special Committee of the Calcutta Corporation appointed to consider and report on matters between the Corporation and the Gas, Tramways, Telephone, and Electric Light Companies, considered at their meeting on the 30th ult. a letter from the Manager of the Oriental Gas Company (Mr. James C. Watson), offering certain terms in connection with the new contract for the supply of gas for the lighting of Calcutta. The letter is as follows:—

I have the honour to inform you that your letter of Feb. 25 has been carefully considered by my Directors, and they request me to state their desire to acquiesce in the proposal that the new contract for the supply of gas for public lighting should exclude the maintenance, lighting, and extinguishing of the lamps, the supply of mantles, the supply and upkeep of lanterns, and all other expenses connected therewith.

They have read Mr. Mansfield's report on the 12th of February, a copy of which you were good enough to enclose in your letter;* and, while not accepting the value of tests made under the difficult circumstances to which he alludes, they think it better at this stage of the negotiations to avoid any remarks thereon, beyond a simple protest against the conclusions arrived at, and confine themselves to Mr. Mansfield's suggestions, submitted by him for your consideration, as follows: (1) The Gas Company concur, with the exception of the pressure. They submit that a minimum pressure of 15-10ths is ample. (2) The Gas Company agree to the contract being for twenty years. The alterations in the existing mains have been put in hand, and will be proceeded with in a thorough manner with all despatch and at a considerable expenditure. (3) The Gas Company could not pledge themselves to an unknown obligation, nor could they consent to be bound by future legislation applicable to gas supply in towns in England, the economic conditions of which may be wholly dissimilar from those in Calcutta. But, as heretofore during the past fifty years, they would do all that may be necessary to carry out their engagements with the Corporation. (4) As regards day pressure, this must be left to the discretion of the Gas Company, whose interests are to encourage the use of gas for purposes other than public lighting. (5), (6), (7), (8), (9) These suggestions are for the consideration of the Corporation, and every assistance will be given by the Gas Company to carry them out. (10) In this, the Gas Company fully concur.

As regards the price of the gas for the street-lamps, my Directors regret to state that they are unable to accept the rate of Rs. 2-4 per 1000 cubic feet suggested in your letter under reply. I am instructed to offer to supply gas for public lighting, under the conditions set forth in the present letter, at Rs. 3 per 1000 cubic feet. In quoting this price, I may be allowed to call your attention to the difference in the supply of gas in Calcutta as compared with England. The sale of gas in Calcutta is less than a million cubic feet per mile of main, whereas in English towns a consumption of more than 14 million cubic feet per mile is attained. The difference in the outlay for mains, therefore, necessitates a considerable difference in the selling price of gas.

The Company further stipulate that this price is for a minimum annual consumption of 150 million cubic feet (which is less than the total supplied last year), and that the amount of gas consumed is to be ascertained by the average quantity registered by meters affixed at the expense of the Corporation—at least one to every ten lamps. The necessary provisions in regard to extending the number of public lamps beyond the minimum of 9000, to defining the point at which the Municipality take over the supply of gas in the lamps, to testing meters and verifying tests, and the settlement of general clauses in the agreement, will be duly considered hereafter. The Company would be prepared to extend their mains to streets and thoroughfares not now lighted by gas, upon terms similar to those in their existing contract. This proviso would not apply during the last five years of the contract, when extensions of mains would be a matter for arrangement between the Corporation and the Company.

The preceding letter, and one from Mr. Alfred Mansfield regarding the submission of a detailed report to be given in consultation with the Directors of the Oriental Gas Company in London, were considered together; and it was resolved to ask Mr. Mansfield and Mr. Shirley Tremearne, who is now in England, to meet the Directors, discuss the question thoroughly with them, and let the Corporation know the result. The Committee pressed that the 2-feet pressure recommended by Mr. Mansfield should be maintained.

* The report was given in the "JOURNAL" for March 9 (p. 720).

Gas and Electricity Profits at Stoke-upon-Trent.

In presenting the annual financial statement at a recent meeting of the Stoke-upon-Trent Town Council, Mr. N. Emery, the Chairman of the Finance Committee, who announced an increase of 3d. in the pound in the district rate, said the Gas Committee, who handed over towards the rates last year a sum of £1400, which was equal to a 3d. rate, had found that the present charge for gas would not permit of any contribution this year, the figure being now reduced to as near as possible the actual cost, and they had but a small balance in hand to cover extensions for which the Council had no borrowing powers. The gas consumers now obtained the full benefit of the gas-works, and the ratepayers had to rely entirely on the rates by an increase of 3d. in the pound on a normal expenditure. Alderman Geen, the Chairman of the Gas Committee, said the Committee were acting in accordance with what would be the law after the Potteries towns were federated next year, for then gas would have to be sold at cost price, or, at all events, no profit could be made for the relief of the rates. Alderman Robinson said the Electricity Committee were in exactly the same position as the Gas Committee, as, but for having reduced the price of electricity to the bare cost of production, they would have been able to hand over a sum of upwards of £1000 to the district fund.

SMETHWICK GAS UNDERTAKING.

Annual Report.

The annual report and statement of accounts in connection with the Smethwick gas undertaking, for the year ended March 31, was issued on Saturday by the Secretary (Mr. W. J. Sturgess).

The total income on revenue account amounted to £63,644, a decrease of £2904. From the sales of gas the loss in revenue had been £1872, of which the reduction in price to large consumers which came into operation at the commencement of the year accounted for £1051; the remainder being due to diminished sales which (says Mr. Sturgess) "for the first time since the commencement of the undertaking in 1881 it is now my regrettable duty to record." The total quantity of gas sold and accounted for was 418,581,300 cubic feet; being 20,074,400 cubic feet short of the output in the previous year, or a decrease of 4.58 per cent. The total number of collections from prepayment meters during the year was 72,982; and the average amount of cash taken from each meter was 39s.—the average consumption of gas being 11,700 cubic feet. Prepayment meter consumers had increased by 11.81 per cent.; while, on the other hand, the ordinary consumers, at 2s. 7d., had taken 7.5 per cent. less, and the large consumers for lighting purposes 3.54 per cent. less. The day consumers for power and manufacturing purposes had fallen off 19.5 per cent.; while the consumption for public lighting had increased 9.99 per cent. Much of the falling off was due to bad trade, exceptionally light days, and the introduction of suction gas and electric installations by some of the large consumers. This falling off had affected their finances considerably. It touched them in every department and process of manufacture. At the same time, the cost of operating the concern and the amount of work done from day to day did not proportionately decrease. The quantity of gas unaccounted for, due to leakage and condensation, was 23,224,700 cubic feet, or 5.26 per cent. of the gas sent out, as compared with 4.91 per cent. last year. The cost of coal, though 1085 tons less were carbonized, was higher, on account of the increased prices; the average being 5½d. per ton in excess, equal, on the total quantity carbonized, to £793. The length of mains at the end of the year was 50½ miles; and there were 1210 public lamps in the borough.

The gross profit on the year's trading was £18,012, compared with £20,518 for the previous year—a reduction of £2506. The balance at the beginning of the year was £7108. Against these items, had to be charged the necessary provision for interest on loans and the requisite instalments for redemption of the debt, amounting in the aggregate to £10,567, and leaving a net profit for the year of £7445, against £10,021 in the previous year—a decrease of £2576. From the net profit of £7445 had to be deducted the value of public lighting, £3934, now contributed free of charge by the Gas Committee in aid of the district rate, and the fourth instalment of £1000 on account of the Committee's contribution of the sum of £5000 towards the cost of the new Council House. This left £2510 to be carried to the depreciation and suspense fund account, against which had been charged the cost of laying the new 15-inch main for the Bearwood supply; leaving a balance of £1049 to the credit of the account. During the year they had not found it necessary to raise further money for capital purposes. The net debt stood at £147,175, against £151,554 in 1908. The capital expenditure at the end of the year amounted to £217,048, which was equivalent to 10s. 4d. per 1000 cubic feet of gas sold, against 9s. 10d. last year with the same plant.

EVESHAM CORPORATION GAS UNDERTAKING.

Gas Manager's Salary Increased.

At the Meeting of the Evesham Town Council last Wednesday, the minutes presented by the Gas Committee contained a resolution which had been unanimously passed by them to the effect that, in view of the satisfactory position and working of the Gas Department, the salary of the Manager (Mr. Percy H. Fletcher) be increased by £30 per annum, to commence from the end of next month.

In moving the adoption of the minutes, the Chairman of the Committee (Mr. W. A. Fisher) said the annual statement of accounts, as certified by the Auditor, had been received; and it afforded him pleasure to give the Council particulars of the year's working. The total receipts for the year amounted to £9081, and the expenses to £6432; leaving a gross balance of £2649. After giving details from the accounts, he said the sale of gas showed a satisfactory increase during the year; there were 147 new consumers; and the number of gas-stoves fixed was 132. The consumers on the books on March 31 last totalled 1356. He would just like to mention that the quantity of gas made during the year ending March 31, 1905—the first year he had the honour of being Chairman of the Gas Committee—was 30,934,000 cubic feet. The make during the year ending March 31 last was 44,010,000 cubic feet—showing an increase during the four years of 13,076,000 cubic feet. He thought the Council would agree with him that the gas undertaking was in a very sound financial condition. Referring to the minutes, Mr. Fisher said the Committee thought that during a portion of the year some people did not use their stoves, but still had to pay the hire. They therefore recommended that the cost of hiring be reduced 50 per cent. from the 24th of June. They also recommended that the Manager's salary be raised £30 per annum.

In seconding the motion, Alderman New remarked that the net profit on the year's working was more than £1600; and he felt sure there would be no question about using some of the surplus to increase the salary of their excellent Manager. Mr. Fletcher deserved the utmost credit for the way in which the gas-works had been conducted since they had been under his management; and not only the members of the Council, who had the matter before them in detail, but all the ratepayers must admit that he was responsible for the excellent condition of the works and the large amount of profit of which eventually they would have the benefit. The minutes were approved.

HINCKLEY GAS SUPPLY.

At the last Meeting of the Hinckley Urban District Council, the Gas Manager (Mr. F. Lee) presented his report for the year ended March 31. He stated therein that the amount expended on capital account during the year was £1054, of which £129 was for new mains and services, £436 for new meters, £450 for new stoves, and £39 for fittings; the whole having been paid for out of profits. The total expenditure on the special renewals account was £2037; the chief items being £1054 for new offices, store-rooms, and workshops, £919 for laying a new 9-inch main to Burbage, and £36 for a new 4-inch main in Hollycroft. During the year, in addition to the ordinary instalment of £1203, a sum of £1000 was placed to the sinking fund out of profits. Loans amounting to £2609 were repaid during the year. The total receipts were £13,526, and the working expenses £8310; the gross profit being £5216. Interest on loans came to £1329, and the payment to the sinking fund to £1203; leaving a net profit of £2684—being £822 less than in the preceding year. This was caused by the reduction of 2d. per 1000 cubic feet in the price of gas, the allowance of stove-rents to consumers using slot-meters, the increased cost of coal, higher charges for rates, taxes, interest, and sinking fund, and reduced revenue from residuals. The coal used during the year was 6967 tons, compared with 6826 tons in 1907-8. The gas made was 75,106,000 cubic feet, compared with 73,640,000 cubic feet; being an increase of 1,466,000 cubic feet. The quantity sold was 72,783,600 cubic feet, or an increase of 1,543,200 cubic feet; while the unaccounted-for gas was 1,192,400 cubic feet, or 1.59 per cent. During the year, £265 was transferred to the general district rate.

In moving the adoption of the report, Mr. Kinton remarked that it showed the Council had had another successful year. The gas sales had increased by 1½ millions; and but for depression in trade, which caused less gas to be consumed in factories, there might have been a larger profit. The additional consumption was owing to prepayment meters, which had increased considerably in Hinckley and Burbage. Altogether, the report was a satisfactory one; and though the profit was £822 less than before, this was accounted for by the 2d. per 1000 cubic feet reduction in the price of gas and the allowance of stove-rents. The Gas Committee recommended that, in addition to the sum of £1054 already placed to the capital account, and £864 to the special renewals fund, the sum of £520 should be transferred to the general district rate, and that the balance of £244 be carried forward. They also recommended certain reductions in the meter-rents, which would absorb about £100 of the profits; but it was a step in the right direction, and would go towards abolishing meter-rents altogether. As to the transference of £520 in relief of the rates, it would be a considerable help to ratepayers. The report was unanimously adopted.

GAS PROFITS AND THE RATES AT WIGAN.

At the Meeting of the Wigan County Borough Council last Wednesday, Alderman Gee, the Chairman of the Finance Committee, laid before the members his annual budget. In the course of his speech, he announced that the district rate would be reduced 4d. in the pound, and referred incidentally to the generous contribution made by the Gas Committee to the rates. This elicited from Mr. Fletcher a few remarks on the policy of applying the gas profits in this way. He said the Chairman of the Finance Committee had congratulated the Gas Committee on having handed over £4000 to the relief of the rates; but did they think the thanks of the gas consumers were due to the Committee? He knew it was a ticklish point; but he liked to get at a just basis if he could in his public representation, and he did not think this was fair. There was a big assessment in the town that did not contribute anything to the gas profits. There were companies and individuals who produced their own light simply because they could do so cheaper than they could buy it from the Corporation. The Chairman of the Finance Committee had said that if it had not been for the Gas Committee handing over £4000 of profits, the district rate would have been increased to 5s. 4d. in the pound. But seeing that this money came from the gas consumers, it was they who were paying for the reduction of 4d.; and this was unjust. The only way to be fair all round was to make every ratepayer bear a just share of the responsibility; and he declared that they had no right to ask the gas consumers to relieve the rates of people who were not consumers. He was not going to move that the gas profits be not used for the rates. All he was doing was pointing out to the Council and to the town that certain things were being done which, in his opinion, were not just; and he hoped that in the near future they would realize that it would be better to have cheaper gas than that gas consumers should be called upon to relieve the rates of people who did not use gas. Alderman Ashton, dealing with the same subject, remarked that the question as to the use of the gas profits for the relief of the rates, raised by the previous speaker, was a very debatable one. In the case of people producing their own light, the gas consumers did, of course, help to keep their rates down; but there was another side to the question. For instance, they were handing over from the rates £5000 to the tramways; and, of course, the big companies would have to help in paying this. Consequently, what they got from the gas they paid back to the trams, and one was a set-off against the other—at the present time, at any rate.

Before the Liverpool Stipendiary Magistrate last Thursday, a young man named George Edwin Wake pleaded guilty to four charges of having obtained money in Liverpool last year by falsely representing that he was a manufacturer of gas-fittings and mantles which would reduce gas consumption to one-half. At present, it was stated, the prisoner was serving a sentence of six months for similar offences at St. Helens. He was now sentenced to eight months' imprisonment, to follow the St. Helens term.

MR. L. W. S. ROSTRON ON CO-PARTNERSHIP.

At the Caxton Hall, Westminster, last Wednesday evening, Mr. Laurence W. S. Rostron, Barrister-at-Law, gave an address, under the auspices of the London Municipal Society, on "Co-partnership and Profit-Sharing," in which he referred to the principle as adopted by various gas undertakings and other businesses in different parts of the country.

At the outset, the speaker dealt with the subject theoretically, claiming that it was a most desirable system to introduce into a company, as it gave the workers a better interest in their work, with the result that the companies had a more contented body of employees. Further, it was good for the men, as it gave them a safe investment for their savings. There was no greater argument in favour of the system than the fact that it brought employers and employees closer together. Nationally it was true that nothing could be worse than ill-feeling between capital and labour. Regarding co-partnership from the social standpoint, Mr. Rostron expressed the opinion that it would tend to increase industrial efficiency. He thought it would be almost universally admitted that the system was sound theoretically; but was it practicable? This was the object he had set himself to prove in his address; and he thought he could show that it had been fully demonstrated that co-partnership had conferred great benefits on all classes of the community. In support of his contention, he mentioned that at the present time sixteen gas companies had adopted the principle; this number including all the London and a number of the Suburban and Provincial Companies. The system, which was started by the South Metropolitan Gas Company twenty years ago, was, he thought, capable of being very considerably extended if employers would only take up the matter with some spirit, and follow the example of the late Sir George Livesey. In conclusion, the speaker considered the movement from a general point of view.

An interesting discussion followed, in which Mr. Appleby, who is connected with the South Metropolitan Gas Company, remarked that the employees of that Company were better off than those of any other company in England. They wanted, he said, the men to share in the responsibility of the firm. Mr. Henry Austin, a Workman-Director of the Company, as one who had been on the Board for nine years, paid a tribute to the late Sir George Livesey, and characterized the co-partnership system as the salvation of the working man. He added that if people were there discussing this subject instead of being in "another place," he thought they would be far better employed.

The proceedings terminated with a vote of thanks to Mr. Rostron for his address.

Malta and Mediterranean Gas Company, Limited.—The balance of the general revenue account of the Company for the year ending March 31 is £5867. The Directors recommend the payment of the usual dividends on the first and second preference capital, and a dividend of 4 per cent., free of income-tax, on the ordinary capital; making, with the interim dividend paid in December, 6 per cent. for the year, and leaving a balance of £990 to be carried forward.

SALES OF STOCKS AND SHARES.

The keen competition which was in evidence at the sale conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., on the 11th inst., as noticed in the "JOURNAL" last Tuesday, was repeated that day, when they made four new issues of capital for gas and water companies; some £25,000 worth of stocks and shares being sold in a very short time. The first lots consisted of an issue of 4 per cent. perpetual debenture stock of the Aldershot Gas and Water Company; and it fetched from £102 5s. to £103 10s. per £100 of stock. Some £10 "B" shares in the Tendring Hundred Water Company were next offered, and realized £10 10s. to £10 15s. each. New issues of £2000 of 4 per cent. perpetual debenture stock and £3000 of consolidated ordinary stock of the Chigwell, Loughton, and Woodford Gas Company were then offered. The former fetched from £100 to £100 15s., and the latter (which will carry interest at the rate of 5½ per cent. per annum) £111 10s. to £113, per £100. The final lots consisted of £4000 of consolidated stock and £3000 of 4 per cent. perpetual debenture stock of the Uxbridge Gas Company; and the prices realized were £112 to £112 15s. per £100 for the former (which ranks with similar stock on which 5½ per cent. per annum was paid last year), and £100 to £100 5s. per £100 for the latter. At a recent sale by auction, some "A" stock of the Wellington (Somerset) Gas Company, carrying 10 per cent. dividend, fetched £180 per £100. Last Wednesday, Messrs. Nock and Joseland sold some fully-paid "A" shares (£5) in the Bilston Gas Company at £11 15s. each, and some "B" shares at £8 apiece.

RICHMOND (SURREY) WATER SUPPLY.

Additional Filter-Beds and Other Works.

Some time ago, the Water Committee of the Richmond (Surrey) Corporation instructed Mr. Joseph Quick, M.Inst.C.E., to prepare a special report on a proposal to construct filter-beds and other works to improve the quality of the water obtained from the existing well in Petersham Meadow, in accordance with the recommendation of Dr. Klein and the Medical Officer of Health (Dr. Crocker). Mr. Quick accordingly conferred with the Water Engineer to the Corporation (Mr. W. G. Peirce) on the subject of the quantity of water which would have to be dealt with; and he came to the conclusion that provision should be made for treating 250,000 gallons per day. The site proposed for the filter-beds was one selected by Dr. Klein, who was guided by consideration of its isolation, as far as possible, from any risk of contagion. According to Mr. Quick's report, it is proposed to construct two filter-beds, each capable of passing the above-named quantity of water per day when working at the minimum rate of 50 gallons per square foot. In the ordinary way, both filters will be available except during cleaning out, which, with the water of the kind that will pass through them, will, it is believed, be comparatively seldom. Mr. Quick had to consider the relative advantages of conveying the water from the present well to a proposed new dummy well to be constructed in an existing

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 502.

Issue	Share.	When ex-dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	174-18	..	5 11 1	501,000	Stk.	Feb. 25	10	Liverpool United A.	225-227	..	4 8 1
258,955	10	"	4	Do. 7 p.c.	124-123	..	5 9 10	718,100	"	"	7	Do. B	168-170	..	4 2 4
310,000	10	Jan. 14	7	Do. 4 p.c. Deb.	95-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	Oct. 29	6	Bombay, Ltd.	53-6	..	5 8 4	75,000	5	Dec. 11	6	Malta & Mediterranean.	43-5	..	6 0 0
40,000	5	"	6	Do. New, £4 paid.	44-43	..	5 15 6	50,000	100	Apl. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne- 0 p.c.	24-29½	..	4 14 11	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101-103	+1	4 7 5
51,510	10	"	7	mouth Gas B 7 p.c.	163-17	..	4 15 7	541,920	20	Nov. 13	5½	Monte Video Ltd.	123-13	..	5 7 8
53,200	10	"	6	and Water Pref. 6 p.c.	158-17½	..	4 15 7	1,775,802	Stk.	Feb. 25	43	Newcastle & G'ts'd Con.	101-107½	..	4 3 9
350,000	Stk.	"	12½	Brentford Consolidated	250-251	+1	4 19 2	154,955	21K	Dec. 30	3½	North Middlesex 10 p.c.	91-93	..	3 15 3
300,000	"	"	1½	Do. New	119-121	..	4 19 6	155,940	10	Feb. 25	7	Do. 7 p.c.	193-20	..	5 0 0
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	303,000	Stk.	"	8	Do. 13-13½	13-13½	..	5 3 8
206,250	"	Dec. 11	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	60,000	5	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	212-214	..	4 0 6	3,800	53	Mar. 31	13	Ottoman, Ltd.	6-6½	..	6 8 0
246,320	"	"	10	Do. A Ord. Stk.	154-156	..	4 19 4	60,000	50	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
470,000	2½	Apl. 16	10	British	44½-45½	..	4 12 6	100,000	5½	"	12	Do. B.	109-131	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	117-119	+1	5 0 10	140,800	5½	"	13	Do. C.	119-121	..	4 19 2
165,700	"	"	4½	Do. do. 3½ p.c.	87-89	+1	5 1 2	398,490	5	May 13	7	Do. D and E.	101-103	..	4 17 1
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	134-133½	..	5 1 10	796,83	5	Jan. 28	5	Primitiva Ord.	63-7*	..	5 0 0
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	487,903	100	Dec. 1	4	Do. 5 p.c. Pref.	54-5½	+½	4 10 11
100,000	10	"	—	Cape Town & Dis., Ltd.	41-5	..	—	1,00,000	10	Apl. 23	8	Do. 4 p.c. Deb.	95-97	..	4 2 6
50,000	10	May 3	6	Do. 4½ p.c. Pref.	53-6	..	6 2 5	312,650	Stk.	Dec. 30	4	River Plate Ord.	144-15	..	4 2 6
100,000	Stk.	Dec. 30	4½	Do. 6 p.c. 1st Mort.	48-49	..	5 13 11	250,000	10	Mar. 31	8	Do. 4 p.c. Deb.	95-97	..	5 12 3
157,150	Stk.	Feb. 25	5	Do. 4½ p.c. Deb. Stk.	77-79	..	4 10 1	125,000	50	"	—	San Paulo, Ltd.	134-141	..	5 0 0
1,493,280	Stk.	Mar. 12	5½	Chester 5 p.c. Ord.	109-111	..	4 16 2	135,000	Stk.	Mar. 12	2	Do. 6 p.c. Pref.	118-12	..	5 0 0
560,000	"	"	5	Commercial 4 p.c. Stk.	108-110	..	4 16 2	219,981	10	"	10	Do. 5 p.c. Deb.	504-513	..	4 17 1
475,000	Stk.	Dec. 11	3	Do. 3½ p.c. do.	102-104	..	3 11 5	523,500	10	Oct. 29	10	Sheffield A.	230-238	..	4 4 0
800,000	Stk.	"	6½	Continental Union, Ltd.	100-102	+1	6 7 5	6,429,895	Stk.	Feb. 11	5/6	Do. B.	233-235	..	4 5 1
200,000	"	"	7	Do. 7 p.c. Pref.	139-141	..	4 19 3	1,895,445	Stk.	Jan. 14	3	Do. C.	233-235	..	6 17 11
497,200	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	209,822	S.k.	Mar. 12	8	South African	14-14½	..	4 5 4
55,000	"	Mar. 31	4	Do. Deb. Stk.	103-105	..	3 16 2	605,000	Stk.	Feb. 25	5	Do. 3 p.c. Deb.	123-125	..	3 9 9
143,995	"	"	5	East Hull 5 p.c. Ord.	97-99	..	5 1 0	60,000	Stk.	"	5	South Shields Co., Stk.	152-154	..	5 11 1
486,190	10	Jan. 23	12	European, Ltd.	24-24½	+½	4 18 0	177,018	Stk.	Jan. 14	5	S'th Suburban Ord. 5 p.c.	120-122	..	4 10 2
151,663	Stk.	Feb. 11	41/8	Do. £7 rs. paid.	18-18½	+½	4 17 4	509,310	Stk.	May 13	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
2,600,000	"	"	3½	Gas 4 p.c. Ord.	103½-104½	+½	4 6 6	120,000	Stk.	Feb. 25	6½	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
3,793,735	"	"	4	light 3½ p.c. max.	88-89	..	3 18 8	423,940	Stk.	"	5½	Southampton Ord.	107-109*	..	4 11 9
4,193,975	"	Dec. 11	3	and 4 p.c. Con. Pref.	135-107	..	3 14 9	149,470	Stk.	Dec. 30	4	Tottenham A 5 p.c.	132-134	..	5 0 9
258,740	Stk.	Mar. 12	4½	Coke 3 p.c. Con. Deb.	83-86	..	3 9 9	12,300	13	"	8	Do. B 3½ p.c.	110-112	..	4 13 8
82,500	"	"	4	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	236,476	Stk.	Feb. 25	6½	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
70,000	10	Apl. 29	11	Do. do. 5 p.c.	118-120	..	5 4 2	255,600	Stk.	"	5	Tuscan, Ltd.	83-91	..	8 13 0
123,500	Stk.	Mar. 12	6½	Hongkong & China, Ltd.	17½-18	..	6 2 3	79,416	"	Dec. 30	3	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
65,781	"	"	5	Ilford "A" and "C"	135-137	+1	4 14 11	85,872	"	"	5	Tynmouth, 5 p.c. max.	105-107	..	4 13 6
63,000	"	Dec. 30	4	Do. "B"	103-105	..	4 15 3	210,000	"	"	5	Wands- 3 p.c.	131-141	..	4 12 2
4,940,000	Stk.	May 13	8	Do. 4 p.c. Deb.	102-104	..	3 16 11	253,300	"	Dec. 30	4	worth 3 p.c. Deb. Stk.	73-75	+1	4 1 1
473,600	Stk.	Feb. 11	3½	Imperial Continental	181-183*	-1	4 7 5					West Ham 5 p.c. Ord.	121-123	+2	4 5 4
195,242	Stk.	Mar. 12	6	Do. 5½ p.c. Deb. Red.	95-97	..	3 12 2					Do. 5 p.c. Pref.	125-127	..	3 18 9
				Lea Bridge Ord. 5 p.c.	120-121	..	4 18 4					Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5

Prices marked * are "Ex div."

building used as a potting-shed, through a suction-pipe upwards of 400 yards in length, or laying a main from the bottom of the well at a sufficient depth to allow the water to flow by gravitation to the new well. He advised the adoption of the latter course, though it would cost approximately £467 more than the suction-pipe. The water will be lifted on to the filters by means of gas-engines in duplicate, each capable of raising 12,500 gallons per hour with one set of three-throw pumps, which could be worked by either engine. The proposed works are estimated to cost £5463. Mr. Peirce reckons that the annual working expenses, exclusive of the interest and sinking fund, will be £573; but Mr. Quick considers they might be reduced to £473, or rather more than 1d. per 1000 gallons. Adding £300 for the repayment of the loan and for interest, the total cost would be less than 2d. per 1000 gallons, compared with 6d. per 1000 gallons which the Corporation now pay to the Metropolitan Water Board.

Having considered the report in detail, the Water Committee agreed with Mr. Quick's suggestion, and referred the matter to the Finance Committee for them to make the necessary arrangements in the event of the recommendation being agreed to. When the report came before the Town Council, it was stated that since the use of the Petersham well supply had been discontinued, the Corporation had paid £2000 a year more to the Metropolitan Water Board. The recommendation was adopted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 22.

The market has been quiet throughout the week. Available supplies have not been very large at any point; but buying has been perfunctory, and prices have been fairly maintained. The closing quotations are £11 per ton f.o.b. Hull, £11 2s. 6d. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. Makers' prices for forward delivery are for the most part quite above the ideas of buyers. Meantime there is speculative offering abroad at the equivalent of £11 5s. per ton f.o.b. for delivery up to the end of the year, but it does not seem to be meeting with a very ready response.

Nitrate of Soda.

Local supplies being somewhat limited, the spot market remains firm at 10s. 6½. per cwt. for 95 per cent., and 10s. 9d. for refined quality, though the spring demand is nearing its close.

Tar Products.

LONDON, May 24.

Tar products have been steady throughout the past week; while pitch is decidedly firm. Though there is no business doing for prompt delivery, and prices for delivery between now and June are purely nominal, for forward delivery business has been done at very good figures, and makers are not at all inclined to sell any further quantity unless

they can obtain an advance in price. There is a slight lull in business in South Wales at present—which is not to be wondered at, seeing how heavily they have bought during the last month or two, and the considerable doubt which prevails as to whether there will be a strike in this district. The Continent appears to be abstaining from buying as far as possible. It is, however, known that, in certain quarters at any rate, parties are not at all well bought, and must sooner or later come into the market; and when due consideration is given to the fact that pitch is not at all plentiful in England, it is probable that we shall see a still further advance. Creosote is steady. In London, makers are more disposed to sell for near delivery; but in the Midlands and the North, they are apparently well sold. Benzol is very quiet, and sales are difficult to negotiate; while Continental manufacturers are offering, to the French consumers in particular, at prices even below the parity of those in England. Toluol is steady, but there is not much business doing. Solvent naphtha is firm in London, but quiet in the North. Heavy naphtha is steady, but there is not much business to report. Carbolic acid remains firm, but there is no disposition on the part of actual consumers to purchase.

The average values during the week were: Tar, 14s. 3d. to 18s. 3d., *ex works*. Pitch, London, 27s. to 27s. 6d.; east coast, 26s. 6d. to 27s.; west coast, 25s. 9d. to 26s. 9d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others. Benzol, 90 per cent., casks included, London, 5½d. to 6d.; North, 5½d. to 5½d.; 50-90 per cent., casks included, London, 6½d. to 6½d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8½d.; North, 7½d. to 7½d. Crude naphtha, in bulk, London, 3½d. to 3½d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady throughout the week, but towards the end there appeared to be slightly more inquiry, and it is possible that prices have touched bottom. The Gas Company maintained their price; but it is possible to buy outside stuff on Beckton terms at £11. In Hull, £11 is reported to have been accepted; and in Liverpool, £11 1s. 3d. In Leith, makers are well sold, and are very firm in their ideas. The firmness of nitrate of soda, if continued, must ultimately have its effect on sulphate of ammonia.

According to a telegram from Berlin which reached London through Reuter's Agency, there was an explosion in the gas-works at Charlottenburg last Wednesday morning, by which five persons were severely injured.

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The GAS BIRD.*



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20, Fennel Street, Manchester.

COAL TRADE REPORT.

Northern Coal Trade.

There is a steady demand for coal, though a little less pressing than was the case a month or so ago. The output is generally maintained; and, on the whole, it is well taken up. In the steam coal trade, best Northumbrians are from about 12s. 1½d. to 12s. 3d. per ton f.o.h., and some of the collieries appear to be well sold ahead. Second-class steams vary from about 10s. to 10s. 6½. per ton; and steam smalls are in good demand at from 5s. 6d. to 6s. 6d. There is a good request for gas coal for this season, though the deliveries on the long contracts are now very low to what is known in the winter. Durham gas coals vary from about 9s. to 10s. 3d. per ton f.o.h., according to quality, for the usual classes; while for best "Wear" specials," up to 11s. 3d. is quoted—the latter having been well sold forward. A few small contracts are in the market. The amounts, however, are not likely to influence the prices to any great extent, though there is the uncertainty as to the effect that the Eight Hours Act may have on the production and price after the end of next month in other districts than those of Northumberland and Durham; so that until there is some settlement made, forward business is still generally limited. At the same time, there is more disposition to take a favourable view of the result of the negotiations between coalowners and miners. Coke is steady; and gas coke is rather firmer at 13s. to 13s. 3d. per ton f.o.b., the production being less.

Beyrouth Water-Works Company, Limited.—Last Tuesday week, an extraordinary general meeting of the Company was held at the London Offices for the purpose of considering a resolution for the sale of the assets and undertaking to Messrs. Sabbag et Cie., for the sum of £100,000. Mr. W. T. Western, who presided, remarked that the expectation held out by the promoters when the Company was formed 35 years ago had not been fulfilled. The cost of the works was large, and the revenue was much less than was anticipated. It would be necessary for them to raise extra capital, and under existing conditions there would be difficulty in doing so. But a group of bankers in Paris had acquired a large interest in the Company, representing a majority of the shares and of each class of debentures. They considered that the best way of meeting the situation was to start an entirely new Company, and liquidate the existing one. Under the arrangement, they would pay £100,000 for the property, and meet the liabilities. This would not be enough to pay off the debentures in full; but under the scheme they would receive £90,000 of the purchase-money, and the remaining £10,000 would go to the shareholders, giving them 10s. a share. In reply to a shareholder, the Chairman said there were £85,000 first debentures, and approximately £100,000 second debentures. The proposal was agreed to; and a resolution for winding up the Company was also passed.

Nuisance Caused by Washings from Producer-Gas Plants.

The annual report of Dr. Collingridge, the Medical Officer of Health for the City of London, which was issued on Saturday, contains the following references to the nuisance of washings from gas-producer plant: "Of recent years, the use of producer gas in the City for motive purposes has considerably extended; but this form of power is not without some disadvantage, as shown by several complaints of nuisance from gas washings inseparable from the process unless properly treated. There can be no objection to this system of gas making for utilization in engines instead of coal gas, provided no nuisance is created thereby; but the trouble in several cases has been caused by the abominable odour of the effluent, which contains sulphuretted hydrogen. Further, it is a direct contravention of the City of London Sewers Act, 1848, to discharge any gas washings into the public sewers. Section 76 is as under: 'And he it enacted, that if any gas company or person making, manufacturing, or supplying gas, shall at any time empty, drain, or convey, or permit or suffer to be emptied, drained, or conveyed, or to run or flow, any washings or foul or waste water, or any noisome or offensive liquid, substance, or thing that may arise or be produced in the making of gas, into any public sewer or drain, every gas company or person so offending shall forfeit and pay the sum of two hundred pounds for each and every day during which any such washing or foul or waste water, or other noisome or offensive liquid, substance, or thing, shall be permitted or suffered to flow into any public sewer or drain.' It has been found by experiment that the odour of sulphuretted hydrogen with which these gas washings are charged can be practically eliminated by the use of permanganate of potash, the addition of which to the washings in a settling-tank produces an effluent to which little or no exception can be taken. Such treatment abated the nuisance in each of the cases reported last year; and on the advice of the City Engineer the discharge of the treated effluent was limited to the hours between 8 p.m. and 8 a.m. Each case of this kind will be dealt with on its merits, and the effluent examined from time to time. No further complaints have been received."

Gas Poisoning at Norwich.—On the morning of Saturday, the 15th inst., Samuel Paston, aged 55, a retired sergeant-major of the 3rd Dragoon Guards, who had recently taken over the Festival House public-house at Norwich, was found dead in bed. For several days deceased and his wife had been removing their furniture, &c., to their new abode; and on the evening before his death he slept there alone. Shortly before ten o'clock on Saturday morning, Mrs. Paston returned to the Festival House, and, not finding her husband about, went upstairs and knocked at his bedroom door. As she obtained no answer, she entered the room, which she found to be full of gas. She immediately broke the window, and on turning to the bed found that her husband had been dead for some time, his death having no doubt been caused by gas poisoning.

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Gas for Treeton and Catcliffe.—At a recent meeting of ratepayers and property owners of the villages of Treeton and Catcliffe, near Rotherham, a Canvassing Committee presented their reports showing a good percentage of the inhabitants willing to accept gas, and sixty names were submitted of people willing to take shares. Subsequently, a meeting of the latter was held, at which upwards of £1000 of capital was subscribed.

Gas and Electricity Supply at Brighouse.—At the meeting of the Brighouse Town Council last Thursday, the report on the Gas and Electricity Department for the past financial year showed that the total gas made was 153,377,000 cubic feet, or a decrease on the previous year's total of 10,253,000 cubic feet. Residuals realized £6173, against £6335. The aggregate income was £25,792, and the profit made was £1259. On the electricity works there was a deficiency of £482. Alderman Healey, in moving the adoption of the report, remarked that it was satisfactory in so far as the balance of profit was a little more than it was a year ago. They regarded last year's profit, however, as exceptionally low. The Committee were disappointed with the result of the year's working; but there was no need, they thought, for despair. They were advertising for a new Manager; and they were expecting that, when the change had taken place, better results would be obtained. The Electricity Department, they were sorry to say, was in a poor condition. This, however, was soon to be closed, so far as the old premises were concerned. The report was adopted.

Lurgan Water Supply.—At the last meeting of the Lurgan Urban District Council, the report of the whole Council in Committee, held for the purpose of considering the recommendations of Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Metropolitan Water Board, London, as to the best means of detecting waste of water in the town and as to how to improve the system of filtration at the water-works, was read. Mr. Bryan stated that the average consumption of water for the whole town between the hours of 1 and 5 a.m. from Jan. 27 to April 6 was at the rate of 6400 gallons per hour. It was clear that between these hours there could be no legitimate use for this very large amount of water; and he believed there was scope for the saving, by careful inspection, of 120,000 gallons per day—possibly of much more. In order to locate the leakage and waste, he suggested that the Council should adopt the Deacon meter system of waste detection, which would involve the purchase of one or two 6-inch meters and the making of bye-pass connections at suitable places in the town. Referring to filtration, Mr. Bryan suggested that brick or concrete chambers should be constructed inside each filter-bed adjoining the present filtered water outlets, and that an automatic floating weir regulator should be attached to each outlet. This would allow of approximately 135,000 gallons of water being filtered during the interval that the pumps were not at work, which would tend to equalize the rate of filtration throughout the 24 hours. His estimate for doing the work would be between £300 and £400. The recommendations were unanimously adopted; and it was agreed to apply to the Local Government Board for sanction to a loan of £500 to carry out the work.

Proposed Purchase of the Northwich Gas-Works by the District Council.—At the meeting of the Northwich District Council last Tuesday, it was reported that a Committee had interviewed the Directors of the Northwich Gas Company on the proposed purchase of their undertaking. The Directors received the Committee in a friendly spirit, and suggested that the Council should ascertain the approximate value of the undertaking on the usual basis, and then decide whether they would proceed with the negotiations. The matter was referred to the Finance Committee for this purpose.

Assessment Appeal by the Mitcham and Wimbledon Gas Company.—The Kingston-on-Thames Union Assessment Committee recently considered an appeal by the Mitcham and Wimbledon Gas Company against the new assessment of £8300 gross and £4156 net of their property in the parish of Wimbledon. The original figures were £4271 gross and £3417 net. Mr. A. L. Ryde, for the appellants, argued that the fair rateable value would be £2947. It was finally agreed between the parties that the figure should be fixed at £3700. A sum of £460 was taken off the gross assessment; reducing it to £7840.

Portsmouth Water Company.—At the half-yearly general meeting of this Company last Thursday, the Directors reported that the balance on the profit and loss account available for distribution was £27,284; and they recommended the payment of the full statutory dividends. After deductions for void houses and bad debts, there would be a balance of £7935 to be carried forward. The revenue for the half year was £35,506, and the expenditure £14,011. The Chairman (Mr. W. Grant, J.P.), in moving the adoption of the report, said the most striking feature in the accounts was the diminution in some of the items of expenditure, for which they had to thank their Engineer (Mr. Herbert Ashley, M.Inst.C.E.). Colonel C. L. Owen, J.P., seconded the motion; and it was carried unanimously.

Water Charges in the Clayton District.—A special meeting of the Clayton District Council was held last Wednesday for the purpose of considering a revision of the water charges. Some few years ago, there was considerable loss on the water supply; and, in consequence, the charges for both domestic and trade purposes were increased. A water inspector was also appointed to supervise the plant; and, as a result of the increased charges and effective supervision, the loss has been changed to a profit, which for the last two years has amounted to £200 each year. At the meeting, it was decided to lower the charges for trade purposes to a uniform rate of 1s. 2d. instead of 1s. 4d. per 1000 gallons, with a reduction to those consuming a certain quantity, as at present. It was also decided to reduce the meter-rents 6d. per quarter, and the minimum consumptions from 5000 to 4000 gallons and from 3000 to 2000 gallons. Afterwards the rates for domestic purposes were considered, and it was moved that the charges for all houses up to and including £10 rateable value should be reduced 6d. per house per quarter. An amendment to the effect that all houses, of whatever rateable value, should be reduced 4d. per house, was, however, submitted and carried.

APPRECIATIONS.

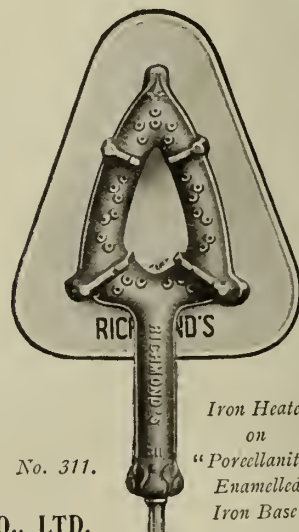
SERIES No. 2.

The "GAS JOURNAL" said:—

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The Shocking Affair at Hackney.—At the Bethnal Green Coroner's Court, last Thursday, an inquiry was held into the circumstances attending the death of Thomas Edward Dillon, which took place early on Sunday, the 16th inst., as recorded in the "JOURNAL" last week (p. 472). Deceased was found lying asphyxiated on a bed in his room. The gas-pipe had been severed, and all the crevices in the apartment carefully stopped up. An explosion of gas took place when the door was opened, resulting in serious injuries to three constables, as well as to Mrs. Dillon and her son-in-law. The Jury returned a verdict of "Suicide by gas poisoning during temporary insanity."

New Joint-Stock Companies.—The Slag and Tar Macadam Company, Limited, has been formed with a capital of £5000, in £5 shares (400 preference), to carry on the business of slag and tar macadam merchants and manufacturers, &c. The Company's offices are at Darlington. The Western Canada Coke and Bye-Products Company, Limited, has been registered with a capital of £1050, in 1000 preference shares at £1 and a like number of ordinary shares at 1s. The Isham Water Company, Limited, was registered on the 13th inst., with a capital of £5000 in £1 shares. The Company's offices are at Albion House, New Oxford Street, W.C. Under the title of A. Roux and Co., Limited, a Company has been registered with a capital of £2400, in £1 shares, to carry on the business of manufacturers of indices for gas and other meters, measuring instruments, &c. The Premier Lighting and Engineering Company, Limited, was registered last Wednesday with a capital of £3000, in 2999 ordinary shares of £1 each, and 15 deferred shares of 1s. 4d. each—offices at 4, Lloyds Avenue, E.C.

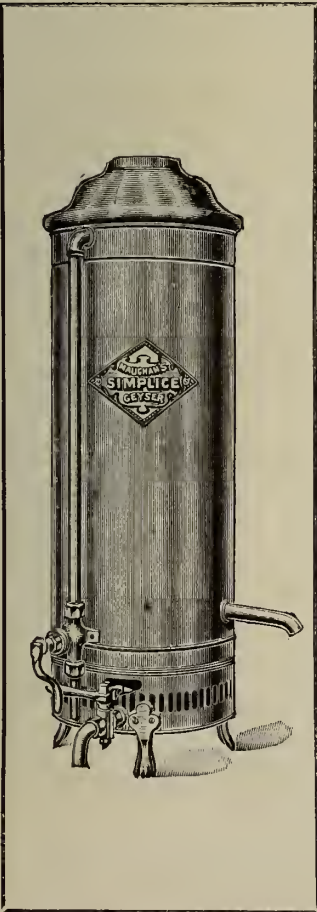
Tewkesbury Public Lighting.—At the meeting of the Tewkesbury Town Council on Monday last week, the question of the public lighting of the town was under consideration. At present gas is used; but the agreement with the Gas Company is terminable on twelve months' notice, and this was given by the Council in June last. Tenders had been invited from the Company, and also from the newly-formed Electric Light Company, for the lighting of the borough from the 1st of July. The Directors of the Gas Company expressed their willingness to light the whole of the town for a period of not less than five years at the same price and under the same conditions as at present. The Electric Light Company stated that they were willing to undertake the lighting of the streets in which their mains were now laid. The cost for Osram lamps for 4000 hours per annum would be £2 10s. a year for the supply of current. The Company regretted their inability to go to the expense of installing lamps, pillars, &c., for the price per lamp would be about £7 to £9. The Surveyor said there were 146 lamps, including six duplicates charged at 1½ each. Under the original agreement, 102 lamps cost £290, working out at £2 16s. 10½d. each, and the 44 others, charged as 48½, cost £2 19s. 10d. each. Several members objected to the lighting of the front streets only by electricity, and said the Gas Company would raise their prices if the area were curtailed. Others refused to sanction the borrowing of money for the erection of standards. After discussion, a proposition that the existing contract with the Gas Company be renewed, was carried.

Tar-Spraying Roads in Berkshire.—At a recent meeting of the Berks County Council, it was decided to spend £250 this year on tar-spraying the roads in the county. The Council will also contribute one-third of the cost of tar-spraying by private landowners, as well as that done by villages. The Berkshire Automobile Club have agreed to give £75 for the same purpose, to be devoted chiefly to the villages; and the Reading Town Council are also spending a large sum this year on tar-spraying.

Electric Light Losses at Morecambe.—At the last meeting of the Morecambe Town Council, Alderman Gardner referred to a request made that he would furnish details of a scheme to produce electric current at 1½d. per unit, and said he had worked out a scheme, using gas-engine power, and his figures had been confirmed by two of the best firms in the country. He expressed the hope that the question would be taken up seriously by the Council, because it was high time the leakage was stopped. They had lost £12,597 within six years; and last year their loss was £2716, or more than £52 a week.

Water-Works Profits at Leeds.—The accounts of the water undertaking of the Leeds Corporation for the year ended the 31st of March last were presented at a meeting of the Water Committee on Friday. They showed a profit of £14,021, compared with £19,930 for the year 1907-8—a decrease of £5969. It is proposed to place £5000 to the reserve fund, and devote the rest to the relief of the rates. Last year the whole of the surplus went to the rates. The amounts received from water charges totalled £151,822, compared with £152,522 in 1907. The total income was £162,287, and the working expenditure £42,554, including £14,114 for rates. Out of the £119,733 gross profit, interest on loans claimed £91,605, and after other items of this character had been met, a net profit of £50,338 remained. Of this sum, £33,970 was placed to the redemption fund, and £2347 contributed to capital in respect of the Washburn main.

South African Lighting Association, Limited.—In submitting to the shareholders the accounts of the Company for the past year, the Directors express their regret at being unable to report any improvement in the position of affairs in Cape Colony. While the number of consumers has been again increased, the sale of gas shows a further falling off, due partly to the competition of electric light, and partly to the state of trade. The Directors are advised that the electrical undertaking in Port Elizabeth is carried on at a substantial loss. But its competition has nevertheless to be faced by the Association; and to this end every endeavour has been made by the Directors and officials to reduce the cost of working. Manufacturing results have been improved, and cheaper coal has assisted to maintain the profits in spite of loss of business. At Grahamstown, there was an increase of 5·66 per cent. in the sale of gas last year; and at both stations the works and plant were thoroughly maintained. The balance of profit is £203 more than in 1907. The Directors recommend the payment of a dividend of 10 per cent. for the year. This will absorb £5333, and leave £614 to be carried forward.



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Besides being exceedingly Durable, they are so made that the few wearing parts can be replaced *in Situ* at a very Low Cost.

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WHERE ALL PATTERNS MAY BE INSPECTED.

Tarred Roads in East Sussex.—In connection with the discussion on the dust nuisance on public highways, it is stated by the Secretary of the Royal Automobile Club that the County Surveyor of East Sussex proposes to tar nearly 80 miles of main roads and about 20 miles of other roads. The roads to be treated include those from Crawley to Brighton, East Grinstead to Eastbourne, and Tunbridge Wells to Hastings.

A Doctor's Testimony to Gas for the Eyesight.—An Eastbourne doctor has written as follows to the Secretary of the Eastbourne Gas Company: "I do much prefer gas-light with good mantles to electric light, as I firmly believe the former is much more helpful to one's eyesight on account of the light being more diffused than is the case with the electric light. And for this reason I have always told my patients, and especially those who read or write much by the aid of artificial light, that they will not only materially save their eyesight, but that they will derive more pleasure in reading and writing."

The Hastings Gas Company and the Current Rate.—Last Thursday, application was made to the Hastings Magistrates by Mr. F. W. Coles, on behalf of the Hastings and St. Leonards Gas Company, with regard to the current rate. He said the Corporation had included in the estimate certain items which the Company objected to; and they served the Corporation with a notice of appeal to the next Quarter Sessions. The Company accordingly entered into recognizances to prosecute the appeal. He was happy, however, to say that arrangements had been come to. The items objected to had now been excluded from the rate, and the Corporation had paid the Company's costs. His application was to release the Company from their recognizances. The Town Clerk (Mr. B. F. Meadows) agreed to this course being adopted; and the Mayor said the Bench were very glad to grant the application.

Through Electrical Spectacles.—"Apparently," says the "Electrical Review," "as the result of its experimenting, the Bradford City Council has decided to retain the public gas lighting in Manningham Lane; and, we might add, to retain its reputation as one of the worst-lighted cities in the country." There is a little confusion between pronouns and nouns in the sentence; but that does not matter so long as we gather our contemporary's meaning.

Water-Rates in London.—At the meeting of the Metropolitan Water Board last Friday, the Finance Committee reported that they had had before them a report by the Accountant (Mr. A. Newton) showing in detail the result of the collection of water-rates for the half year ended March 31 last; this collection covering the second half-year's working of the new Charges Act. The arrears of water-rates for domestic supply and fixed charges at the above-named date were £47,800, compared with £106,298 at the close of the first half year—viz., at Sept. 30 last—a reduction of £58,498 in the amount uncollected. In a similar way the arrears in respect of meter supplies had been reduced by no less than £57,000. The Committee pointed out that a very large proportion of the arrears was outside the control of the collecting officers; and they thought the result of the collection was very satisfactory, and reflected credit upon the officers concerned.

We have received from the British Mannesmann Tube Company, Limited, of Salisbury House, London Wall, E.C., copies of their latest booklets dealing with weldless steel spigot and faucet tubes. One of these consists of a large number of very interesting testimonials from gas and water engineers, and others, as to the advantages and the economies connected with the use of these tubes; while the other contains illustrations, descriptive matter, particulars of tests, lists of places to which the tubes have been supplied, &c.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER AND MANAGER. Bolton Gas Department. Applications by June 14.
MANAGER. Maryport Urban District Council. Applications by June 2.
GAS MANAGER (FIFESHIRE). Applications by June 7 to J. Dishart, Edinburgh.
TEACHER IN GAS SUPPLY. Tottenham Polytechnic. Applications by June 7.
DISTRICT SUPERINTENDENT. No. 5097.
GAS FITTING, STOVES, &c., SALESMAN. Torquay Gas Company. Applications by June 2.
SHOW-ROOM SALESMAN. Belfast Gas Department. Applications by May 28.
WATER-RATE COLLECTOR. Maidstone Water Company. Applications by June 3.

Situations Wanted.

SECRETARY, MANAGER, OR ACCOUNTANT. W. B. Mimmack, St. Paul's Cray.
SULPHATE, LEADWORK, &c. 117, Galloway Road, Shepherd's Bush.

Books, &c., Wanted.

"JOURNALS." Mr. Maurice Graham, 115, Ashley Gardens, London, S.W.
King's TREATISE. R. C. Annandale, Hull.

Plant, &c. (Second-Hand), for Sale.

COMPLETE GAS-WORKS. Northleach Gas Company.
GAS-COOKERS. Coventry Gas Department.
PURIFIERS, &c. Sutton Gas Company.
SCRUBBER AND WASHER, &c. Barnet Gas and Water Company.
STATION METER. Solihull Gas-Works.
SULPHATE STILL. High Wycombe Gas Company.

Plant, &c. (Second-Hand), Wanted.

LIVESY WASHER. No. 5098.

Meeting.

MALTA AND MEDITERRANEAN GAS COMPANY. London Offices. June 4. Twelve o'clock.

Stocks and Shares.

BEXHILL WATER AND GAS COMPANY. June 9.
BRISTOL GAS COMPANY. June 17.
EAST HULL GAS COMPANY. June 2.
HARROW AND STANMORE GAS COMPANY. June 17.
SOUTHEND WATER COMPANY. June 9.
YARMOUTH WATER COMPANY. June 9.

TENDERS FOR

Benzol.
WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Carbon.
BISHOPS STORTFORD GAS COMPANY.

Coal and Cannel.

BARNOLDSWICK GAS AND WATER DEPARTMENT. Tenders by June 1.
BARROW - IN - FURNESS CORPORATION. Tenders by June 8.
CIRENCESTER GAS COMPANY. Tenders by May 31.
DEVONPORT GAS DEPARTMENT. Tenders by June 12.
DONCASTER GAS COMMITTEE. Tenders by June 11.
ELSECAR, &c., GAS COMPANY. Tenders by June 2.
GAINSBOROUGH GAS DEPARTMENT. Tenders by May 31.
GLOUCESTER GASLIGHT COMPANY. Tenders by June 1.
HALIFAX GAS DEPARTMENT. Tenders by June 4.
HORNCASTLE GAS DEPARTMENT. Tenders by June 5.
LURGAN GAS COMPANY. Tenders by June 7.
MORECAMBE GAS DEPARTMENT. Tenders by May 31.
PENRITH GAS DEPARTMENT. Tenders by June 2.
PETERBOROUGH GAS COMPANY. Tenders by June 7.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 3.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 7.
VARIOUS WORKS. Tenders to Mr. Joseph Reeds, Matlock Bath, by June 6.
WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Cookers.

WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Coke.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 7.

Fire-Clay Goods.

WARRINGTON GAS DEPARTMENT. Tenders by May 31.

General Stores—

(Bags, Bolts and Nuts, Brass and Copper Tubing, Fittings, &c., Ironmongery, Cement, Castings, Bricks, Flexible Tubing, Glass, Iron and Steel, Lead and Compo. Pipe, Lime, Oils, Paints, &c., Rails, &c., Drysalteries, Sulphuric Acid, Taps and Valves, &c.)

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 7.

WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Lamps.

WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Meters.

WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Oil for Gas Manufacture.

BARROW - IN - FURNESS CORPORATION. Tenders by June 8.

Pipes, &c.

RHONDDA GAS AND WATER DEPARTMENT. Tenders by June 3.
WARRINGTON GAS DEPARTMENT. Tenders by May 31.

Purifiers, Scrubber, and Condensers.

WINSFORD GAS DEPARTMENT. Tenders by June 14.

Tar and Liquor.

DONCASTER GAS DEPARTMENT. Tenders by June 11.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 7.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON 182 Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEEDS.
Correspondence invited.

"HALLITE" Asbestos High-Pressure

Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

J. & J. BRADDOCK (Branch of Meters

Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE).

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,

NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

CHARLES E. FRY, LEAMINGTON,

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.

(NATURAL)

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.

36, MARK LANE, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

WHITSUNTIDE HOLIDAY.

In consequence of the WHITSUNTIDE HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

APPLY TO THE

CHAIN BELT ENGINEERING CO.
DERBY, ENGLAND,
FOR REALLY HIGH-CLASS
ELEVATORS AND CONVEYORS
ALSO
DRIVING AND CONVEYOR CHAINS.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.

See Advertisement, May 4, p. II. of Centre.
ALDRIDGE AND RANKEN,
39, VICTORIA STREET, WESTMINSTER, S.W.
Telegrams: Telephone:
"MOTORPATHY, LONDON." 5118 WESTMINSTER.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding
Oxide Lightly.
See Illustrated Advertisement May 4, p. 273.

KRAMERS AND AARTS WATER-GAS PLANT.

K. & A. WATER-GAS COMPANY, LTD.
39, VICTORIA STREET, S.W.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

TAR WANTED.

National Telephone 7002. Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS
Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

"GAZINE" (Registered in England and
Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGTON ROAD, LONDON, E.C.
Telegrams: Telephone:
"DAOLIGHT LONDON." 2336 HOLBORN.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore,
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

OXIDE OF IRON FOR GAS PURIFICATION.

Please Address Inquiries for Analysis and Prices to the
NEW WESTBURY IRON COMPANY, LTD.
WESTBURY, WILTS.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of
AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WENNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

KINGS Patent Agency, Limited, 165,
Queen Victoria Street, London, E.C. Director
Benj. T. King, A.I.M.E., British Chartered Patent Agent
(Regd. by Exam.). Telep. 682 Central. Telep. "Geologic,"
London. We sustain over quarter of a century's Experience
and Reputation for Patenting Inventions and Registering
Trade Marks throughout the World.
Write or call. We attend and advise you free.

SULPHURIC ACID for Sale, specially
suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDERLAND.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.

For all Joints in connection with Oil-Gas Plant
and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Re-
fineries in America; also Petroleum Spirit for Gas
Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
11, OLD HALL STREET, LIVERPOOL.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manu-
facturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

DESSAU PATENT VERTICAL RETORTS.

FOR list of Installations, see "Journal,"
May 18, p. I. of Centre.

THE DESSAU VERTICAL RETORT COMPANY,
Care of Mr. CHARLES HUNT, Consulting Engineer,
17, VICTORIA STREET, WESTMINSTER, S.W.

GAS PLANT for Sale—We can always
offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gasholders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

BRISTOL RECORDING GAUGES
AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manu-
facturers, OLDBURY, WORCS.

PINCHBECK'S Meters and Burglar
PROOF STRONG BOX.

See illustrated advertisement, May 11, p. I. of Centre.
PINCHBECK LIMITED, Adams Place, George's Road,
HOLLOWAY, N.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 487.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

J. E. C. LORD, Ship Canal Tar Works,
Wearside, Manchester. Pitch, Creosote, Benzols,
Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
Carbolic Acid, Sulphate of Ammonia, &c.

TO Gas Managers, &c., Wanted, Old

Condemned GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
&c., also bought.
J. WILSON, Pleasant Grove, York Road, King's Cross,
LONDON, N.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

SULPHATE Leadwork, Repairs,

Alterations, New Saturators by a Journeyman
PLUMBER of Great Experience. Worked at Beckton,
Sheffield, Dublin, &c. Work Guaranteed and at
lowest possible Prices. Own Plant. Any Distance for
Odd Work. Day or Contract. Leadburner.
117, Galloway Road, Shepherd's Bush, LONDON.

WANTED, a District Superintendent

for Control of Out-Door Staff (Gas and Water).
Thoroughly up to date in Modern Lighting and able to
Secure Business in Competition with Electricity. Good
Appearance, Tactful, and Enterprising. Age not to
exceed 35.

Applications, by letter, with at least Three recent
copies of Testimonials, stating Wages, and if Married or
Single, to be received by June 12, 1909.

Address No. 5097, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

SHOW-ROOM SALESMAN.

THE Gas Committee of the County
Borough of Belfast require an Experienced Gas-
Stove SHOW-ROOM SALESMAN.

Applicants must be competent to advise Consumers as
to the use of Cookers, Fires, Gas-Fittings, Burners, &c.
Previous Experience and a knowledge of Gas-Fitting
essential.

Preference will be given to a Young Energetic Man
of good address.

Commencing Salary, £90 per Annum.

Applications, endorsed "Salesman," stating Age and
Qualifications, with copies of Two recent Testimonials
in own Hand-writing, should be sent in to R. Meyer,
Esq., Town Clerk, Belfast, not later than Eleven a.m.
on the 28th inst.

ROBERT SHARPE,
Engineer and Madager.

Gas-Works, May 17, 1909.

MARYPORT URBAN DISTRICT.

APPOINTMENT OF MANAGER OF GAS-WORKS.

THE Maryport Urban District Council
invite APPLICATIONS for the above APPOINT-
MENT from competent Men thoroughly Acquainted
with the Manufacture and Distribution of Gas and the
Making of Sulphate of Ammonia. Preference given to
a Practical Gasmaker.

Particulars of Duties may be had on Application to
the undersigned.

Salary, £100 per Annum, with free House, Coal, and
Lighting.

The person appointed will be required to give his
whole time to the Service of the Council.

Canvassing, either directly or indirectly, will disqualify
Applicants.

Applications, in Candidates' own Handwriting, stating
Age, giving Particulars of Experience, and with Testi-
monials (not more than Three) of recent date, will be
received by the undersigned up till Noon on Thursday,
June 3 next.

F. KELLY,
Clerk of the Council.

Town Hall, Maryport,
May 21, 1909.

GAS Manager required for a New Gas-Works in rising Fifeshire Town, to SUPERINTEND, under the Engineer, the Erection of Gas-Works, also Main and Service Laying and Meter Fixing, and take over Full Management on Completion. Must have good Experience of all the various Branches.

Salary, £100 per Annum.
Applications, with Three copies of Testimonials, to be lodged with J. DISHART, 23, Rutland Street, EDINBURGH, on or before June 7.

TORQUAY GAS COMPANY.

REQUIRED by the above-named Company, a Smart, Intelligent Man, of Good Address, who thoroughly understands Interior Gas-Fittings, Stoves, Fires, and Hot-Water Apparatus, Competent to Advise and give Estimates to Consumers, and to make himself generally useful.

Salary to commence, £120 per Annum.
Apply, by letter, not later than June 2, stating Age, Experience, and accompanied by copies of Two recent Testimonials, to the SECRETARY, Torquay Gas Company, Fleet Street, TORQUAY.

MIDDLESEX EDUCATION COMMITTEE.

TOTTENHAM POLYTECHNIC—SESSION 1909-10.

APPLICATIONS are invited from TEACHERS of the following Subject in the Evening Classes commencing in September:—
GAS SUPPLY—On One Evening a week. Fee, 21s per Evening.

Applications, stating Age, Qualifications, and Teaching Experience, should reach me not later than Monday, June 7, 1909.

J. W. TOMLINSON,
The Polytechnic, South Tottenham.

MAIDSTONE WATER-WORKS COMPANY.

COLLECTOR of Water-Rate required by the Maidstone Water-Works Company, to commence duties on the 1st of July. Age not to exceed Forty Years.

Collector to provide suitable Office and Clerical Assistance.

Salary, £225 per Annum.
Written Applications, with copies of Testimonials (not exceeding Three in number, and which will not be returned), to be forwarded to the Secretary before the 3rd of June, 1909.

Canvassing a Disqualification.
CHAS. E. ROPER,
Secretary.
Maidstone Water-Works Company,
Canal House, Maidstone.

COUNTY BOROUGH OF BOLTON.

GAS ENGINEER AND MANAGER.

THE Gas and Lighting Committee of the Bolton Corporation invite APPLICATIONS for the APPOINTMENT of a GAS ENGINEER and MANAGER, who will be required to devote the whole of his time to the duties of the Office and will not be permitted to undertake any other Business Employment.

Salary, £500 per Annum, rising by Annual Increments of £25 to £600 per Annum.

Two Works—Make of Gas, 1000 Million Cubic Feet per Annum or thereabouts. Mechanical Stoking Machinery in use at One of the Works, and Generative Furnaces in use at both Works.

Applicants must have had Practical Experience in the Position of a Gas Engineer and Manager, and be thoroughly versed in the Manufacture and Purification of Coal Gas, both with Lime and Oxide of Iron, with the Construction of Water-Gas Plant and the Manufacture and Purification of Water Gas, and with the Manufacture of Sulphate of Ammonia, and also must have a thorough knowledge of the Commercial Management of a Gas-Works.

Applications, endorsed "Gas Engineer and Manager," stating Age and previous Experience, together with copies of not more than Three Testimonials of recent date (which will not be returned), to be delivered to the undersigned not later than Twelve Noon on the 14th of June next.

Canvassing Members of the Council will be deemed a disqualification.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
May 21, 1909.

LIVESEY Washer Wanted, Modern make, 10-inch Connections, to effectively deal with 250,000 to 300,000 Cubic Feet per day.
State Price to No. 5098, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

KING'S TREATISE ON COAL GAS.

WANTED to Purchase, a Set of above (3 Vols.).
Price and Particulars to R. C. ANNANDALE, Bookseller and Stationer, Queen Street, HULL.

OLD "JOURNALS"—Wanted, Six Sets, each comprising the following issues of the "JOURNAL": May 12, July 7, Aug. 25, Sept. 8, Dec. 22, all for 1908. Advertiser will pay 4s. per Set delivered. The first Six Offers by letter will be accepted.
Please communicate with Mr. MATRICE GRAHAM, 115, Ashley Gardens, Victoria Street, LONDON, S.W.

FOR SALE—A Station Meter, with 6-inch diameter Valves and Connections. All in good condition. Replaced by larger Plant.
Apply to the MANAGER, Gas Company, Solihull, BIRMINGHAM.

BISHOPS STORTFORD AND DISTRICT GAS COMPANY.

FOR SALE—A Quantity of about 4 to 5 Tons of Good RETORT CARBON.
Quotations to be addressed to the MANAGER, Gas-Works, BISHOPS STORTFORD.

FOR SALE—Three Purifiers, by Newton, Chambers, and Co., 20 ft. square by 5 ft. deep, Planed Joints, 18-inch Valves and Connections, with Bye-Passes, Travelling and Lifting Gear. In Good Condition. Being Removed for Extension.
Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE—Sulphate of Ammonia Stills (by Dempster), in perfect Working Order, capable of producing Two Tons of Sulphate per week. Price, £20. Can be inspected.
Further Particulars from HAROLD BAKER, Engineer, Gaslight and Coke Company, HIGH WYCOMBE.

FOR SALE—Anderson's Brush Scrubber, by Henry Balfour and Co., 10-inch Connections, to pass 300,000 Cubic Feet per diem; also a Livesey WASHER, 10-inch Connections, worked in conjunction with above Scrubber.
Further Particulars from F. J. BANCROFT, B.Sc., M.Inst.C.E., M.I.M.E., Engineer and Manager, Barnet District Gas and Water Company.

FOR SALE, Cheap, the undermentioned GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkio's VALVES, 12-inch, 10-inch, 6-inch.
Apply to SAMUEL WHITE and SON, 60, Queen Victoria Street, LONDON, E.C.

TO CAPITALISTS AND OTHERS.

FOR SALE.

THE Directors of a Gas-Works in a Small Country Town, Seven Miles from Railway, are, owing to insufficient Capital, offering the BUSINESS FOR SALE. Output increased from Half-a-Million to Three Times that amount in Eighteen Months. Inspection and Offers invited.
Particulars from the SECRETARY, Gas Company, Northbleach, GLOS.

THE Coventry Corporation Gas Department have FOR SALE about 170 WESTERN GAS-COOKERS, made by the Davis Gas Stove Company. These are excellent Gas-Cookers for Slot Consumers and are only offered for Sale because of being replaced by larger Cookers. They have been thoroughly Repaired, Cleaned, and Renovated, and supplied with New Grill Pans and Grids.
Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,
Engineer and General Manager.
Gas-Works, Coventry,
April, 1909.

PENRITH URBAN DISTRICT COUNCIL.

GAS COAL AND CANNEL.

THE Gas Department of the above Council are prepared to receive TENDERS for the Supply of COAL and CANNEL during Twelve Months ending June 30, 1910.

Tenders to be delivered to Mr. G. Wainwright, Clerk, Town Hall, Penrith, not later than Wednesday, June 2, 1909.

Form of Tender and other Information may be obtained from the undersigned.

E. SHAUL,
Manager.

Gas-Works, Penrith.

PETERBOROUGH GAS COMPANY.

TENDERS FOR BEST SILKSTONE GAS COAL.

THE Directors of the above Company invite TENDERS for One or Two Years' Supply of Best Screened SILKSTONE NUTS. Delivery to commence July 1, next.

The Tenders must state:—

Price per Ton in Waggon at Pit.
Railway Rate to Peterborough.
Wagon Hire to Peterborough.

Tenders must be sent in by the 7th of June, 1909, endorsed "Coal," and addressed to the Chairman of the Company, Gas-Works, Peterborough.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided.

JOHN BARTON,
Secretary and Manager.

Peterborough, May 21, 1909.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the Supply of about 34,000 Tons of GAS COAL for One Year from the 1st day of July next, in such Monthly Quantities as may be required by the Company.

Tenders to State the Price Delivered at the Midland Railway Sidings, Hempstead, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or, if sent (as preferred) by Water, the price f.o.b. and also the Price Delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the Description and Quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than Tuesday, the 1st day of June next.

The Directors reserve to themselves the right to accept the whole or any portion of any Quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 3, 1909.

BOROUGH OF MORECAMBE.

THE Gas Committee invite Tenders for the Supply of 5000 Tons of Best Screened COAL, and 4000 Tons of Rough SLACK; deliveries commencing the 31st of August, 1909, and ending the 31st of August, 1910.

Particulars and Forms of Tender may be obtained from the undersigned.

Sealed Tenders, endorsed "Coal," to be delivered to me on or before the 31st of May, 1909.

By order,
H. BLAKEY,
Engineer and Manager.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF GAS OIL.

THE Corporation are prepared to receive TENDERS for the Supply of about 550 to 650 Tons of OIL, suitable for the Manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such quantities and at such times as may be required during the period ending June 30, 1910.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Oil," to be delivered at the Town Clerk's Office not later than Twelve o'clock Noon on Tuesday, the 8th of June, 1909.

The lowest or any Tender not necessarily accepted.

By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the Supply of Screened GAS COAL and CANNEL for the Year ending the 30th of June, 1910.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock Noon on Tuesday, the 8th of June, 1909.

The lowest or any Tender not necessarily accepted.

By order,
L. HEWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

LURGAN GASLIGHT AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the Supply of 3500 Tons of Best Quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.

The Coal must be delivered in such Quantities and at such times as the Directors may fix, and the Weights as shown on the Company's Weighbridge to be accepted by the Contractor. Each Cargo to be accompanied by a Certificate as to place of origin.

Tenders (no Special Form in use), accompanied by Reference to Gas-Works using the Coal offered, should reach me not later than Monday, June 7, 1909, at 10.30 o'clock a.m.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 10, 1909.

GAINSBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply of 8000 Tons of Best GAS COAL (Screened, Unscreened, and Nuts) to be delivered at the Great Central Railway Station, Gainsborough, between the 1st of July, 1909, and the 30th of June, 1910, in such quantities, monthly, as may be required.

Sealed Tenders, endorsed "Tender for Gas Coal," giving Full Particulars of the Coal offered, to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 31st inst.

No Special Form of Tender issued.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
May 19, 1909.

COUNTY BOROUGH OF WARRINGTON.

THE Gas Committee invite Applications from Firms wishing to TENDER for the undermentioned GOODS as may be required during the next Twelve Months.

Full Particulars can be obtained on Application to Mr. W. S. Haddock, Gas Engineer, Warrington. All Inquiries must be made before May 31 next.

- | | |
|----------------------------|--------------------------|
| 1—Bags. | 16—Iron and Steel. |
| 2—Bolts and Nuts. | 17—Lead and Compo. |
| 3—Brass and Copper | Pipe. |
| Tubing. | 18—Lime. |
| 4—Brass Fittings. | 19—Oils, Paints, Red and |
| 5—Builders' Ironmongery. | White Lead. |
| 6—Cast Iron Pipes and | 20—Printing and |
| Connections. | Stationery. |
| 7—Cement. | 21—Rails, Crossings, |
| 8—Castings. | Fastens, &c. |
| 9—Clothing. | 22—Timber. |
| 10—Copper Street-Lamps. | 23—Wet and Dry Gas- |
| 11—Cookers. | Meters. |
| 12—Common Paving and | 24—Wrought-Iron Tubes |
| other Bricks, and | and Fittings. |
| Setts. | 25—Coal, Cannel, and |
| 13—Fire-Bricks, Fire-Clay, | Benzol. |
| and Retorts. | 26—Taps, Valves, &c. |
| 14—Flexible Tube. | 27—Sulphuric Acid. |
| 15—Glass. | 28—Drysalteries. |

FREDK. TAYLOR,
Secretary.

Gas Offices, Warrington,
May 18, 1909.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the Supply of GAS COAL, to be supplied in such quantities as may from time to time be determined by the Gas-Works Committee during the Year ending June 30, 1910.

Forms of Tender and Further Particulars may be obtained on Application to Mr. J. Wilkinson, F.C.S., Engineer, Gas-Works, Halifax.

Tenders, endorsed "Coal," must be sent to the undersigned on or before Friday, June 4, 1909.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
HERBERT ASHLING,
Town Clerk.

WINSFORD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for the Supply and Fixing of the following New Plant: PURIFIERS, TOWER SCRUBBER, and CONDENSERS.

Specification and Form of Tender may be obtained from Mr. F. Sidwell, the Gas Engineer, on payment of the sum of £1 1s., which will be returned on receipt of a bond-fide Tender.

Sealed Tenders, endorsed "Gas Plant," and addressed to the undersigned, to be delivered on or before the 14th day of June, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

Jno. H. COOKE,
Clerk to the Council.

Council Offices, Winsford,
Cheshire, May 21, 1909.

COUNTY BOROUGH OF DEVONPORT.

(GAS DEPARTMENT.)

THE Gas Committee of the Devonport Corporation are prepared to receive TENDERS for the Supply of GAS COAL, to be delivered in such quantities as may from time to time be determined previous to June 30, 1910.

The Coal is to be delivered c.i.f. at Tamar Wharf, and Forms of Tender and Specification may be obtained from the undersigned.

The Committee reserve the right to accept Tenders for the whole or any Portion of the Quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to R. J. Fittall, Esq., Town Clerk, Devonport, are to be delivered at the Town Clerk's Office on or before Saturday, the 12th of June, 1909.

By order,
WILLIAM P. TERVET,
Engineer and General Manager.
Gas-Works, Devonport,
May 22, 1909.

BOROUGH OF DONCASTER.

TENDERS FOR COAL.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the Supply of 22,000 Tons of Best Screened GAS COAL NUTS during the Year ending June 30, 1910.

TENDERS FOR TAR.

They also invite TENDERS for the Purchase of their Surplus TAR during the Year ending the 30th of June, 1910.

Particulars and Tender Forms may be obtained on Application to the undersigned.

Tenders, endorsed "Coal" and "Tar" respectively, should be sent under seal to the Chairman, and received at the Corporation Gas-Works, Doncaster, not later than Ten a.m. on Friday, the 11th of June next.

By order of the Gas Committee, who do not bind themselves to accept any Tender.

ROBT. WATSON,
Engineer and Manager.

Corporation Gas-Works,
Doncaster, May 24, 1909.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

(GAS COMMITTEE.)

TENDERS FOR GAS COAL, CANNEL, AND LIME.
TENDERS FOR COKE, TAR, AND AMMONIACAL LIQUOR.

COAL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Supply of 5000 Tons of Well-Screened GAS COAL, to be free from Shale and Pyrites, also 1000 Tons of CANNEL, to be delivered at the Midland or Great Northern Railway Stations, Sutton-in-Ashfield, in such quantities as the Manager shall from time to time direct between July 1, 1909, and June 30, 1910.

Also for the Supply of about 300 Tons of best Hand-Picked LIME to be delivered at either of the above Railway Stations in such quantities as the Manager shall from time to time direct between July 1, 1909, and June 30, 1910.

COKE, TAR, AND LIQUOR.

Tenders are invited for the Surplus COKE, TAR, and AMMONIACAL LIQUOR produced at their Works from July 1, 1909, to June 30, 1910.

Tar to be delivered in Purchasers' Tank Waggons at either the Midland or Great Northern Railway Stations; Ammoniacal Liquor at the Great Northern Railway Station only; and Coke delivered at either of the above Stations.

Tenders for Coal to State Price per Ton of 20 cwt. at the Works or above Railway Stations.

No Tender Forms provided.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed, to be addressed as under, so as to arrive not later than June 7, 1909.

By order,
JOHN D. FINLER,
Clerk.

TENDERS are invited for the Supply

of about 10,000 Tons of GAS COAL during the Year ending June 30, 1910, delivered at various Works.

For full Particulars, Apply to Mr. Joseph Reeds, Matlock Bath.

Tenders, endorsed "Tenders for Coal," should reach me on or before June 10, 1909.

It does not necessarily follow that the lowest or any Tender will be accepted.

A. R. LEIVERS.

Bentnck Buildings,
Nottingham.

ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY.

THE Directors invite Tenders for the

Supply of the whole or part of 3500 Tons of Best Screened GAS COAL or NUTS, to be delivered at Elsecar Station (Great Central Railway), during the Year ending the 30th of June, 1910, at such times and in such Quantities as may be required by the Manager.

Tenders to be delivered by the 2nd of June, addressed to the Chairman, endorsed "Tender for Coal."

ALBERT F. HALL,
Secretary.

Hoyland, near Barnsley,
May 14, 1909.

CIRENCESTER GAS COMPANY, LIMITED.

TENDER FOR GAS COAL.

THE Directors are prepared to receive

TENDERS for the Supply, during the Twelve Months commencing July 1 next, of about 5000 Tons of GAS COAL, delivered at the Watermoor Station of the Midland and South Western Junction Railway Company at such times and in such Quantities as required by the Manager.

Tenders, Forms for which will be sent on Application, to be forwarded to the undersigned not later than May 31.

JOHN P. BEECHAM,
Secretary.

12, Silver Street, Cirencester,
May 4, 1909.

BARNOLDSWICK URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE above Council invite Tenders for

the Supply of 4500 Tons of Screened GAS COAL or NUTS for the Year ending June 30, 1910.

The Council reserve the right to Divide the Quantity between Two or more Contractors.

The Council do not bind themselves to accept the lowest or any Tender.

Form of Tender supplied.

Tenders to be on the prescribed Forms, and addressed to the Chairman, Gas Committee, Town Hall, Barnoldswick, and delivered not later than June 1, 1909.

J. W. THOMPSON,
Engineer and Manager.

Town Hall, Barnoldswick.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THIS Council are prepared to receive

TENDERS for the following:—

1—The Supply from the 1st of July, 1909, to the 30th of June, 1910, of about 22,000 Tons of GAS COALS and CANNEL, delivered at the Porth and Ystrad Gas-Works. The Council reserve the right to accept for either Six or Twelve Months.

2—For the Supply and Delivery of CAST-IRON PIPES required from the 1st of July, 1909, to the 30th of June, 1910.

Specifications and Forms of Tender can be obtained on Application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, Rhondda, Glam.

The Contractors will be required to pay the Standard Rate of Wages recognized in the District.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Gas Coal," "Cannel," or "Cast-Iron Pipes," as the case may be, and delivered at my Office not later than Ten a.m. on Thursday, the 3rd day of June, 1909.

The Council reserve to themselves the right to divide the Quantity into Two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk to the Council.

Public Offices, Pentre,
Rhondda, Glam., May 18, 1909.

URBAN DISTRICT COUNCIL OF HORNCastle.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Council are prepared to receive

TENDERS for the Supply of from 600 to 1800 Tons (Railway Weight) of Best Screened Silkstone GAS COALS, to be delivered at Horncastle Railway Station during the Year ending the 30th of June, 1910, in such Quantities and at such times as the Council may from time to time direct.

The Coal must be delivered in a Dry Condition, free from Hards, Smudge, Dirt, Pyrites, or other Impurities. Sealed Tenders, marked "Tender for Gas Coal," must be sent to me, the undersigned, so as to reach me not later than Twelve o'clock Noon on Saturday, the 5th day of June, prox.

The Council do not bind themselves to accept the lowest or any Tender.

The Firm whose Tender is accepted will be required to enter into the usual Contract for the due Delivery of the Coal, and to give Security for the due performance of such Contract.

Forms of Tender are not supplied.

Further Particulars may be obtained on Application to the Manager, T. Davies, at the Gas-Works, Horncastle.

R. W. CLITHEROW,
Clerk to the Council.

The Court House,
Horncastle, May 22, 1909.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

TO THE SHAREHOLDERS.

NOTICE is Hereby Given, that the

ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices, 59 & 60, Gracechurch Street, London, E.C., on Friday, the 4th of June, 1909, at Twelve o'clock Noon, for the purpose of receiving the Report of the Directors and the Accounts for the Year ended the 31st of March, 1909, and for the Transaction of the General Business of the Company.

One of the Directors, Col. James Le Geyt Daniell, retires from Office, and offers himself for Re-election. The Auditors, Mr. Robert Hesketh Jones and Mr. Thomas Guyatt, retire, and offer themselves for Re-election.

The TRANSFER BOOKS WILL BE CLOSED from the 21st of May until the day of the Meeting, both days inclusive.

By order of the Board,
A. W. COOPER,
Secretary.

59 & 60, Gracechurch Street, E.C.,
May 4, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to

notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £3000 NEW ORDINARY STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL
DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 750 NEW ORDINARY FIVE PER
CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

THE BRISTOL GAS COMPANY.

GEO. NICHOLS, HOWES, YOUNG, ALDER, and CO. are instructed to SELL by PUBLIC AUCTION, at their Sale-Room, 49, Broad Street, Bristol, on Thursday, the 17th day of June, 1909, at 2.30 p.m. precisely, in Lots of £100 each, or less, &c.

£25,000

FIVE PER CENT. MAXIMUM GENERAL CAPITAL
STOCK, AND

£10,000

NEW DEBENTURE STOCK,

(Bearing INTEREST AT THE RATE OF FOUR
POUNDS PER CENTUM PER ANNUM, payable Half-
Yearly, in June and December),

OF AND IN

THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers. The Stocks will be Sold and Registered in the Books of the Company FREE OF EVERY EXPENSE to Purchasers thereof.

Full Particulars and Conditions of Sale may be obtained of the AUCTIONEERS, 49, Broad Street, Bristol; Mr. T. D. SIBLY, Solicitor, Exchange, Bristol; or of

JOHN PHILLIPS,
Secretary.

Chief Office: Colston Street,
Bristol.

HARROW AND STANMORE GAS COMPANY.

PARTICULARS OF ALLOTMENT OF £1830 FOUR
PER CENT. PERPETUAL DEBENTURE STOCK.
PRICE, £100 FOR £100 STOCK.

THE Directors are prepared to receive

APPLICATIONS for £1830 PERPETUAL DEBENTURE STOCK, to bear Interest at the Rate of £4 per Cent. per Annum, to be paid up in Full on or before the 28th of June, 1909, and the Interest thereon to commence to accrue from the 1st of July, 1909.

Application Forms can be obtained from the Secretary (by Post) at the Gas-Works, Harrow.

Applications may be made for £10 or any Multiple of £10, and must reach the Office of the Company not later than the 17th of June, 1909.

By order of the Board,
JAMES L. CHAPMAN,
Secretary.

Office: The Gas-Works, Harrow,
Middlesex, May 24, 1909.

EAST HULL GAS COMPANY.

SALE BY TENDER OF £20,000 NEW FIVE PER CENT. ORDINARY STOCK.

THE Directors Offer For Sale by Tender

the above amount of STOCK, to be issued under the Provisions of the East Hull Gas Act, 1906, and the various Acts Incorporated therewith.

Since the Year 1867, the Company have paid, without intermission, the Maximum Dividend allowed by Parliament.

The Dividend is Cumulative—i.e., should the Profits of the Company in any One Year be insufficient to pay the Maximum Dividend, the same may be made up out of the Reserve Fund or out of Surplus Profits in any future Year.

Any amount of Stock being a multiple of £5 but not less than £20 may be applied for.

The Stock will be allotted to the Highest Tenders.

A deposit of £10 per Cent. on the nominal amount of the Stock applied for must accompany each Tender, and the Allottees must pay the remainder of the Purchase Money on or before the 30th day of June, 1909.

Last Day for Receipt of Tenders, Wednesday, the 2nd day of June, 1909.

Forms of Tender and Particulars of Sale can be obtained at the Local Branches of Messrs. BARCLAY AND COMPANY, LIMITED, Bankers; or from the OFFICES OF THE COMPANY.

By order of the Board of Directors,
DAVID WOON,
Secretary.

Offices: Saint Mark Street,
Hull, May 14, 1909.

BEXHILL WATER AND GAS COMPANY.

SALE BY TENDER OF NEW ORDINARY SHARES.

THE Directors give Notice, that they will be prepared to receive, not later than Twelve o'clock at Noon on Wednesday, the 9th day of June, 1909, Sealed TENDERS for 1000 NEW ORDINARY SHARES of £10 each, being the first portion of the Additional Capital the creation and issue of which was authorized under the powers of the Bexhill Water and Gas Act, 1904, by Resolution of the Extraordinary Meeting of the Shareholders of the Company held on the 29th day of September, 1908.

Shares will rank with the Existing Ordinary Shares for a Maximum Dividend of Seven per Cent.

The lowest Price at which Tenders will be accepted (which may not be less than par) will be deposited with the Board of Trade pursuant to the Act.

In the event of the receipt of Tenders at the lowest price accepted for a larger number of Shares than those proposed to be issued, such Tenders will be subject to a pro rata diminution.

Every Purchaser will be required on notice being given of the acceptance of his Tender, forthwith to pay to the Company the full Price of the Shares sold to him, including any premium; and if from any cause whatever such Price shall not be paid on or before the 18th day of June next, interest at 10 per cent. shall be paid thereon from that date until payment.

The Registered Holders of the Shares now sold will be entitled to Dividend from the date of payment for same.

Forms of Tender can be obtained personally or by letter from the Offices of the Company.

By order of the Board of Directors,
ROBT. DOUGLAS JESTY,
Secretary.

Offices of the Company,
5, Sea Road, Bexhill-on-Sea.

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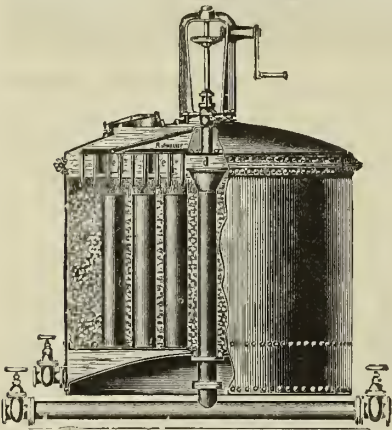
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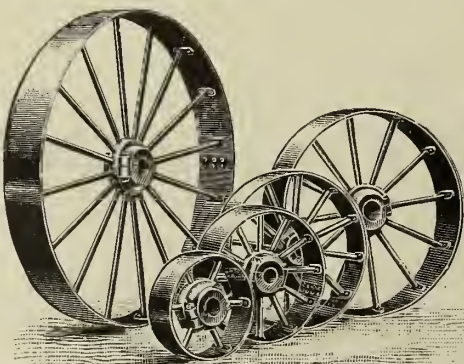
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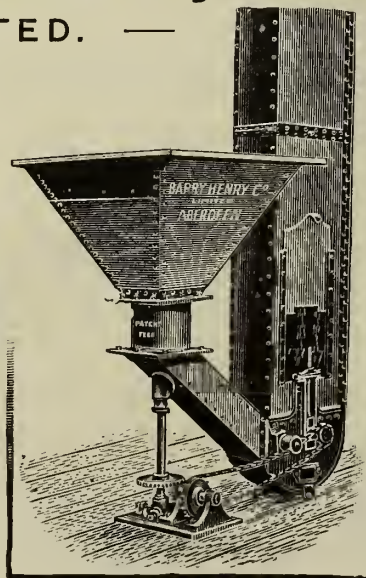
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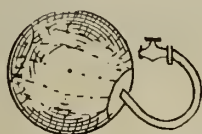
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Gas Bags for repairing
Mains. All Seams
Stitched and Taped.

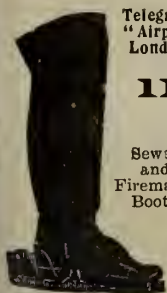


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Gas Bags for repairing Mains.
All Seams Stitched and Taped.

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and
Fireman's
Boots.



HIGH PRESSURE MERCURIAL GOVERNOR



WE have specially designed this Governor for use in places where it has been found necessary to raise the pressure in Gas Mains to several pounds per square inch, in order to meet the increased demands in districts where the Gas Mains are small.

This Governor is correctly compensated, and is so accurately adjusted that it will work as an ordinary low pressure Governor so long as the Inlet pressure is at least five-tenths more than the required Outlet pressure. This is particularly useful in the event of the Main being used as an ordinary low pressure distribution Main. The Governor is usually supplied for Inlet pressure of up to 5 lbs. per square inch, and Outlet pressure of from Zero to 6 inches; but, of course, it can be specially prepared to suit any desired range of pressure.

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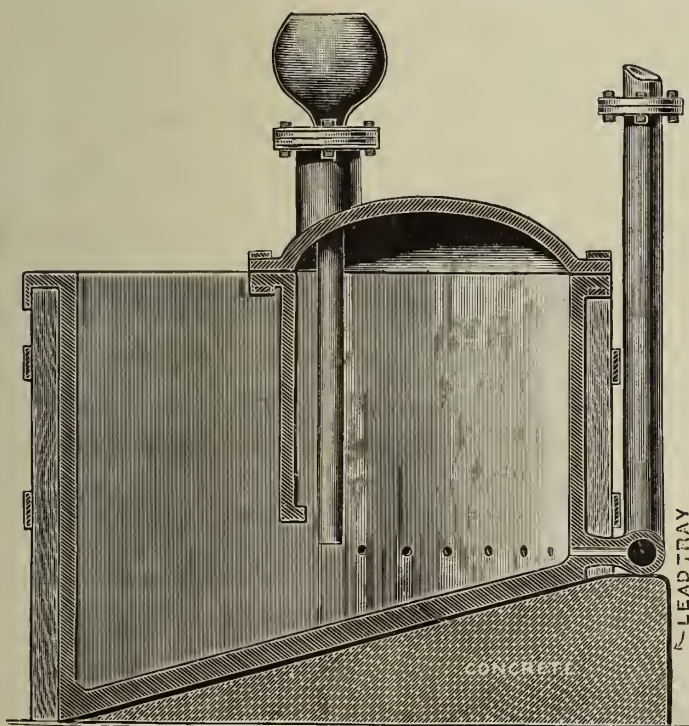
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Saturator with Outside Cracker Pipe, for which we
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ADVANTAGES:—

1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity,
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5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

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(PATENTED PROCESS)

Awarded a DIPLOMA OF MERIT at the recent Smoke Abatement Exhibition held in the Corn Exchange, Sheffield.

The New Smokeless Fuel.

Why Gas Companies should adopt the above Process:—

- (1) Because no extra Capital is required.
- (2) It eliminates ARSENIC, so that COALEXLD can be used by MALTSTERS.
- (3) The Cost is repaid by increased Price on Coalexld.
- (4) Coalexld finds a readier Sale than Coke.
- (5) It can be used in Drawing Rooms or Kitchens.

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HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT).

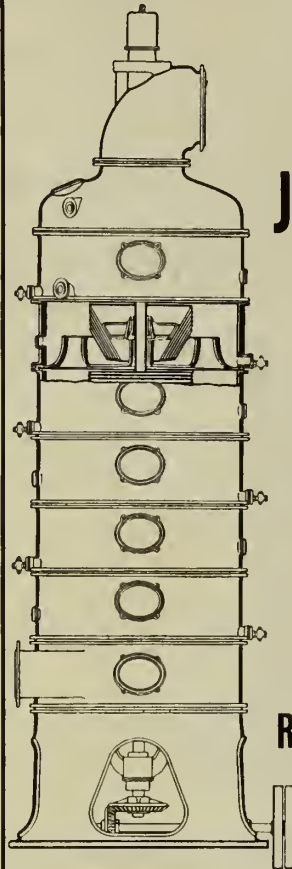
WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,
GLASGOW.

[See Illustrated Advertisement, May 18, p. 484.]

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Sole Agents for United Kingdom—

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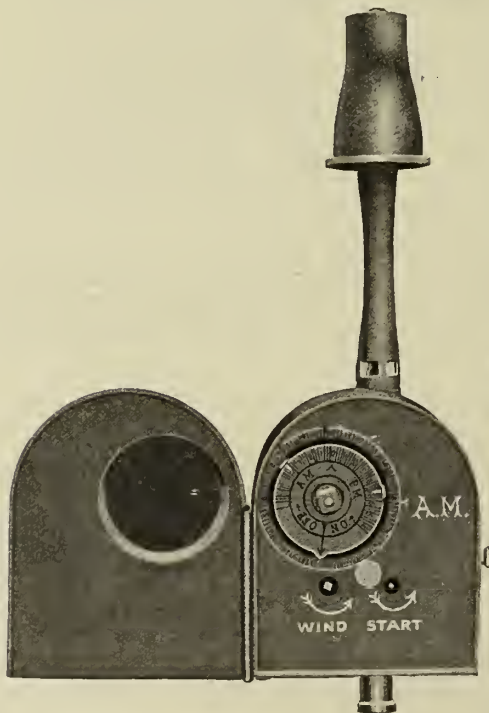
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The Rapid Light Controller.



1. Is instantaneous in Lighting-up and Extinguishing without shock to apparatus, and can easily be set with one hand in a few seconds by simply moving the respective pointers to the predetermined times.
2. Clock can be started and regulated *in situ*.
3. Is compact and self-contained, the whole of the working parts, including the specially arranged Gas Cock, being entirely enclosed in a brass case as a protection against dust and insects.

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Telephone No. 2044 HOP.
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Welsbach

LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

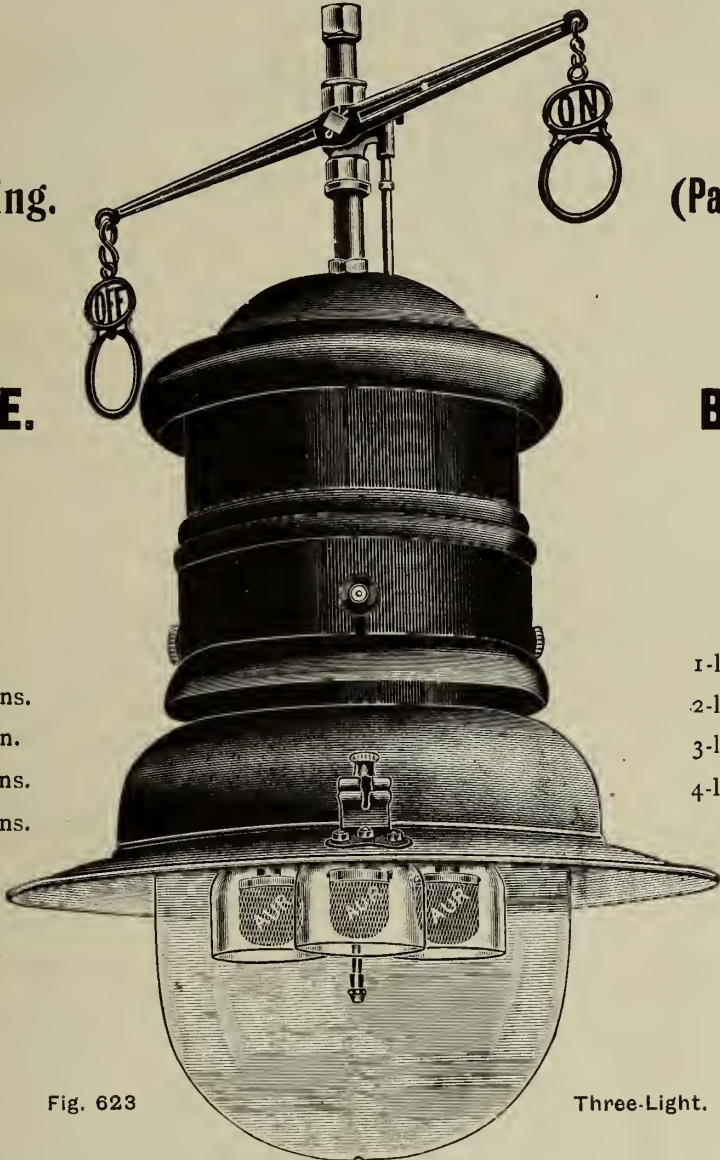


Fig. 623

Three-Light.

Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 1 in.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 4 ins.
3-light	. . .	1 ft. 6 ins.
4-light	. . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) 3/4½ per dozen, or in case lots of 5 gross, 33/- per gross.

	1-Light.	2-Light.	3-Light.	4-Light.		1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	2/3	4/-	5/9	9/-	Wired Globes, extra	each	2/-	2/-	2/9 3/6
" " " In Case lots per dozen.	19/6	42/9	57/9	93/-	Parabolic Reflector, extra	"	3/6	6/-	7/6 Not made.
Case contains . . .	80	48	18	12	Welsbach Mantles, each	6d.	subject as usual.		

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price 4½d. each.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.
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Telephone 2410 NORTH.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

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More liquid Tar.

Stopped Pipes unknown.

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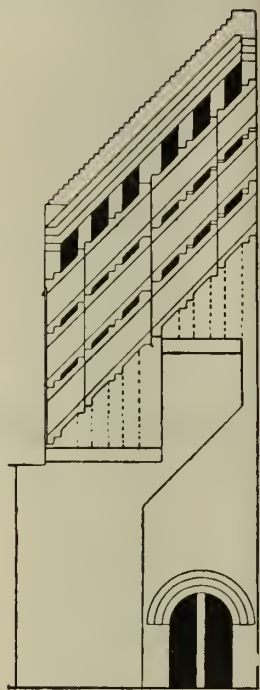
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

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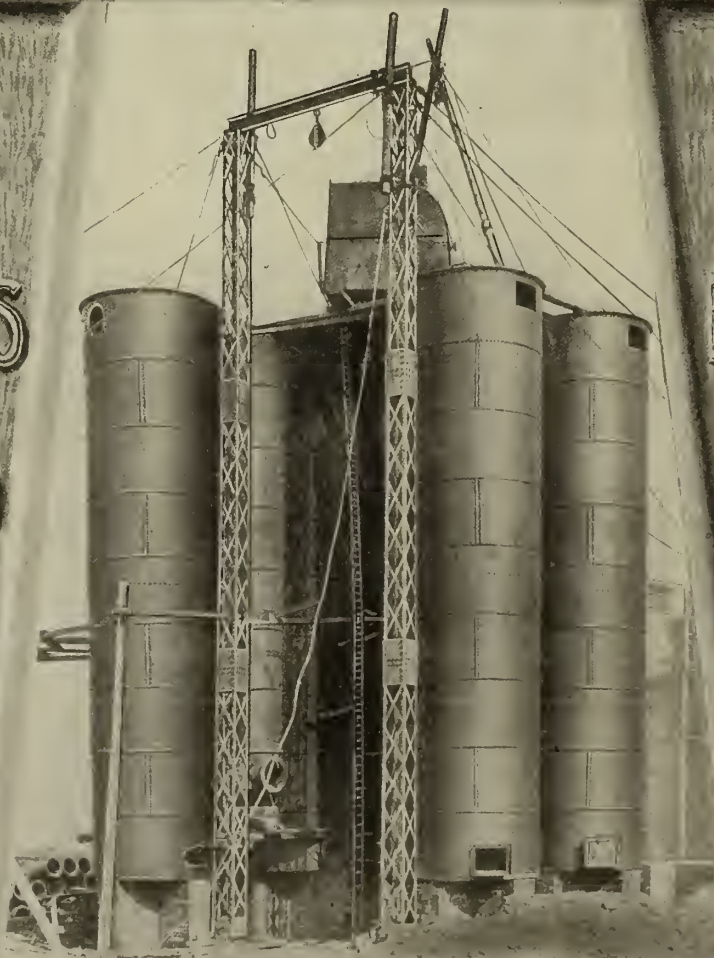
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CLUSTER LAMPS.

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**FOR LOW PRESSURE
HIGHEST DUTY FOR GAS CONSUMED**
Over 41 Candles per cubic foot.

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OF ANY MAGNITUDE
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WATER-GAS PLANTS

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Over 80 Installations supplied for Gas-Works.

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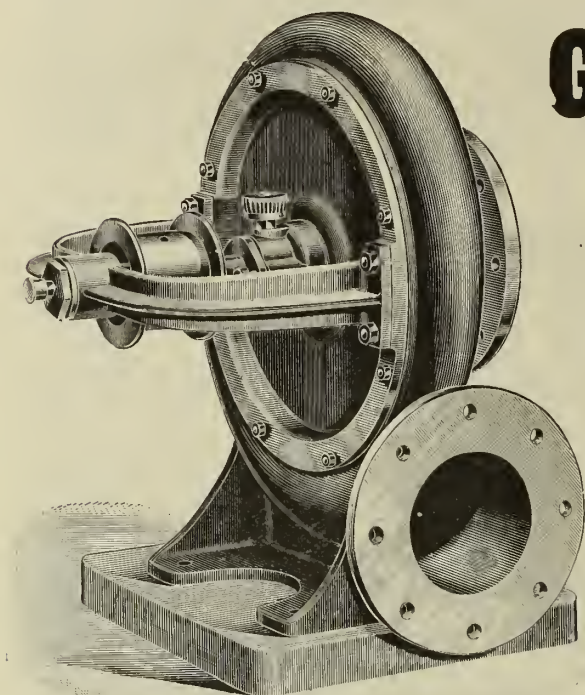
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AND

EXHAUSTERS

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THE JOURNAL OF GAS LIGHTING

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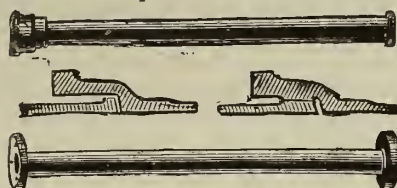
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1½ to 12 in. BORE.



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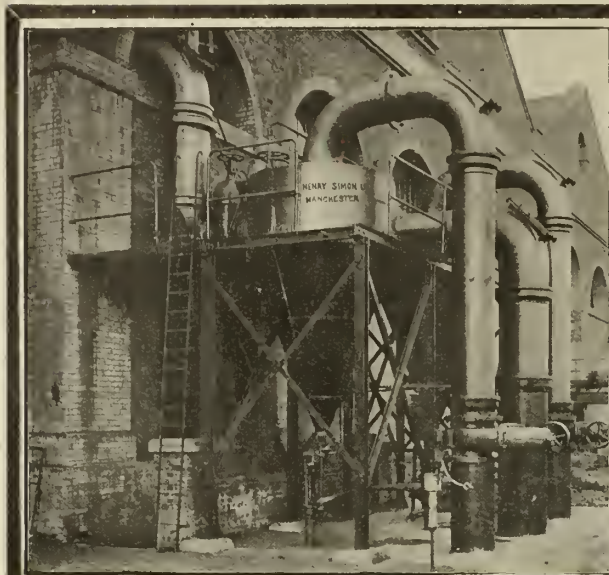
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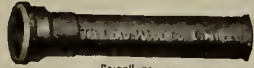
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This Result can only be obtained at **lightning speed** by using "**Gascolite**."

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One Trial is worth
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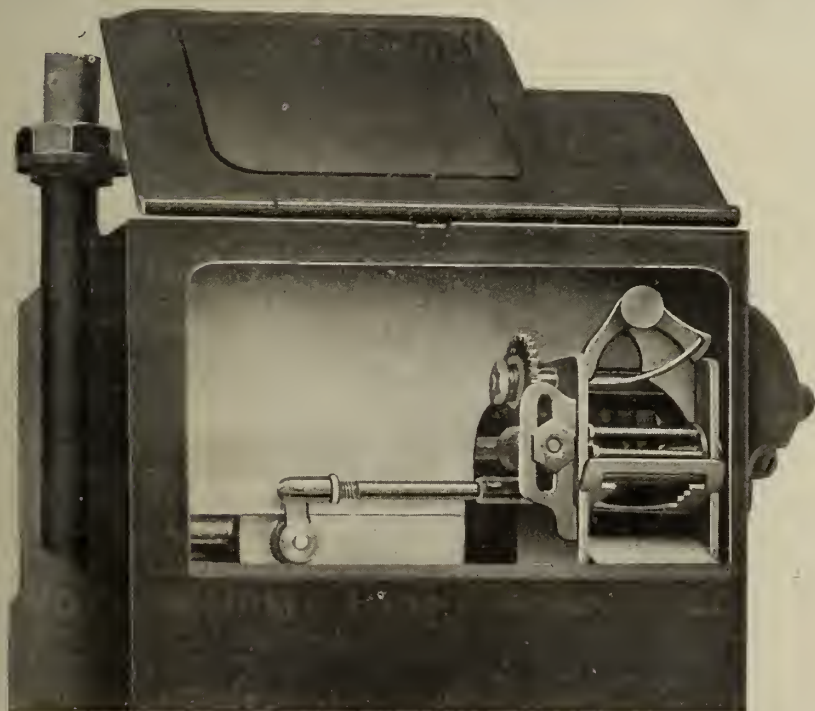
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The "TITAN."



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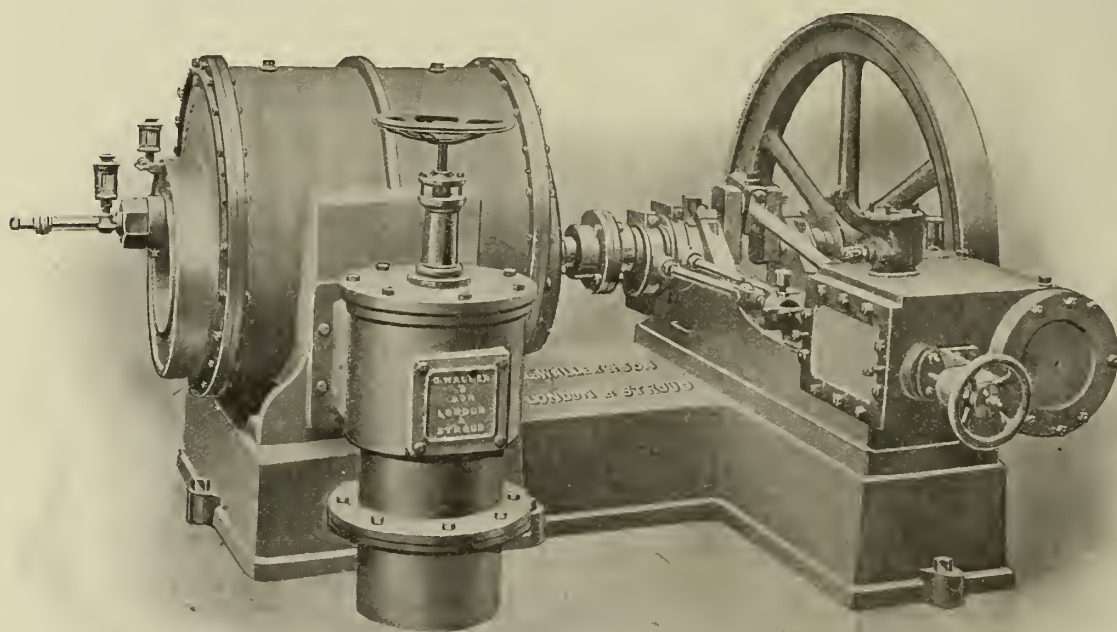
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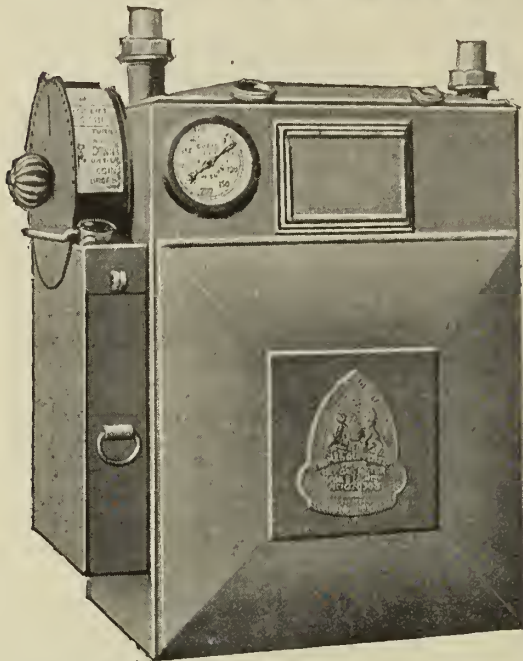
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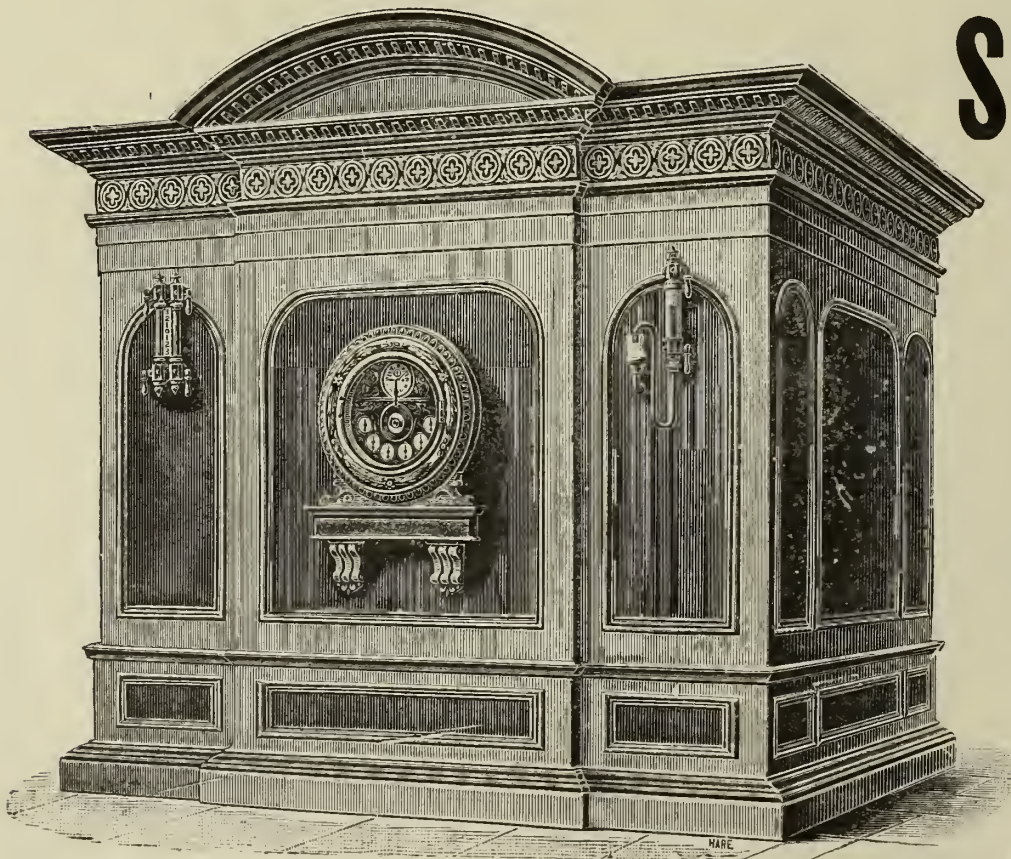
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VOL. CVI., No. 2403.—TUESDAY, JUNE 1, 1909.

EDITORIAL NOTES—GAS, &c.

An Appeal.

A FORTNIGHT to-day, the Institution of Gas Engineers commence their sittings under the presidency of Mr. Thomas Glover. With Mr. Glover in the chair, a meeting was held last December in the hall in which the members will assemble, at which it was resolved to form a fund for the perpetuation of the memory of Sir George Livesey, and to apply the fund to the endowment of a Livesey Professorship in Gas Engineering and Fuel. The fund it was proposed should be accumulated to the amount of £10,000. To-day the total of the fund is about £9800—£200 short of the sum required. Is it too much to ask that the deficiency may be made up within the next fortnight, so that the President may have the gratification of reporting at the opening sitting of the Institution that the fund has actually reached the sum required. It ought not to be a difficult thing to do this from the still considerable section of the industry forming the non-subscribers. It is earnestly hoped the effort will be seriously made, and that it will prove successful.

In the annual report of the Council of the Institution, there appears an analysis of the contributors to the fund to the date of the report. It exhibits the largeness of the scope for further contributions. There are no less than 631 members of the Institution who have not contributed. Only 154 gas companies have given anything, though there were at the date of the last Board of Trade returns 491 statutory gas companies in the United Kingdom; and a further surprise is that only 19 of the 272 local authority gas undertakings of the country have subscribed. When these figures are considered, it must be conceded that the members of the British Society of Gas Industries did not do badly with their £538. A year ago Sir George was with us; and on June 16 he read his last paper before the Institution. Its title was "Co-Partnership." We should like our readers, in relation to this fund and the work of the gas industry generally, to consider the title in a much broader sense than the limit imposed upon it for the purpose then in hand by the distinguished author. What we should be pleased to see are the evidences of a greater desire among the responsible heads of gas undertakings to be co-partners in providing the funds for technical work and in sharing in the "profits" of that work.

Institution Annual Report.

IN completed work, there is nothing very solid about the report of the Council of the Institution, as published in other columns. But the Council have kept closely in touch in several directions with some important subjects; and we are hoping that the report Mr. E. W. Smith will be submitting at the annual meeting, upon the investigation into the hygienic and economical applications of gas for heating purposes, and the paper by Mr. Arthur M. Forshaw, the first holder of the Fellowship in Gaseous Fuel at the Leeds University, treating of the results of his work on the relative "mantle" efficiency of carbonic oxide and hydrogen, will put a more conclusive aspect upon some of the special technical work of the year than the report itself presents. However, there must not be disappointment over the poverty of the harvest. The Council cannot perform superhuman feats. There is no surprise, for example, that the Committee on Carbonization are not at present in a position to submit any definite statement on the subject. When the Committee were set their task, the vastness of the problems entrusted to their inquiry caused the suggestion in these columns that the work would necessarily be of a protracted nature. The course of events is justifying the prediction. The times are pregnant with carbonization ideas, trials, and experiences; and never has there been a period in the history of carbonization, having for its primary end

the production of gas, in which the whole question, and the considerations affecting it, have been in a more unsettled condition than now. Instead of narrowing down, there is a broadening out, of topic—structural, physical, chemical, and so forth—identified with, or inherent to, carbonization. And there is no immediate prospect of such cessation (as there was, for instance, at the time of the general acceptance of the principles of gaseous firing) that the work of co-ordination and concentration can be taken in hand with any degree of value attaching. When this work is ultimately performed, it should be in a systematic way, and with qualified assistance with time available to devote persistently to the work, instead of the intermittent attention that can possibly only be given by, or expected from, men occupying responsible and time-absorbing positions like the members of the Committee. There is good ground here on which to emphasize the remark of the Council, in a previous paragraph in the report, that increased support should be "given by gas" undertakings to enable the present important investigations to be continued, and others initiated."

We are glad to see the Council have—following up the criticism by Mr. F. J. Bywater in his paper a twelvemonth ago of the methods of the British fire-clay industry—appointed a Sub-Committee to take part in the work of the Joint Committee consisting of representatives of all the industries interested in the standardization and improvement of refractory materials. Respecting the conference on the international unification of gas-threads, it is a strong case that Mr. Leslie S. Robertson, the Secretary of the Engineering Standards Committee, puts forward against any departure from general practice, unless grave and weighty reasons for such departure can be advanced. The Whitworth forms of thread and pitches have been adopted by the Engineering Standards Committee; and these have been in general use for a considerable number of years throughout not only the British Empire, but also Germany, and many other of the Continental countries. On a consideration of the matter, admittedly only from the case presented in the Council's report, it would appear that confusion and injury—just what it is desired to avoid—would arise, anyway in this country, from the acceptance of the proposals before the International Commission. But there is to be another conference of the members of the Commission this week; so that probably more will be heard of the matter at the forthcoming meeting of the Institution.

Most of the other technical matters treated upon by the Council in the report have recently been before our readers—notably the international unit of light; and the adoption, in concert with the Council of the Society of British Gas Industries, of the model contract clauses. It is observed that the hope is not abandoned by the Council that a conference on the subject of heating by gas may yet be arranged with architects jointly by the Councils of the Institution and the Society of British Gas Industries. There can be no question as to benefit arising from such a course. The Council also briefly report upon the interview a deputation from the Council and the Committee of the Gas Companies' Protection Association had with the Parliamentary Secretary of the Board of Trade on the subject of the general prescription of a standard test-burner for gas undertakings throughout the United Kingdom. The Board have not yet arrived at a decision on the matter; so that the less said at the present time, the better. In conjunction with these miscellaneous matters, there is one other of which mention should be made. Approval will, we are quite certain, be given to the award of the London Gold Medal to Mr. Harold W. Woodall, for the paper he read last year on "Continuous Carbonization in Vertical Retorts;" of the Institution Silver Medal to Mr. F. J. Bywater, for his "treatise" on "Refractory Material;" and of the Bronze Medal to Mr. A. F. P. Hayman, for his contribution on "Recent Experience with the Dessau Vertical Retorts." Much original technical work was at the base of these contributions.

Further to Power Competition.

THE competition for power business is becoming more interesting day by day. There is no doubt that steam plant is in these times greatly losing in favour, and the internal combustion engine is gaining much of what the steam-engine is losing. The attention of the gas engineer has during recent years been somewhat constantly directed, by his own immediate surroundings as well as by the technical Press, to the competition of suction-gas plant. It is his business to keep himself well-informed as to the position of not only that but other competitors in the same line. There is another rival of which there has been much talk of late in engineering circles outside the gas industry, and which should be kept well in sight. That is the Diesel oil-engine, which, as a professed competitor of suction-gas and steam plants, is also a competitor of town gas. When it can be claimed, as it is claimed to-day, that there are 350,000-horse power of Diesel oil-engines at work, it would be folly not to recognize that that engine is, within the limits of its application, an effective rival. And just lately there has been a large amount of activity in proclaiming its merits. The Diesel engine is not by any means a new one. The first on this principle was made several years since; but from the very beginning, its efficiency was shown to be in advance of any oil-engine then on the market. The ordinary forms of oil-engine have their defects; their fuel consumption is somewhat high; the labour attaching to them is not a recommendation; foul cylinders and carboning-up are of the common experiences—with the result that they have not commanded any striking adoption such as the gas-engine has achieved, and is still achieving. In the modern Diesel engine, however, there is no question that a departure has been made that should not be ignored. The makers are following hard upon the track of gas-engine makers. The thermo-dynamic efficiency of the engines is spoken of very highly by engineers who have experience of them. They are economical in fuel consumption—the small sizes are reputed to be as economical as the larger ones; and their character for simplicity and reliability are certified by many. The cleanliness of the interior of the engine cylinder and the valves after long periods of running are points of advantage that the older types of oil-engine could not claim; and the cost of repairs is said to be low. With all these virtues, there will be no disposition on the part of town gas men to let the Diesel engines progress without being in a position to show that, when all is said in support of their claims, the gas-engine cannot admit the superiority of the rival.

A paper on the subject has been read before the Institution of Electrical Engineers by Mr. A. J. J. Pfeiffer; the main object of the communication being the advocacy of the use of the Diesel oil-engine in small and medium sized electricity generating-stations in place of other prime movers, and of such use in preference to concentration of generating plant, and the delivery of energy to sub-stations for district distribution. The convictions of electrical engineers are anything but settled on this point as to the relative advantages of concentrated large, and of isolated small, units of plant; but it, and the associated multitude of questions as to capital, running, and management costs, and relative distribution cost and power losses, have little concern for us. The only point at which town gas comes into contact with this question is as to the relative economy to the large electricity consumer for lighting and power of having an independent generating plant of his own, or taking a supply from the district electricity cables. Many gas undertakings have now consumers who employ town gas for operating private generating plants, and who experience both economy and reliability from doing so. And where space and labour, and the minimum scope for trouble and interruption of supply, are matters for consideration—such as in the lighting of large hotels and business establishments—town gas, at moderate prices, is preferred to the suction-gas plant, to the trouble of storing oil, and to the provision for light loads of small oil-engine units to prevent nuisance from smoke. A chairman of a London electric lighting company was only quite recently complaining that certain important consumers had been lost to them, through having installed private generating plants for lighting and power. And breakdowns of electricity supply have, we know, also quite lately produced advantage in the same way for a certain provincial gas undertaking.

However, among oil-engines, it must be admitted that the Diesel is the one that stands at the head and front as a

competitor; but, in regard to it, there is still some indefiniteness and unreliability in information in respect of costs. Mr. Pfeiffer gave the capital costs per kilowatt for a steam plant, including buildings, as £24 5s.; for a gas plant, as £23 5s.; and for an oil plant, as £23 to £25. But speakers with experience asserted, in the discussion, that the author had cut his figures much too fine for the Diesel engine; and that the capital outlay for it was high compared with gas or steam. The same applies to the fuel and works costs that he submitted. With a 33 per cent. load factor, the author gave the total works costs for steam as 0.501d. per unit generated, for gas as 0.485d., and for oil as 0.374d. The figure for gas, of course, refers to producer gas; and in working this out, the price of coal was taken at 25s. On this point, the author was closely pressed for taking such a figure for gas—by, particularly, Mr. Leonard Andrews and Mr. J. E. Dowson, both of whom are interested in gas-engine driving by producer and suction gas. Mr. Andrews was emphatic on the point that 12s. per ton was an outside figure to have to pay for coal for gas-producers; but we do not think he would claim that 12s. would be a fair figure to adopt in connection with suction-gas plants. However, taking the 12s., and the 33 per cent. load factor, we get to 0.348d. for gas, as compared with 0.374d. for oil. But in all these comparisons of costs, authors have recourse to such discrepant bases, just as best suits their own individual fancies and objects, that it is difficult to draw reliable conclusions from their figures. We are reminded of Mr. J. F. C. Snell's figures published in the "JOURNAL" on Jan. 28 last year (pp. 215, 218), in which he gave the costs of various forms of power per unit of electricity generated. With a 30 per cent. load, he quoted 0.944d. for coal gas, and 0.812d. for suction gas. But he took the price of coal gas at 2s. per 1000 cubic feet; while many gas undertakings are supplying for power at 1s. 6d., and even lower. The paper is of especial interest in this connection at the present time; for it shows that town gas can, at moderate prices, compete with suction gas for private electricity generation, and offer advantages that are foreign to suction gas. Total works costs, of course, with any form of power, depend greatly upon the loads and the prices of fuel. We do not know the load at the Leatherhead electricity works; but any way Mr. H. W. Handcock shows that, with the Diesel engine, in 1907 the works costs were 1.238d. per unit, and in 1908 0.762d. It will be noted, bearing in mind that the load factor is not stated, that these actual figures are considerably in excess of those quoted by Mr. Pfeiffer.

This brings us to another point. The oil market is a very sensitive one; and the author calculated the price in one place upon the basis of 50s. per ton, and in another of 60s. But the price depends again not only on the market, but the situation of the town; and down south one place at which Diesel engines are used paid 63s. in 1906, 66s. in 1907, and 70s. in 1908. Such fluctuations in the price of the fuel are not commendable features for the oil-engine; and naturally they urge the makers of these engines to extend the sources of fuel as widely as possible. It will interest the gas engineer with carburetted water-gas plant as part of his equipment to learn that Mr. Pfeiffer regards the oil tar from these plants—the oil tar having a calorific value of about 16,500 B.Th.U.—as an admirable oil-engine fuel; and he informs us that it has been successfully used for some time past on the Continent in the Diesel engine. In the carbonization of bituminous coal, a tar oil is also obtained which, on refinement, can be used. In view of the large field of the operations of the gas industry, perhaps it is not a peculiar thing that from it help should be available for so many of its competitors.

However, the main points to be considered are these: The Diesel engine at the present time is an active rival, with qualities that should not be despised. Under normal conditions, there is little to choose between it and the gas-engine in regard to works costs; but the oil market is perpetually in a state of instability as to supply and cost. Capital costs are heavier; and there is the trouble of purchasing and storing the fuel. The Diesel engines, however, demand skilful attention, and more of it, than the gas-engine. There is a certain amount of nuisance with them. Many manufacturers, too, have a great objection to any form of motive power that requires the storage of fuel on their premises, and development *in situ* of the motive force. Gas on tap, for direct delivery to the engine, is a distinctive advantage of which suction gas and the Diesel engine cannot deprive town gas; nor can either of these claim less space,

greater cleanliness, less attention, or a larger degree of constancy, together with the other merits to which Mr. Tookey drew attention in an interesting contribution to our pages last week.

Maladministration in Public Lighting.

THE Public Lighting Question is losing none of its interest; and it is likely to be more with us in the future than in the past. A new phase has just been imparted to it; and the metallic filament lamp is the active cause. The singular thing is that the question has become more acute in certain towns and districts where the electricity supply undertaking is in the hands of the local authority, and the gas supply is controlled by private enterprise—private enterprise, be it marked, in most cases statutorily controlled in a manner that brings advantage to the ratepayers and the consumers with every increment of advantage to those who have provided the capital. In districts where both the gas and the electricity supply are in the hands of the local authority, the question is less acute; and where there is not municipal ownership of either the gas or the electricity undertaking, there the local authorities are only interested in securing the cheapest method of efficient lighting for public purposes. The reason of the greater tension over the matter at the present time where the electricity supply is in the possession of the municipal authority and the gas supply in that of a company, is that the metallic filament lamp is producing an appreciable shrinkage of electricity consumption in private lighting; and, in consequence, the local authorities are rushing precipitately into the adoption of schemes for sacrificing the ratepayers by unnecessary capital expenditure, and putting into the street-lamps, in place of incandescent gas-burners, metallic filaments at almost any price for electricity, in order that the output of electricity shall not show any great declension. These tactics bode no good for the ratepayers. They have to provide sinking fund and interest on the capital expenditure involved; or else pay cash down if the work of conversion is carried out step by step, and *pari passu* payment is made direct from the rates. But whichever way the initial cost is met, the ratepayers have to pay annually more money for a less efficient and less reliable system of illumination, as the people of Hastings, for example, know to their cost. They are made to suffer peculiarly under the pretext that they are benefiting the electricity undertaking, for the welfare of which they do not individually care one iota, and are unwilling supporters.

The Local Government Board have repeatedly asked, and they are still asking, electricity owning local authorities to try to—in thought, if not actually—divest themselves of their ownership when discussing this question of public lighting, and to treat the matter on an independent business basis, and buy their illumination in the cheapest market consistent with efficiency. But the difficulty is that these local authorities do not care a fig for the Local Government Board. They set at naught the central authority, and treat it as a meddlesome body. The only good the intervention of the Board really does is to call the attention of the ratepayers more emphatically to the reckless procedure of the local authority; but before the local authority will give up their fatuous procedure, they will proceed with their project at a price that cannot possibly pay the electricity department, and that will in all probability result in the necessity for a subvention from the rates. The ratepayers are compelled to support the electricity undertaking, by any unwholesome means the local authority choose to select; and, the more indirect the method, the better the local authority likes it. The Local Government Board and the London County Council have been doing their best to stop the procedure of which we complain, not only by persuasion, but by the former refusing their sanction to loans, and the latter by declining to grant loans. The irritation that these actions have caused in interested municipal circles is indescribable; and the avenue the headstrong municipal councillor has discovered through which to circumvent those who are obstructive to his wishes, is the payment (as already explained) of the cost of the direct conversion of the gas-lamps to metallic filament lamps on the instalment principle. Where there is a will, there is a way. But if the will be irrational, and the way be paved with imprudence, so much the worse for some one or more persons. In this instance, the persons are the ratepayers.

The Hastings Corporation are one of the authorities that have merited reproach from the Local Government Board

for proposing an insensate public lighting scheme, which has for its purpose that interesting but vicious operation of robbing Peter to pay Paul. The acts of the Corporation are so vagarious that, setting the one against the other, there are the best of grounds for believing that the robbing of Peter to secure some advantage for Paul will fail in its object. In face of the refusal of the Local Government Board to grant a loan for something that is unproductive of benefit, the Corporation have resolved to begin their project of street-lamp conversion by lightening the pockets of the ratepayers to the extent of £500 the first year; and this is to be spent on the conversion of 130 street incandescent gas-lamps to electric metallic filaments. For this sum, the ratepayers are to gain no advantage in annual cost; and the electricity undertaking will not gain anything, until at some future time, the price for the electricity to these lamps is sufficiently raised, the same as has been the charge for electricity to the public arc lamps. Once the conversion is made, the ratepayers will be in the hands of the Electricity Committee; and the former will have to cry out and wriggle a good many years before they will be able to slip from the leash. The total amount of business that this expenditure of £500 a year is going to produce for the Electricity Department is merely 8 units per hour, at less than 2d. per unit, which is below the total works' cost! The current for the public arc lamps, which is a considerable quantity for all-night lighting, has for some years been charged at 3d. (4.26d. is quoted by the "Electrical Times") per unit; but from July 1 the 3d. is to be increased to 4d. per unit. Yet it is declared that the 2d. per unit will pay for the lighter load—the total of 8 units per hour—for the metallic filament lamps. We cannot find any reasonable explanation for this assertion. Forsooth, there must be people living in Hastings, and among them town councillors, who are easily gulled. We should like to see some answers to the riddle that the Electricity Department have put to the ratepayers, through the credulous councillors, as to why electricity for the fattest part of the public lighting supply must be charged at 4d. per unit, and the leanest part can be supplied at under 2d.? The Electricity Department may rejoice in the possession of supporters on the Council who give them such large-souled support and credence.

As there may be some question as to the 2d. per unit, it should be explained that figures given at a Local Government Board inquiry in November last, at which this question of conversion was dealt with, showed that £3 2s. 2d. per lamp would be made up of current £1 18s. 2d., renewals 13s. 6d., and labour, lighting, cleaning, and extinguishing, 10s. 6d. The Electrical Engineer on the same occasion gave the average consumption of electricity per metallic filament lamp (60 watts per hour) as 245 units per year; so that the £1 18s. 2d. will yield less than 2d. per unit. The Electricity Department says that it will pay, but other public lamps must pay 4d.! To get hold of this metallic filament lighting, it is not improbable that the Electricity Department has included in the 4d. per unit for the arc lamps something to compensate them for the metallic filaments. What they lose on the swings, they gain on the roundabouts. If this is the view they are taking, it is interesting, but it is not straightforward business. We should like to know how many £500 the ratepayers will have to pay in connection with this matter before conversion is ended. Each one of these lamps (and only at best 50 Hefner unit lamps, or less than 50 candle power) the first year, including conversion, is going to cost the Hastings ratepayers about £7! Will the Electricity Department guarantee that the annual charge of £3 2s. 2d. will not be increased? And will the Electricity Department say that the efficiency and reliability (remember recent events) of the street lighting will be on a level with that of the incandescent gas-lamps? Whatever their answers may be, the fact remains that the Corporation are imposing a serious charge upon the ratepayers without any commensurate benefit attaching. There is only one word that fits this sort of thing, and that is maladministration; and maladministration is at the present time a growing evil in more places than Hastings, in connection with the public lighting. In their last report, the Committee of the Gas Companies' Protection Association pointed out that they had had their attention directed to the unfair manner in which this competition with private gas enterprise is being carried on, and they stated that the matter was receiving their close attention. We hope it is. It is one that requires the close attention of as many individuals and organizations as possible.

Science and Industry.

THE meeting of the Institution of Gas Engineers in a fortnight's time, will strikingly illustrate the expansion in the gas industry of the recognition that it is only by the application of science in all the branches of its operations that the utmost progress and advantage will be, or can be, made; and with the completion of the fund that will endow the Chair of Gas Engineering and Fuel at the Leeds University, the bond between science and our particular industry will be made stronger than ever. But the consummation of this scheme, which is sure to have beneficent effect, must not do anything to undermine in the industry individual work in the paths of science that are so profusely opened up in connection with the gas industry. The more minds there are at work, the broader the field of research, and the greater the depths to which investigation is carried, the richer will be the fruits in really useful knowledge gathered from the (at present) vast unknown.

The large affinity that there is between science and industry has been much before us during the past week, through the holding in London of the International Congress of Applied Chemistry, which in itself, in its personal composition—*savants* of all countries being present—was an extraordinary demonstration of the truth, reiterated by the President (Sir William Ramsay), that science is cosmopolitan, and knows no country. Just as it knows no country, so it knows no bounds in industry. We talk of pure science and of applied science, as though there is a severe and quite distinguishable division-line drawn between them. There is not. The one so dovetails into the other that they are really inseparable; and this applies above all things to the science of chemistry. Chemistry is a practical science; and its centres are found in the bed of every industry, however poor or small, however rich or extended. As the Prince of Wales said in opening the Congress, we all recognize that, without a scientific foundation, no permanent superstructure can be reared, and that those great industries which do not keep abreast of the advance of science must surely and rapidly decline. Had the gas industry continued plodding along in the old ways in which crudity was a distinctive feature, the industry would not have been where it is to-day. Look at the heating of our retort-furnaces, at the conditions under which gas is produced, at the incandescent mantle, and at the other means of utilizing gas. Then it must be confessed that we owe much to science for preserving and increasing the strength of our position as one of the great industries of the civilized world.

There is more work to be done. There is more that is useful to be obtained from the coal used; and we want to realize all that is possible—including the bye-products—not in any haphazard manner, but by exact and controllable methods. In such work, and in work dealing with the utilization of the products of manufacture, immeasurable value may be discovered under the auspices of chemistry that will go to increase the industry's wealth. All that is undiscovered represents present waste; all that is saved is an accretion to wealth. But the matter must not be looked at in a selfish manner, as is frequently the case. Science deserves to be rewarded for its fruits. There is too much disinclination to make the reward in a practical manner. Science may be a hard taskmaster in industry if it is ill-directed; but, when properly directed, science and practice operating in company can do an infinity of good in the service of man.

The Shylocks of Salford.

The Salford Corporation are not to be satisfied by anything less than a full pound of flesh from the gas consumers. As the General Purposes Committee, they have held a meeting *in camera* to consider the subject of the limitation to appropriation of gas profits put upon them by the House of Lords; and they have decided to withdraw the gas section of the Bill, which the Lords Committee determined should not be withdrawn unless the whole Bill was sacrificed. According to a notice of the proceedings in a local paper, it was stated that at the meeting the ratepayers had had no opportunity of considering the decision of the Lords Committee. It so happens that Parliament is not in the habit of consulting ratepayers before pronouncing their decisions on a case presented to them. Assent was also given by those present to the suggestion that the Corporation are not prepared to increase the

rates by reducing the price of gas, which would necessarily be involved "if they were to comply with the Lords' decision." The Salford Corporation take up an interesting attitude. They consider they are a supreme body—that they have the right to pick and choose from the decisions of Parliament, and to reject all they do not care to accept. While, too, they study the effect of the decision upon the rates, they decline to study the position of the gas consumers, or the question of indirect and unequal taxation. It is a sad blow the House of Lords delivered against municipal trading in general, and the Salford Corporation in particular. What do these sentences in the report mean? "A further point which the discussion centred round was the way the evidence of some of the Corporation witnesses had been given. It was alleged that but for these witnesses the Lords might not have given a decision adverse to the Corporation." We do not know what is intended here; and so leave the point. But what move will the out-district authorities make from whom the Corporation are proposing to take away, without anybody's leave, the success gained in the Lords.

Further Prospectuses.

The East Sussex Gaslight, Coke, and Water Company, Limited, we are inclined to think, have beaten the record now in the matter of issuing prospectuses for a single gas or water undertaking. They are out with a reissue of the one circulated last April, and criticized in the "JOURNAL" for April 27, p. 228. They evidently did not have success with that prospectus, which was fortunate—for the public. The Directors are asking for applications for precisely the same number of shares—483 ordinary ones of £5 each; but the money is now wanted not only for the extension of the works, but for "current expenses." The prospectus has undergone a little further modification. The information about the drainage scheme sanctioned by the Local Government Board is omitted; and the "Important Development: Discovery of Natural Gas" paragraph has become played out. That, too, has been deleted; and its place is now occupied in showing the premiums at which certain Sussex gas and water securities now stand. By an oversight, the East Sussex insecurity has been left out. In a covering letter, "Dear Sir (or Madam)" is reminded that "under this Company's agreements, the period under which this Company's undertaking becomes liable to be purchased, commences to run from February next year; and in the event of the option being exercised, and the business taken over, the shareholders therein would *no doubt* receive a substantial premium." We doubt it. Not long ago the Bucks and Oxon District Gas and Coke Company, Limited, were after fresh capital. They are after more now. On the previous occasion £3500 of 6 per cent. preference stock and £2000 first 5 per cent. debentures were offered. This time the offer is £1450 of mortgage debentures, and £1200 preference stock. Then and now, the money was and is required "in part payment of the purchase money for the Buckingham Gas-Works," and in connection with "the purchase of the freehold works at Woodford." When will these works be finally paid for? A full six months' interest—the old game—is to be paid on Sept. 29 next. When the invitations were last issued, the name of Mr. Alfred Truman, Solicitor, Bicester, Oxon, appeared at the bottom. That of Mr. A. H. Franklin, Solicitor, Oxford, is now given. Has Mr. Truman retired?

Municipal Gas Undertakings Results.

Since referring a fortnight ago to some of the "earlier arrivals" among the results of municipal gas undertaking operations for the past financial year, numerous further particulars have come to hand. There is reported from Evesham a satisfactory increase in the sale of gas; and there is a net profit of over £1600. A point to be noted is that the Gas Committee, finding that during part of the year some people did not use their stoves, but still had to pay hire, recommended that the cost of hiring be reduced 50 per cent. from June 24. At Heywood the net profit is £223, or £1135 less than for the preceding year; this falling off being due principally to bad trade, the increased cost of coal, a reduction in price of gas, and diminished consumption for public lighting. The gas made per ton of coal was 10,859 cubic feet, which was an increase of 89 cubic feet over the previous year. At the same time, the quantity of the unaccounted-for gas was reduced from 7·88 to 6·79 per cent. Heywood has, of course, been

affected largely by the disturbed conditions which prevailed in the cotton trade over a considerable portion of the year; and there has also been a falling off in the prices realized for residuals. Turning to Leeds, we find that, instead of £14,708 being available for the relief of the rates (as was the case twelve months ago), the sum now handed over is £2245. Another place which suffered extensively from the cotton strike is Leigh (Lancs.), where, up to the end of November, there was a substantial decrease in consumption which arose from this cause. Since then, however, there has been an improvement; so that on the year the quantity of gas sent out has increased 0.46 per cent., which, under all the circumstances, is regarded as being very satisfactory. The net amount realized by the gas undertaking is £3238, which has been arrived at after taking from the profit of £3915 a sum of £677 capital expenditure and special charges paid out of revenue. The make of gas per ton was 11,000 cubic feet; and here, again, there is reported a falling off in the value of residuals—with the exception of coke. At Smethwick, there is a loss in revenue from the sale of gas amounting to £1872, of which a reduction in price to large consumers accounts for a little more than half—the remainder being due to diminished sales. The falling off is explained by bad trade, exceptionally light days, and the introduction of suction gas and electric installations by some of the large consumers. The net profit is £7445, against £10,021 last year. Coal cost nearly 6d. per ton more. From the net profit named has to be deducted the value of public lighting, £3934, “now contributed free of charge by the Gas Committee in aid of the district rate.” The net profit for the year at West Bromwich is £3317, compared with £4114 for the previous year. During the financial period just closed, nearly all branches of trade and industry in the borough suffered from somewhat serious depression; and while a considerable increase in the number of consumers took place during the year, there was a drop of about £1500 in the receipts from sales of gas. The yield of coal gas was 11,141 cubic feet per ton carbonized; while the yield of water gas was 53,300 cubic feet per ton of coke. The total quantity of gas made was 2.41 per cent. less than in the previous year.

Notices Served in South Wales.

In the case of the South Wales coalfield, it is, for once in a way, the expected that has happened; for last Friday the owners served notices upon their employees—who number some 150,000—to terminate their contracts on June 30. This, of course, means that, should the parties fail to come to an agreement before the date named with regard to the various matters outstanding, there will be a general stoppage of work throughout the coalfield. Already a keen desire is being shown by large users of steam coal to lay in a stock against the “rainy day” which appears to be in prospect. A struggle in South Wales—if it were confined strictly to that locality—would be a matter which would not directly affect the great majority of gas undertakings, seeing that they derive their supplies of coal from other parts. But would the fight be likely to be restricted to the South Wales field? This is a question which is of first importance to all users of coal—for whatever purpose it may be employed; and unfortunately it is a point upon which it is just at present impossible to speak with any very great amount of hopefulness. It has already been reported that the Miners’ Federation of Great Britain have decided to support the South Wales men by every means in their power, and these means would presumably include the “putting on of the screw” by causing disorganization in other coalfields. As is so often the case with industrial (as with other) disputes, “one thing has led to another” so rapidly that it is doubtful whether the ultimate issue will be the same as that which was first of all raised. Of course, the Eight-Hours’ Act is at the bottom of it all. But the points of dispute have passed through the phases of the automatic termination of the wages agreement, a reduction in wages, and the working of the sixty extra hours per annum; and now the crucial question is stated to be the operation of the mines in double shifts. Under the new conditions of working, it is obvious that working in two shifts of eight hours per day, rather than in only one, would generally prove more economical; and it is a saving to compensate for the extra expense which the new Act will involve, that the owners are bent on securing. But the double shift—like most of the other concessions they have been asked to make—does not meet with the approval of the miners, who urge various more or less

convincing reasons for their attitude. Should the dispute eventually result in a “national” strike, the latest available official returns show that the number of workpeople who would be directly involved would be about 660,000. This figure includes others besides those who are members of the Miners’ Societies, but whose employment would to all intents and purposes cease with the stoppage of the pits. It is stated that approximately the Federated Unions have a membership of slightly over 600,000.

Ancient and Modern.

We congratulate Mr. P. J. Pringle, of Burton-on-Trent, upon his success in getting the electricity press at the end of last week to advertise largely a most wonderful performance. At St. Peter’s Church, Stapenhill, the electricity bill for two quarters has only amounted to £3 10s. 8d., against £13 7s. 7d. for gas in the corresponding quarters. The reason is simply due to a comparison between the most modern in electricity and gas-burners after the fashion of those that ruled in the early days of the gas industry. Osrams pitted against fishtails! Mr. Pringle must be fearfully hard up for instructive illustration of the marvellous savings to be effected by electricity if he has to fall back on such an instance of antiquated lighting as was continued in this church till Osram lamps were introduced. There will not be surprise at the amount of the gas bill when it is learned that there were no less than 288 (twelve coronals of 24 burners each) of these fishtail gas wasters in the church; while only 75 Osrams of 25-candle power each are now used. Supposing, instead of paying the capital cost of introducing electricity, the coronals had been converted, and 75 bijou inverted lamps of 25-candle power each had been introduced, each using a fraction over a cubic foot of gas per hour, what then would have been the saving compared with electricity? Will Mr. Pringle justify his illustration, and answer a simple question?

PERSONAL.

Mr. ARTHUR ESCOTT, youngest son of the late Mr. James Escott, whose recent death is noticed elsewhere, succeeds his father as Manager and Secretary of the Llantrisant Gaslight and Coke Company.

Mr. A. THOMAS, eldest son of Mr. Philip Thomas, Engineer and Secretary of the Wellington (Somerset) Gas Company, has been selected by the Directors of the Budleigh Salterton Gas Company as Manager to succeed the late Mr. W. Walker.

Mr. G. B. GIBBS, who for ten years has been Cashier of the Sunderland and South Shields Water Company, has been appointed Secretary, in succession to the late Mr. Sutherland; and Mr. R. W. Arrowsmith, the Assessor, will in future discharge the duties of Cashier.

Mr. CECIL RHODES ARMITAGE, Technical Assistant to the Preston Gas Company, younger son of Mr. Charles Armitage, the Engineer and Manager of the Lancaster Corporation Gas-Works, has been appointed to the position of Engineer and Manager of the Morecambe Corporation Gas-Works. Mr. Armitage was educated at the Royal Grammar School, Lancaster, and was afterwards articled to Mr. J. H. Brown, Engineer and Manager of the Nottingham Corporation Gas-Works, with whom he remained some time as Assistant.

OBITUARY.

The death occurred a few days ago, in his 70th year, of Mr. JAMES ESCOTT, the Manager and Secretary of the Llantrisant Gaslight and Coke Company, Limited. Deceased leaves six sons and two daughters.

We regret to record that the operation which Sir JOHN COLOMB underwent on the 17th ult., and which left him in an extremely serious condition, resulted in his death last Thursday. Deceased was born in May, 1838; his father being General G. T. Colomb. As already mentioned, he was one of the Directors of the Commercial Gas Company; and he was on the Boards of the Fanti Consolidated Mines, Limited, the Baths Club Company, Limited, and Chairman of the Kootenay Valleys Company, Limited.

The sudden death, in his 78th year, is announced of Mr. THOMAS BULL, of Hornsea, who for some twenty years was Manager of the Kingston-upon-Hull Gas-Works, from which position he retired about nine years ago. On the death of Mr. J. A. Wade, the Chairman of the Hornsea Gas Company, Mr. Bull succeeded him, and held the post till he died. He was one of the earliest members of the British Association of Gas Managers, having been admitted in 1867. He passed into the Gas Institute, but severed his connection with it on relinquishing his managerial duties. He was also a member of the Hornsea Urban District Council. Deceased, who was held in great respect in Hornsea, leaves a son and two daughters.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 594.)

THE last week concluded on the Stock Exchange was a short one; for the House was closed for Whitsuntide on Saturday, and it was Derby week into the bargain. For all that, it was a busy and lively time, as there was an unusually heavy account to get through, which was quite enough, without requiring any accession of fresh business, to keep members well at it. Most of the leading departments were quiet enough; the animation being centred in South Africans, with Mines a good second. The gilt-edged division were adversely affected by another Colonial Loan, which was not welcomed with a rush, and the expectation of others to come. The opening was quiet, with a rather downward tendency in most lines except the busy ones above-mentioned, though Consols held on unchanged. Brighter views prevailed on Tuesday. Consols rose $\frac{1}{16}$, with several of the gilt-edged rank in sympathy, and Railways stiffened up a bit. Wednesday was the Derby Day, and was quiet as usual. Things in general were rather droopy, and realizations checked the rise in the popular markets. Thursday was devoted to the heavy settlement. The tendency generally was not unfavourable except in Government securities. Friday, was, of course, a very quiet day, but not weak. Government securities were firm, and the speculative lines showed some strength. Business in the Gas Market was quieter, like most other lines; but the general tendency was excellent. The remarkably steady advance in prices which has characterized several past weeks—healthy rises of a point or two in the week, and no fitful jumps—was well maintained, and many quotations kept creeping up. In Gaslight and Coke, the ordinary was very firm and commanded rather higher figures, changing hands at from 103 $\frac{5}{8}$ to 104 $\frac{3}{8}$. In the secured issues, the maximum fetched 88 $\frac{1}{2}$ free, the preference from 105 $\frac{1}{2}$ to 106 $\frac{1}{2}$, and the debenture 86 and 86 $\frac{1}{2}$ (a rise of 1). South Metropolitan was very quiet at 123 and 123 $\frac{1}{2}$; and the debenture made 85 $\frac{1}{2}$. Commercial 4 per cent. realized 108 $\frac{1}{2}$, ditto 3 $\frac{1}{2}$ per cent. 102 $\frac{1}{2}$, and ditto debenture 82 $\frac{1}{2}$. In the Suburban and Provincial group, Brentford old was done at 251 and 251 $\frac{1}{2}$, Hastings 3 $\frac{1}{2}$ per cent. at 93 $\frac{1}{2}$, Tottenham "B" at 111 $\frac{1}{2}$ (a rise of 1), and West Ham at 121 $\frac{1}{2}$ and 121 $\frac{3}{4}$. Both Ilford stocks had a good advance in view of the Company's successful issue of stock by tender. Both the Bombay and the Alliance and Dublin new further improved. In the Continental companies, Imperial was a point lower, at from 181 to 182 $\frac{1}{2}$, the debenture made 96 $\frac{1}{2}$ and 97, and Union made par and 99 $\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at from 13 $\frac{3}{8}$ to 13 $\frac{15}{16}$, ditto debenture at 95, Cape Town at 4 special, ditto preference at 51 $\frac{1}{2}$, Primitiva at 61 $\frac{1}{4}$, ditto preference at 51 and 51 $\frac{3}{8}$, ditto debenture at 97, and River Plate at from 14 $\frac{3}{4}$ to 14 $\frac{15}{16}$.

ELECTRICITY SUPPLY MEMORANDA.

Some Surprises in Municipal Accounts—The Metallic Filament at Work Reducing Revenue—And Causing Uneasiness in the Electrical Manufacturing Industries—Incandescent Gas-Mantle Sales and Metallic Filaments—Life Tests of Metallic Filaments—Meter Certification and Perfidy.

SOME of the accounts for the past financial year of municipal electricity undertakings as they are being published, are creating a little surprise. The grip of the metallic filament lamp is beginning to be seriously felt in some places, and trade depression too in the past year has left its marks on many accounts. We do not pretend to notice here all the characteristics of the accounts of municipal electricity departments, but merely certain of the distinctive features, including such financial results as deficits and small profits, as these are the evidences of an old misplaced confidence as to what electricity venture would do for the towns concerned. Some towns have, admittedly, done very well; but in nearly all, in these times, and in some of the best quarters, there is a complaint, as to the metallic filament lamps dealing out an unwelcome injury to an already dearly-won revenue. Running down the experiences of a few towns, it is seen that Barnstaple last year incurred a loss of £476. Belfast had an increase in the number of units sold for lighting of only 2·2 per cent.; while the increase for power was 8 per cent. Birmingham showed a net surplus on the year's working of £10,000, which it is proposed to pay over in aid of the rates. The contribution of the Gas Department to public purposes last year was £90,890! In the previous year, the Electricity Department had a surplus of upwards of £29,000. Blackburn only made a profit of £1000. Brighouse had a deficiency of £483, though taking electricity in bulk from the Yorkshire Electric Power Company. At Burton-upon-Trent, the metallic filament lamps have had a marked effect on the accounts. The revenue only increased by £183, while the expenditure was up by £451. The revenue from private lighting decreased by £366, compared with the previous year; and the total revenue from this source is less now than it used to be six years ago, although the lamp connections have increased by 43 per cent. The best the Burton-upon-Trent undertaking can do is to show a surplus of £836. From Clacton, the Engineer reports that several large consumers have used less energy, and that there have been fewer arc lamps in use, and old and new consumers are taking advantage of the metallic filament lamps. The average load being lower, adverse

effects are shown on the running costs. The Electricity Department of the Exeter Corporation reports that, although the business is prospering and increasing, the outlook is made somewhat anxious by the introduction of the metallic filament lamps. Already they have made the revenue stationary. Under former conditions, the installation increased about 10 per cent. annually, and the consumption of current and revenue advanced in ratio. Now, however, there is still the 10 per cent. increased installation annually; but the revenue does not move. From Grimsby, it is learned that, though there has been an increase in the number of consumers, the revenue has only advanced by £38; and this is attributed to the extension of the use of metallic filament lamps and to slackness of trade. The income of the Hampstead Electricity Department is down by about £3000; and it is stated that this is almost entirely due to the new lamps.

It will be seen from what has already been stated that the metallic filament lamp has much to answer for in its effect on the revenues of electricity undertakings. But among the surprises of the year's working are the lighting figures of Leeds. The decline in the consumption of electricity there for lighting has been 531,000 units, or about 10 per cent., "representing a loss in receipts of £7842;" while, in spite of an increase of 1563-horse power, or 18 per cent., in the motors connected to the mains, the revenue from this source shows a diminution of £1935, due to reductions in the scale of charges—the final result being a total reduction in revenue of £9288. From Marylebone, there comes an estimate of the prospects for the current year. It is "assumed" that there will be an increase of a million units sold, and that a profit of £1341 will be obtained. But this lucky event is contingent on the new public lighting scheme being in full swing by Michaelmas next. Stoke-on-Trent made a net profit in the past year of £141, as against £157 the previous year. West Bromwich only had an increase of £45 in the sales of electricity for private lighting. Middlesbrough claims a net profit of £852; and West Hartlepool a surplus of £714. It will be seen from the figures quoted that the lower cost of lighting by electricity has not made itself appreciably felt yet in attracting new consumers; and how to fill the growing void in business is the problem of the hour. The "Electrician" is of opinion that, during the "temporary" reduction of output brought about by the introduction of high efficiency lamps, "the development of the motor and heating and cooking loads certainly seems to furnish the best results." The use of the word "temporary" is a bold one, seeing the vast number of carbon filaments still to be displaced. Regarding the compensating power of the motor and heating and cooking load, four or five units have to be sold at 1d. to bring in the revenue of one unit at 4d. or 5d., and four or five units cost more to generate than one unit, and therefore will not yield the same amount of profit as one unit at the lighting rate. This obvious truth merely by the way!

Electricity supply undertakings are not the only part of the electrical industry that is suffering from the effects of the metallic filament lamp. Over a long course of years now, the electrical plant makers have been under dark clouds through both internal and external causes; and the Olympia and Manchester Exhibitions have not done them any good—at least that is what we gather from accounts showing the financial results of trading, and from the plaintive remarks of chairmen at meetings of shareholders. Depression in the electrical industry was already in full swing before the general dullness in trade set in; and now there has been a precipitous further drop in the volume of business, and for the reduced volume there has been severe competition from the manufacturers both at home and abroad. Among the companies who have been bitterly complaining of the present conditions of things are the Brush Electrical Engineering Company, Limited, the British Westinghouse Company, Limited, and Johnson and Phillips, Limited. Callender's Cable and Construction Company, Limited, are not over-pleased with the situation; but they have less cause for sorrow than the plant supply people. The Brush Company, for example, although they have appropriated £10,229 standing to the credit of the general reserve towards writing-off the loss on the year's working, are carrying forward a debit balance of £29,128. For the plant manufacturers, the metallic filament lamp has no doubt come at the worst possible time. It is true that electricity for lighting when the carbon filament lamp was contesting single-handed for indoor business, had practically reached saturation point; but there was then the continual little increments of business, plant maintenance and renewals, and so on, that brought grist to the mill of the plant maker. Now, though electricity consumers have only commenced to move from carbon to metallic filaments, the consumption of current has been reduced to such an extent that many stations have already a larger margin of spare plant than they require; and the prospects are that they will have more before the tide turns, and business begins to absorb the excess capacity again, otherwise than in a class of business that will be less lucrative than the old. In addition to this, it is confessed that the unassisted metallic filament lamp is incapable of making much headway in securing new custom. And all the time, through the inverted system of gas lighting, the gas consumer is being offered improved and still more economical lighting. The outlook is not a pleasant one for the electrical plant manufacturers. No new plant, no new distribution systems. The cable people, however, are doing better than the plant makers, owing to the central supply stations extending their lines in the hope of catching fish beyond the area of past operations.

As has been seen, our electrical rivals have not much at the present time upon which to congratulate themselves; and so their press has been trying to shed some little comfort around by variously reporting the statement of Lord Weardale, at the meeting of the Welsbach Company (*ante*, p. 463), that one of the factors from which the Company have suffered during the past year has been the metallic filament lamp. Of course, our contemporaries jumped to the conclusion that there had been a falling off in the sale of gas-mantles. "Among the causes of the drop in business in new gas-burners experienced by the Welsbach Incandescent Company," seriously remarks the "Electrical Review," "Lord Weardale names the competition experienced from metallic filament lamps." It is possible to suffer in business in more ways than by an actual drop. Just previous to the statement by his Lordship as to metallic filaments, he said the Company had "once more slightly increased their sales of mantles." So that there was no actual drop in the extent of the business; the chief thing from which the Company suffered was the increasing competition of Continental makes of mantles, and the consequent lowering of mantle prices, upon which depression of trade did not allow the Company to make a compensating expansion of business. Taken all in all, there is no drop in the quantity of mantles sold in this country. It is an ever-increasing business, though the decline in the number of mantles used (say) per consumer must have been considerable, in view of the greater longevity of the inverted gas-mantle than the old vertical form. One way at any rate in which the metallic filament lamp caused the Company to suffer, was owing to the necessity for spending money in controverting the gross misstatements of electrical people as to the cost of electric lighting having been reduced below that of gas-incandescent vertical or inverted burners—through the introduction of new electric lamps.

Lord Weardale spoke of the cheaper kinds of mantles having grown largely in favour, in contrast with the dearer and more durable types. It seems from the results of some tests presented by Herr O. Brandt in the "Elektrotechnische Zeitschrift," that users of metallic filament lamps must exercise care as to the types of lamps they purchase. In the comfortable quarters of a test-room, where neither shock nor other violence comes in to produce premature failure, Herr Brandt, on a steady voltage of 122, alternating current, tried two 32 Hefner unit Osram lamps, with the filament pointing downwards in the vertical direction. One of these was still burning after 1600 hours, while the other broke down at 1400 hours. These lamps gave rather more than their nominal illuminating power before the beginning and after the end of the tests. Two 50 Hefner unit Osram lamps equalled in life the 32 Hefner unit lamps; but they did not succeed in getting to their nominal illuminating power. Two other Osram lamps for 125 volts were tried—respectively 32 and 50 Hefner unit lamps. They were tested on the Berlin mains at 120 volts. The nominal candle power was not actually reached; and the life test was discontinued at 1400 hours. It would be of interest to know if these tests were continuous ones, or if the filaments were alternately cooled and heated as they are in ordinary use. The next lamps tested were 40 Hefner unit ones of the "Just" tungsten type. They lasted respectively only 77 and 100 hours. Three "Sirius" lamps of 25 Hefner units continued only about 150 hours. Three zircon 38 Hefner unit lamps by another maker, and credited with the attribute of being able to be used at any angle, did not do well. One with the filament pointing vertically upwards ran for 100 hours; a second, pointing vertically downwards, lasted for 200 hours; and a third, pointing in a horizontal direction, lasted only 15 hours. Other makes of lamps gave various accounts of themselves, ranging from 82 hours up to 390 hours. On direct current possibly some of these lamps would have done better; and the inconstancy of voltage on town mains, of course, put them to severe trial. Those, however, are conditions met with in ordinary service.

When we were dealing on May 4 with the Electric Lighting Acts (Amendment) Bill, it was mentioned that it contains a clause providing for the certification of meters. The remark was ventured that "this is good so far as it goes; but in the interests of electricity consumers, the more stringent and compulsory provisions of the Sales of Gas Act should be applied." The Parliamentary Committee of the London County Council are in part agreement with this view; though at present they refrain from asking that only certified electricity meters shall be used. However, they suggest that an attempt shall be made to get Parliament to amend the clause, so as to provide that a consumer shall be entitled to a certified meter without extra charge by the electricity suppliers for certification. Although certified, however, electricity meters are more prone than are gas-meters to wander from the path of rectitude. Confirmation of this is given by the "Electrical Review" in the following confession, which we will not maltreat by abbreviation:

It is, perhaps, a fact that need not be too freely advertised, that electricity meters do occasionally go wrong and require replacement. If the error is on the fast side, the earliest indication will probably be a strong appeal from the consumer urging the supply authority not to be so devoid of conscience. If, on the other hand, the meter is running slow, the householder will probably remain in blissful ignorance till further orders, unless the meter department discovers that the consumption of electricity has gone down as compared with the similar quarter in the previous year, without adequate cause. To obviate this sort of thing, many supply authorities now make a practice of regularly changing the meter attached to any consumer's supply at intervals of (say) three years. Where trouble appears to be developing, the change is made

whenever it appears necessary. A point in this connection, however, is worth noting. Unostentation may be overdone. It is not necessary to tell the world that an electric meter has gone wrong; but, on the other hand, it is due to the consumer to let him know that his meter is being changed. Some supply authorities omit to do this except in a casual way; and the result is confusion and strife. The best way to go about the work if there are indications that the meter is recording inaccurately, is to send an inspector to examine it in the first instance. If his report shows trouble, it is worth while sending a postcard at least a day in advance, saying that the supply authority's men will be calling at a certain time to replace the old meter with a new one. This gives the householder an opportunity of taking the final reading on the old meter and the initial reading on the new one. A good many consumers nowadays prefer to keep a check on the authority's readings; and if a meter is removed without due notice, they are apt to complain. And their complaint is not altogether without justification.

It is to be hoped that the little homily has been taken to heart by electricity purveyors.

NOTES FROM WESTMINSTER.

A LARGE amount of progress was registered in connection with Private Bills just before the recess; and already some of them have arrived at the goal of Royal Assent. Several additional measures have passed on to the second House, and are merrily pursuing their course without obstacle. The Yorktown and Blackwater Gas and Electricity Bill has passed under the review of Lord Onslow in the Lords; and there is to be no fighting over it in the Upper House. So that the Aldershot Company have given up, without any further wrestling, the area that was the bone of contention in the Commons. There is talk of the Dublin Gas Bill being opposed in the Lower House. This is not more than was expected; seeing that the Dublin Corporation—well, they are the Dublin Corporation.

Glamorgan Water Board Scheme.

Consideration of the Glamorgan Water Bill commenced on May 10, and was only concluded last week. In the matter of time absorption, it holds the record for the session. The promoters are the Glamorgan County Council; and the object is to form a Water Board, representative of the local authorities concerned. The Board, it is proposed, shall acquire the undertakings of certain Water Companies and Local Authorities, and construct new works; but all the water undertakings and supply areas in the county are not included. When the Bill came before Sir Luke White's Committee, it was found that several local authorities and other large interests were assembled in opposition; but though there was so much opposition, there was also a substantial amount of local support for the measure. The Board, it is proposed, shall be constituted of representatives of the authorities whose districts are involved. The case for the Bill was that the population is increasing; and unless something is done, the time will come when there will be an inadequate supply of water in the county. For any considerable additional supplies of water, it will be necessary to go to the higher area beyond the coal measures; and such a scheme cannot be carried out by small individual water authorities. But some of the districts appeared to want to share in the scheme, without participating in the expense. Mr. Reginald E. Middleton is the Engineer to the project; and some of the figures he gave in evidence are interesting. He estimates that the total cost of purchasing existing sources of supply would be £593,598; and that the annual cost to the Board would be £35,043. The quantity of water sold per annum would be 2,797,727,000 gallons. Further expenditure would be required to complete the present works and to construct other works. The total estimate of the expenditure of the Board is £1,100,000. Mr. Middleton computes that in 1917 the population to be supplied will be some 570,000; and the supply then provided will be in round figures 10½ million gallons a day. The yearly revenue from this supply at 4½d. per 1000 gallons would be £72,145. As the estimated annual cost to the Board is £60,500, a profit of £11,645 is thus shown to be available for further extension of works. With the large increase of revenue, the cost of administration would be slightly reduced, probably by ½ per cent., and this would increase the profits from £11,000 odd to £14,000. This would bring out the cost of the water per 1000 gallons to 3'6d. Mr. Middleton estimates the capacity of the sources of supply in 1917 at 12,000,000 gallons a day. Owing to the great cost of making new works, there can be no immediate economy except in management. It was suggested during the proceedings that a price of £325,000 had been provisionally agreed upon with the Pontypridd Water Company for their concern; but, failing ultimate agreement, the matter is to go to arbitration. Some amendments were made in clauses, affecting the question of representation. The preamble of the Bill was declared proved by the Committee. If it passes the Lords, there will be an opportunity, when the Act is reviewed in our columns, of showing precisely the final character of this large project.

Taxes on Lighting and Cooking Appliances in Germany.—At the sitting of the Finance Committee of the Reichstag last Friday, they passed duties on matches, incandescent mantles, and all kinds of lighting and cooking appliances. The lamp and stove tax is expected to yield £7,000,000 per annum.

SPECIMENS OF GAS LIGHTING BY THE CITY OF BIRMINGHAM GAS DEPARTMENT.



1.—Wesleyan Chapel, Coventry Road.



2.—Board Room at Parish Offices.



3.—Art Gallery—Italian and Industrial Hall.



4.—Friends' Hall, Moseley Road.



5.—Wesleyan Chapel, Moseley Road.

SPECIMENS OF GAS LIGHTING BY THE CITY OF BIRMINGHAM GAS DEPARTMENT.



6.—School of Art—Brass Workers' Room.



7.—St. James's Church, Edgbaston.



8.—Midland Institute.—Large Lecture Theatre.

By the courtesy of Mr. G. Hampton Barber, the Secretary to the Birmingham Corporation Gas Department, we are in a position to give the accompanying interesting photographs of some excellent specimens of interior gas lighting which are to be seen in the city. These really beautiful photographs, it may be mentioned, were taken with exposures varying from 4 to 5 minutes. The picture of the Art Gallery was the result of a 4 minutes' exposure, which produced a better photograph than was taken by daylight with an exposure of one hour. In the case of St. James's Church, Edgbaston, the exposure was for 5 minutes; and here

a photograph by daylight is almost impossible, as the church is lighted with heavy stained-glass windows. A careful record has been kept of the number of mantles requiring to be renewed to secure efficiency in lighting. In the Art Gallery, the mantles have lasted for a period of fifteen months without renewal; and in the Wesleyan Chapel, in Coventry Road, only six new mantles were needed for 34 burners at the end of the fifteen months. The photographs and particulars furnish valuable testimony as to the efficiency of incandescent gas lighting. Below will be found details of the sizes of the buildings, number of burners, consumption per hour, total illuminating cost per hour, &c.

	1 Wesleyan Chapel.	2 Parish Offices.	3 Art Gallery.	4 Friends' Hall.	5 Wesleyan Chapel.	6 School of Art.	7 St. James's Church.	8 Midland Institution.
Seating accommodation—persons	800	100	—	1200	1000	—	900	1000
Number of gas-burners	34	40	132	46	44	25	58	80
Consumption of gas per hour—cubic feet	170	200	720	230	220	100	224	400
Total illuminating power	2720	3200	10,560	3680	3520	1750	4040	6400
Cost for lighting, per hour.	4'2d. (1)	4'94d. (1)	15'73d. (2)	5'03d. (2)	5'85d. (3)	2'18d. (2)	5'96d. (3)	8'74d. (2)

(1) Gas at 2s. 2d. per 1000 cubic feet, less 5 per cent.

(2) Gas at 1s. 11d. per 1000 cubic feet, less 5 per cent,

(3) Gas at 2s. 4d. per 1000 cubic feet, less 5 per cent.

INSTITUTION OF GAS ENGINEERS.

Annual Report of the Council.

IN previous issues of the "JOURNAL," we have given a general indication of the arrangements for the forthcoming annual meeting of the Institution of Gas Engineers; and last week we published the titles of the papers to be submitted. The business on the opening day (the 15th inst.) will, as usual, include the presentation of the annual report of the Council, which is as follows:—

Membership.—The total membership at the end of the year 1908 was 825, compared with 804 at the close of the previous year—an increase of 21, made up as shown in the table below. The additions to the roll comprised one honorary member, thirty-three members, seven associate members (of whom three were previously students), two associates, and six students.

Class of Member.	At Dec. 31, 1907.	Elected and Transferred during 1908.	Deceased, Transferred, and Erased during 1908.	At Dec. 31, 1908.	Increase.
Honorary members	23	1	2	22	—1
Members	676	36	19	693	17
Associate members	92	7	5	94	2
Associates . . . . .	..	2	1	1	1
Students	13	6	4	15	2
Totals	804	52	31	825	21

The Council regret to record the deaths of the following members since their last report.

Honorary Members.

Sir George Livesey London
Alphonse Salanson Paris

Members.

James Drory Aix la Chapelle
Walter W. Fiddes Bristol
Henry Green Preston
Charles W. Jones Rome
George R. Love Guildford
John Nicholls Crewkerne
William Walter Norris Maryport
John Power Sheffield
George Smedley Buxton

The death of Sir George Livesey, elected an honorary member in 1903, removes from the roll the honoured name of one who had in many ways assisted in promoting the objects of the Institution. Becoming a member of the British Association of Gas Managers in 1864, he served as its President in 1874, and was made an honorary member in 1879. In 1882, under the auspices of the Gas Institute, he was the first recipient of the Birmingham Medal.

The Council, feeling sure there would be a strong desire that steps should be taken on behalf of the gas industry to perpetuate the memory of his life and work, convened a preliminary meeting at which various suggestions were considered. These were submitted to a well-attended and representative meeting, when, after full discussion, it was resolved to invite subscriptions to a Memorial Fund having for its object the endowment of a Livesey Professorship in Gas Engineering and Fuel at the Leeds University, for which at least £10,000 would be required. Reference was made at the meeting to the great practical interest which Sir George had taken in the existing Professorship of Gas and Fuel at the University, by obtaining annual subscriptions for its maintenance, and in other ways showing his sympathy with, and appreciation of, the value of the work carried on there.

A circular inviting subscriptions was accordingly issued to the members of the Institution and of the Society of British Gas Industries, to all the gas undertakings in the United Kingdom, and to others interested in the movement. Publicity was also given to the opening of the fund through the medium of the Daily and Technical Press, with the result that a total amount of £9793 1s. 7d. has been subscribed to date, made up as follows;—

No. or Subscribers.		
11	Institution, District Associations, and Junior District Associations	£310 11 6
194	Members of the Institution	858 7 7
154	Gas companies	7,002 8 0
19	Gas committees of corporations	508 5 0
54	Members of the Society of British Gas Industries	538 1 0
24	Other manufacturers, coal owners, &c.	205 8 0
86	Other subscribers	370 0 6
542		£9,793 1 7

Annual General Meeting.—Under the presidency of Mr. W. Doig Gibb, the annual general meeting of the Institution (the forty-fifth since its establishment in 1863 as the British Association of Gas Managers) was opened at the Institution of Mechanical Engineers, Westminster, kindly lent by the Council of that body, on the 16th of June, and continued there on the following day; the final sitting being held the next morning in the Congress Hall of the Franco-British Exhibition, Shepherd's Bush.

The following communications were read and discussed, and a

lecture on "The Combustion and Thermal Decomposition of Hydrocarbons," illustrated with experiments, was delivered by Professor William A. Bone, B.Sc., F.R.S., Professor of Fuel and Metallurgy at the University of Leeds:—

- "Co-Partnership," by Sir George Livesey, of London.
- "The Extraction of Cyanides and Manufacture of Yellow Prussiate by the Davis-Neill Process at the Linacre Gas-Works, Liverpool," by Mr. Edward Allen, of Liverpool.
- "Refractory Material," by Mr. Frederick J. Bywater, of Birmingham.
- "Recent Experience with the Dessau Vertical Retorts," by Mr. A. F. P. Hayman, of Berlin.
- "Description of the New Gas-Works at Valby, Copenhagen," by Mr. J. O. V. Irminger, of Copenhagen.
- "Continuous Carbonization in Vertical Retorts," by Mr. H. W. Woodall, of Bournemouth.

The three medals which are offered annually in connection with the papers read have been awarded by the Council as follows: London Gold Medal to Mr. H. W. Woodall, of Bournemouth, for his paper on "Continuous Carbonization in Vertical Retorts;" Institution Silver Medal to Mr. F. J. Bywater, of Birmingham, for his treatise on "Refractory Material;" and the Institution Bronze Medal to Mr. A. F. P. Hayman, of Berlin, for his contribution on "Recent Experience with the Dessau Vertical Retorts."

On Wednesday, the 17th of June, a reception and dance was given by the President and Mrs. Gibb, at the Galleries of the Royal Institute of Painters in Water Colours. There was a large attendance; and all the arrangements made for the enjoyment of the members and their friends were greatly appreciated.

At the conclusion of the meeting, a visit of inspection was arranged to the Gas Section of the Franco-British Exhibition, which had been organized with great success by the Committee of the Gas Engineering Section as the exhibit of the gas undertakings of the United Kingdom.

A three days' visit to Berlin to inspect the new gas-works of the City, and especially the vertical retort installations, on the invitation of the German Society of Gas and Water Engineers, was also included in the programme of the meeting, and will long be remembered by the members (about 80 in all) who had the pleasure of taking part in it. Nothing could have exceeded the warmth of the welcome which was everywhere extended to them by their German friends and colleagues; and the Council desire to express their very cordial acknowledgments of all that was kindly done by the Society, with Mr. Ernest Körting as its Acting President, by the Berlin Municipality, and by the Imperial Continental Gas Association, to render the occasion extremely interesting and pleasant.

An excursion to Brighton, which about seventy attended, took place on Friday, the 19th of June, when, by the kindness of the Directors of the Brighton and Hove Gas Company, their works at Portslade were thrown open to the members.

Affiliation.—Following on the announcement made in the Council's last report that the North British Association of Gas Managers had become affiliated with the Institution, it is gratifying to notice that no fewer than twenty members of the Association have joined the Institution during the past year.

The names of members appointed by the District Associations as their representatives on the Council for the year 1908-9 are as follows:—

- Eastern Counties Association Mr. E. J. Brockway.
- Irish Association Mr. T. J. Reid.
- Manchester District Institution. Mr. W. Whatmough.
- Midland Association Mr. Harold E. Copp.
- North British Association Mr. James D. Smith.
- North of England Association Mr. Herbert Lees.
- Southern District Association Mr. N. H. Humphrys.

Examinations in "Gas Engineering" and "Gas Supply," 1909.—Mr. W. Doig Gibb, Immediate Past-President, the Examiner in "Gas Engineering," reports that 311 candidates presented themselves for examination on the 24th of April, 116 taking the Honours and 195 the ordinary paper, against 291 candidates last year (101 Honours and 190 Ordinary); and Mr. J. H. Brearley, the Examiner in "Gas Supply," reports that there were 315 candidates examined in that subject on the 1st of May, consisting of 80 in the Honours and 235 in the Ordinary Grade, compared with 193 candidates—41 Honours and 152 Ordinary—last year. At the request of the Technology Committee of the City and Guilds of London Institute, a Committee of the Council, in conjunction with the Examiner, considered whether any revision in the syllabus of "Gas Supply" was desirable; and, as a result, various modifications were suggested, and have been approved and adopted.

Gas Standard Burner.—During the past year the Council, in conjunction with the Committee of the Gas Companies' Protection Association, have given consideration to the suggestion that steps should be taken for introducing a Bill into Parliament to prescribe a standard burner to be used throughout the United Kingdom for the official testing of the illuminating power of gas, "so that the returns everywhere in the United Kingdom would be comparable, and so that all parties dealing with gas lighting questions, from the Houses of Parliament down to the consumer of gas, would have a definite standard of comparison." It was decided that, with the object of obtaining the views of the Board of Trade on the proposal, an interview should be sought with the President. This was accordingly done, with the result that the Parliamentary Secretary to the Board of Trade (Mr. H. J. Tennant) courteously received a joint deputation at Whitehall Gardens, when the whole matter was put before him. He promised

to give it his careful consideration, and to report to the President of the Board of Trade the arguments brought forward, so that the Board would in due course arrive at a decision on the subject.

Visit of the Société Technique de l'Industrie du Gaz en France.—In connection with the visit of the Société Technique de l'Industrie du Gaz en France to England in June, under the presidency of M. André Coze, the Council had the gratification of entertaining the Committee of the Society; the occasion proving most enjoyable to all who were present.

THE SPECIAL PURPOSES FUND.

During the past year the following matters have been dealt with in connection with the Special Purposes Fund of the Institution [the list of contributions to which, and the accounts, are appended to the report]. The valuable work in the interests of the gas industry which the fund has rendered possible will be apparent; and the Council trust that increased support will be given by gas undertakings to enable the present important investigations to be continued, and others initiated.

Carbonization.—The Sub-Committee having in hand investigation of the various methods of carbonization (Messrs. A. E. Broadberry, Charles Carpenter, Thomas Glover, and S. Y. Shoubridge) report that, having regard to the great development that has taken, and is taking, place in the use of vertical retorts and in carbonizing in chamber settings, they feel it would be impossible to submit any conclusive statement on the subject at present. They are keeping in touch with the work that is going on in this and other countries, and have under preparation for presentation at the forthcoming meeting a report showing the progress which has been made in the methods of carbonization during the last twelve months.

Gas for Heating Purposes.—The investigation into the hygienic and economical applications of gas for heating purposes, which is being carried out under the direction of the Sub-Committee (Messrs. John Bond, J. H. Brearley, and Charles Wood, with whom Professors Arthur Smithells, William A. Bone, and Julius B. Cohen are kindly co-operating, as representing the Leeds University), has been continued in the department of Fuel and Metallurgy by the late Chemist to the Committee, Dr. Julien Drugman, and by his successor, Mr. E. W. Smith, M.Sc. The report of the Sub-Committee's experimental work, with explanatory note by Mr. Smith, will be presented to the Institution at its coming meeting as a communication to be read and discussed.

Fellowship in Gaseous Fuel.—With reference to the Institution Fellowship at the Leeds University, of the value of £100 per annum, to which Mr. Arthur M. Forshaw, M.Sc., was appointed in October, 1907, the Senate, on the recommendation of the Board of Science and Technology, awarded the Fellowship to him for a second year. The results of his work on the relative "mantle" efficiency of carbonic oxide and hydrogen, in which he has been occupied under the direction of Professor Bone in the Fuel and Metallurgical Laboratory, will be given in the form of a paper for reading and discussion at the Institution's forthcoming meeting, under the title of "The Efficiency of a Gas in Relation to Incandescent Lighting." Having completed the term of his fellowship, Mr. Forshaw has been selected to fill a responsible appointment as Chemist in a large gas appliances manufactory—a circumstance which indicates the practical value of the training his fellowship enabled him to secure. The Senate of the University will in due course award the fellowship which is offered by the Institution for the year 1909-1910.

Refractory Materials.—The English Ceramic Society started in January, 1908, a movement having for its object the grading and standardizing as far as possible of the refractory materials such as fire-clay, magnesite, &c., used in the construction of furnaces, &c. It received an impetus from the discussion which followed Mr. Bywater's paper read before the Institution in the following June; and shortly afterwards the Council were invited to appoint representatives to attend a conference on the matter with representatives of the Society and other interested Associations. The subject being of such vital interest to the gas industry, the Council gladly accepted the invitation by appointing Mr. John Bond, Mr. F. J. Bywater, and Mr. Edward Jones. Their report, dated 22nd February, 1909, which has been accepted and adopted by the Council, is as follows:—

Report of Conference on Refractory Materials.

We beg to report that we attended the meeting held at Stoke-on-Trent on Jan. 4, to consider the advisability of forming a Joint Committee to consist of representatives of all the industries interested, for the consideration of the standardization and improvement in the supply of refractory materials.

It was unanimously decided to form such a Committee, and to invite such allied industries and societies as were not represented to assist in the work to be undertaken.

A résumé of the proceedings has appeared in the Technical Press.* The most important decisions were:

- 1.—That each sub-section of the Joint Committee should consider and inquire into the requirements of the industry represented by them.
- 2.—That they were to use their discretion as to the best means of doing this, either by the co-option of other members to act with them, inviting opinions through the Technical Press, or any other means they thought fit.
- 3.—After obtaining reliable data on all points touching the supply and behaviour of refractory material now in use, and formulating what are considered to be the demands of the industry in this respect, the

Sectional Committee should discuss their conclusions with the representatives of the manufacturers, and afterwards report to the Joint Committee for consideration of same.

4.—That each section should be asked to contribute £3 3s. towards the expenses of the Joint Committee.

Subsequently your representatives held a meeting at which it was decided that the questions in which the gas industry is most concerned are as follows:—

- (a) The name and origin of refractory materials at present in use at the various gas-works.
- (b) Temperature of furnaces and plant in which such material is employed, including producers, retorts, retort-settings and combustion chambers, &c., water-gas generators, superheaters, and carburettors, &c., and whether such temperatures are continuous or intermittent.
- (c) Sizes of bricks, blocks, and tiles, and length and section of retorts employed. Cement clays used.
- (d) General remarks and criticisms of the material now employed, with analyses.
- (e) Suggestions as to the improvement, both in material, sizes, and patterns, and limits of deviation therefrom; also as to the standardization of sizes of bricks, tiles, and retorts, &c.
- (f) The preparation of standard specifications.
- (g) The necessity for an independent laboratory for the testing of refractory material.

So that the inquiry into, and information collected, may be as full and reliable as possible, we think it advisable to invite a number of other engineers and gentlemen (about six or eight) known to be interested in this subject, to join our Sub-Committee. Not more than three meetings should be necessary.

Mr. F. J. Bywater has been asked, and consented, to act as Honorary Secretary of the Sub-Section.

We shall be glad to receive the approval of the Council to the proposals herein outlined.

To enable the Sub-Committee to proceed with their investigations, the Council have voted a sum of £50 from the Special Purposes Fund.

Unification of Gas-Threads.—The President (Mr. Thomas Glover) and Senior Vice-President (Mr. James W. Helps) were appointed to represent the Institution at a conference on this subject organized by the Société Technique de l'Industrie du Gaz en France. Their report, containing various recommendations, which the Council have accepted and adopted, is as follows; and it may be added that arrangements have been made for another conference on the subject early in June, 1909, when it is hoped that a satisfactory decision will be arrived at.

Report of Conference on Unification of Gas-Threads.

We have pleasure in stating that we attended the International Conference held in Paris in June, 1908, which had for its object the standardizing of a thread which should be universally adopted in connection with pipe connections.

It was pointed out that at the present time two forms of thread are in general use: (1) The Whitworth. (2) The Sellers. The first-named thread is adopted in England, and also, with some slight modifications, in Germany and other parts of Europe. It has an angle between the slopes of 55°, while the threads are rounded at the crests and roots so as to leave a depth of thread equal to 0.64 times the pitch. The "Sellers" thread is used in America. It has an angle of 60°, with the threads flattened or truncated at the roots and crests.

Both the French and American representatives strongly advocated the adoption of the Sellers or American thread, with some modifications; and finally a table was drawn up, a copy of which we append (Schedule A), giving the recommended diameters and pitches of the thread having an angle of 60° truncated to the extent of $\frac{1}{8}$, and made with a slight taper.

It was also resolved that it was desirable that a further meeting should be held in about six months' time, when the members would have had an opportunity of submitting these recommendations to the different interested societies in their own countries. We, as your representatives, had to content ourselves with the statement that if the objections raised to the adoption of a screw with an angle of 55° were proved to be as grave as suggested, we would not then oppose the principle of the 60° angle; but that, inasmuch as the matter had but lately received the careful attention of the Engineering Standards Committee, who had already issued a report on the subject in which they recommended the adoption of the Whitworth standard, we thought there was little chance of their reconsidering their decisions when we brought the matter before them.

Since the conference, it has transpired that the standard actually adopted for pipe-threads in America is not the "Sellers" but the "Briggs," which fact was not mentioned at the meeting. This standard has the same angle as the "Sellers," but has a theoretically sharp V section. There seems, however, to be considerable doubt as to what the actual contour of the thread is, as the thread as made does not appear to entirely coincide with its theoretical definition. We beg here to draw attention to the resolution on the subject lately passed by the American Gas Institute, a copy of which we append (Schedule B).

We have during the past few months been in frequent communication with Mr. Leslie S. Robertson, the Secretary of the Engineering Standards Committee, who strongly oppose the decisions of the International Commission, and as strongly recommend that our Institution should adhere to the findings of their body.

The Engineering Standards Committee have prepared a reasoned technical statement for the adoption of the British standard pipe-threads, a copy of which we append (Schedule C). They also offer to co-operate with us in the matter, and to arrange for the attendance of their representatives at the next conference in company with our own delegates. We believe that a careful perusal of the reasoned statement referred to will indicate the importance of making a strong stand against the proposals of the International Commission; and we therefore recommend that the offer of the Standards Committee be accepted with

* See "JOURNAL" for Jan. 26, 1909 (p. 230).

thanks, and negotiations entered into with the officials of the conference to secure the attendance of the representatives of the Committee, together with our own delegates.

We should like to point out that at the last conference the representatives of certain countries were in a considerable majority, while others were not adequately represented. We trust, therefore, that at the next meeting this matter will receive careful consideration, and that steps will be taken to secure really representative voting, so that the decisions arrived at shall be in accord with the views of the majority.

SCHEDULE "A."

The results of the deliberations of the First Session of the Commission (June, 1908) were as follows:—

1.—Adoption of an angle of 60° for threads, with a $\frac{1}{2}$ cone-shaped end, for screws, on the Sellers American system.

2.—Adoption of the following diameters and threads for the dimensions of 11 mm. (0.44 inch) and upwards:—

Diameters in Millimetres.	Threads in Millimetres.
11, 13, 17	1.4
21, 26.5	1.8
33, 42, 48, 52, 60	2.3
70, 73, 76, 89, 101.5, and 114	3.2

3.—Adoption of conic junctions, as in the United States and England.

SCHEDULE "B."

1.—Whereas the American standard pipe-thread is the Briggs V thread, which ensures the maximum tightness of joint by utilizing practically the full theoretical depth of the thread, the bottom being filleted and the top rounded only enough to strengthen the pipe sufficiently at the groove and preserve the true contour of the apex; and whereas the American standard screw-thread for bolts and nuts is the Sellers thread, which is truncated to three-quarters of its theoretical depth in order to secure greater strength, but which consequently does not attain the tightness of joint that is essential in pipe work; therefore the American Gas Institute urges the adoption of the American standard pipe-thread, and not the American standard screw-thread for an international pipe-thread. In other words, this Institute urges the universal adoption for pipe work of the Briggs V thread, and not the Sellers truncated thread.

2.—Whereas a change of one-half of a millimetre in the outside diameters provisionally recommended by the International Committee for the following four sizes of pipe will make the entire list practically coincide with American standard diameters and with the diameters (except $2\frac{1}{2}$ inch) adopted by the British Engineering Standards Committee, therefore the American Gas Institute recommends that the suggested sizes of 11 mm., 13 mm., 21 mm., and 33 mm., be changed to 10.5 mm., 13.5 mm., 21.5 mm., and 33.5 mm. respectively; also that the pitch for 10.5 mm. diameter be 1 mm. instead of 1.4 mm.

3.—Subject to the above qualifications, the American Gas Institute endorses the proposed international system of pipe-threads, and will use its best efforts to secure its adoption throughout the United States.

SCHEDULE "C."

The Engineering Standards Committee, having had, through the courtesy of the Institution of Gas Engineers, an opportunity of considering the resolutions arrived at by the Conference for the Unification of Gas-Threads held in Paris in June last, desire to call the attention of the Council of the Institution of Gas Engineers to the following points:

1. *General*.—The Committee would point out that the Whitworth form of thread and pitches which have been adopted by the Engineering Standards Committee have been in general use for a considerable number of years throughout not only the British Empire but also Germany and many other Continental countries; and they are of opinion that the Institution of Gas Engineers should not give their countenance to any departure from general practice unless grave and weighty reasons for such departure can be advanced.

The fact that the British pipe-thread standards have been formally adopted throughout Great Britain, coupled with the fact that they are the result of an immense amount of deliberation by those best qualified to form an opinion, and that a standard set of gauges for them has been deposited with the National Physical Laboratory, renders it improbable that any other standard now put forward in opposition would be generally accepted in this or other countries now working to the Whitworth thread.

The Committee would point out that there are two forms of gas threads in use: (a) The Whitworth form, which has an angle of 55° , with the crest and root equally rounded off until the depth of thread approximately equals $\frac{1}{4}$ times the pitch. (b) The Briggs form, which has an angle of 60° , and theoretically an almost sharp V section, though in practice this form does not appear to be adhered to.

2. *Form of Thread*.—It is found in practice that the Whitworth form of thread, with its rounded crests and roots, maintains its shape almost permanently, which is of the highest importance for pipe-screwing, particularly in the smaller sizes; while the sharp crests and roots of the Briggs thread wear to an approximation of the Whitworth form. In the selection of thread form for an international standard, the Committee would urge that it is better to select that form of thread which is the more easily maintained; and this has been one of the governing factors in the British Committee's deliberations. Further, the Whitworth form of thread does not weaken the pipe to the same extent as the Briggs, because it cuts less deeply into the pipe, has crests and roots rounded to an easy curve (instead of the almost sharp V), the pitch is generally finer (11 threads as against 9), and the pipe is therefore stronger, both as regards the stripping of the thread and the strength of the pipe under the thread.

3. *Pitch*.—The pitches of the original Whitworth standard have been retained by the Engineering Standards Committee of Great Britain. The pitches put forward by the Commission agree closely with British and German practice up to 2 inches nominal bore, with the exception of $\frac{1}{2}$ inch, for which size 18.1 threads per inch is suggested as against the British 28 threads and the American 27 threads. Such an altera-

tion would seriously inconvenience all countries concerned. Above 2 inches the pitches suggested by the Commission are similar to those in use in America (8 threads); whereas the German (11 threads) agree throughout with the British Standards, which have been found to give uniformly good results on all sizes, both as regards strength and tightness. On the other hand, the thread above 2 inches nominal bore proposed by the Commission has 7.9 threads, which latter is far too coarse for the smaller tubes, and requires much greater thicknesses than are usually necessary. Even in cases where thicker tubes are called for, the coarse threads reduce the strength without any corresponding advantage being obtained. If pipes have to be made thicker to meet this nothing is gained, owing to the deeper threads unduly weakening the pipe end, since the strength of the pipe depends on its weakest section.

4. *Gauge Diameter*.—The following is a definition of the term "Gauge diameter," drawn up by the Engineering Standards Committee, and refers to the same dimension as that referred to by the International Commission as "Diamètre extérieur": The gauge diameter is the full diameter of the standard male screw gauge which the coupler to be used with a pipe of that size is required to fit. It may, therefore, for all practical purposes, be regarded as the full diameter of the coupler screw. [By full diameter, the Committee understand a dimension equal to twice the maximum radius of a screw, measured at right angles to the axis.]

As stated, the pitches and form of thread in German practice and the British standard are identical; the only differences being between the gauge diameters on certain sizes. These differences are, for the most part, insignificant; the differences being no more serious than those existing between different British manufacturers prior to the adoption of the British standard table, the introduction of which is being effected with comparatively little inconvenience. As a matter of fact, the German gauge diameters are practically identical with the dimensions originally worked to by a large number of manufacturers in Great Britain.

5. *Proposed International Standards*.—The proposals of the Commission, as they at present stand, seem to have been prompted by an endeavour to combine, as far as possible, German and American practice. They appear to approximate closely to the existing German gauge diameters on the one hand and the American pitches on the other.

The British standard thread and the proposed international thread should be carefully compared with the existing German thread, since pipe-threads closely approximating to the German standards have been in general use throughout the length and breadth of the Continent. If, therefore, it is proposed to establish an international standard, the line of least resistance should be the one selected, and a standard adopted which will cause the least trouble and inconvenience. In the Committee's opinion, these conditions are fulfilled by the British standard, which approximates as nearly as possible to existing European and Colonial usage.

As mentioned above, the adoption of the British standard would involve comparatively small alteration in the German gauge diameters. The pitches would not have to be altered, and very little trouble would be caused. On the other hand, in adopting the proposed international thread, though hardly any alteration in the gauge diameters would be required, the alterations of the pitches would be so serious as to entail a maximum amount of trouble and inconvenience both to consumer and manufacturer. The proposals of the Commission do not agree with German, American, or British practice, and run a severe risk of not being adopted in Great Britain and her Colonies or the Continent of Europe.

The Committee therefore feel fully justified in most strongly urging the Institution of Gas Engineers to press for the adoption of the Committee's standards.

LESLIE S. ROBERTSON, *Secretary*.

Standard Clauses in Contracts.—By desire of the Society of British Gas Industries, representatives of the Institution were appointed by the Council to consider with a Committee of that Society, a set of standard clauses for contract specifications suggested by the Society as suitable for adoption. Several combined meetings were held for the full discussion of the whole matter, with the result that a set of 29 clauses were unanimously recommended to the respective Councils of the Institution and the Society for their consideration and approval. The clauses were subsequently accepted and adopted by them, and a copy issued to every member of the Institution and of the Society.*

International Unit of Light.—The British Electrotechnical Committee (consisting of Mr. Alexander Siemens (President), Sir Wm. Preece, K.C.B., F.R.S., Colonel R. E. Crompton, C.B., Mr. W. Duddell, F.R.S., Mr. Kenelm Edgcumbe, Sir John Gavey, C.B., Dr. R. T. Glazebrook, F.R.S., Mr. R. Kaye Gray, Mr. Robert Hammond, Colonel H. C. L. Holden, F.R.S., Dr. Gisbert Kapp, Mr. T. Mather, Mr. H. W. Miller, Mr. W. M. Mordey, the Rt. Hon. Lord Rayleigh, O.M., F.R.S., Captain H. R. Sankey, R.E. (ret.), Mr. C. P. Sparks, Mr. J. Swinburne, F.R.S., Dr. S. P. Thompson, F.R.S., Mr. A. P. Trotter, Mr. E. B. Vignoles, Mr. C. H. Wordingham, Mr. P. F. Rowell (Honorary Secretary), and Mr. C. le Maistre, Secretary of the International Electrotechnical Commission, requested the Council to appoint a representative of the Institution to co-operate with the Committee in the question of an international standard of light; and Mr. James W. Helps, who consented to serve in that capacity, reports that he attended a meeting held at the Institution of Electrical Engineers on the 23rd of February last, when the memorandum as to photometric units which had been prepared and submitted to the representatives of the various countries was considered, and adopted. [See ante, p. 439.]

Warming of Factories and Workshops.—The attention of the Council having been called by the Master Printers' and Allied

* The clauses were given in the "JOURNAL" for March 16 last (p. 772).

Trades' Association to questions arising from the use of gas-heated steam radiators in factories and workshops, the matter was referred to a Committee consisting of representatives of the Gas-Stove Section of the Society of British Gas Industries and of the Institution, who are now dealing with it in conjunction with the Gas-Heating Research Committee.

Architects and Heating by Gas.—In association with the Society of British Gas Industries, the Institution has also had under consideration suggestions for a conference with architects on the subject of heating by gas. The Council feel that such a conference would be of great advantage, and hope that it will be found possible to arrange for it to be held.

THOMAS GLOVER, *President*.
WALTER T. DUNN, *Secretary*.

May 25, 1909.

IMPERIAL INTERNATIONAL EXHIBITION.

Interior Gas Lighting.

In the "JOURNAL" last week, and for May 11, references were made to the part that gas is taking in the International Exhibition at Shepherd's Bush. In the earlier one, it was mentioned that Messrs. A. E. Podmore and Co. were lighting the Bahamas House, and Mr. William Edgar the Chinese Pavilion. In the lighting of the latter, Mr. Edgar has supplied his "Eclipse" pattern lamp. This is constructed of a strong all-copper casing, with enamelled shade, and fitted with bye-pass cock, and gas and air adjusters, so constructed that either large or small mantles can be used. It is altogether a handsome, strong, and very effective inverted lamp. In the lighting of the Bahamas House, Messrs. Podmore and Co. have supplied thirteen three-light inverted lamps. Each burner, the makers inform us, gives approximately 150-candle power for the consumption of 4 cubic feet per hour. From this it will be gathered, the Bahamas House is one of the best-lighted exhibits in the place. The outside of the building, besides being lit with two three-light "Globe" lamps, is now being prepared to take six dozen small gas-lamps of variegated colours, which will make the appearance very attractive to the passer-by.

Duration of the World's Coal Supply.—At the annual general meeting of the Institution of Mining Engineers, which was opened at Burlington House on Thursday last, the President, Dr. R. T. Moore, devoted his address to the subject of the coal output of the world. He said that, notwithstanding all the economies introduced in connection with the use of coal in various industries, the total consumption continued to increase, and the problem was how long this valuable mineral would last. If the output of coal continued to increase at the present average rate, the world's supply would be exhausted within the next five hundred years; but that it would continue to increase so rapidly, one could hardly believe. However, long before this period expired, some way might be found of doing without coal. In any event, they might safely leave their descendants to solve their own problem in their own way.

Presentations to Officers of the Derby Gas Company.—On Saturday, the 22nd ult., the Engineer of the Derby Gas Company (Mr. J. Ferguson Bell) presented to Mr. W. E. Caton, the Assistant-Engineer, a handsome clock and aneroid barometer, on behalf of the staff and employees. On the clock was the following inscription: "Presented to Mr. W. E. Caton by the staff and employees of the Derby Gaslight and Coke Company, on the occasion of his marriage—27th May, 1909." At the same time, Mr. Edgar Foster, the Engineering Assistant, was presented with a gold watch, on which was inscribed: "Presented to Mr. Edgar Foster, by the staff of the Derby Gaslight and Coke Company, on his leaving for Sydney, N.S.W.—May, 1909." Subsequently, the announcement appeared that on May 27, at the Parish Church, Duffield, Derbyshire, by the Rev. J. F. Alexander, William Eames, eldest son of the late James Caton, of Shefford, Beds., and Mrs. Caton, of Hitchin, was married to Lily, younger daughter of Frank Tatlow, Esq., of Avenue House, Duffield.

"Field's Analysis" for 1908.—We have received from the compiler (Mr. George Orford, Assistant-Accountant to the Gaslight and Coke Company) a copy of the above-named work, in which, as our readers are aware, the accounts of the principal gas undertakings in England, Scotland, and Ireland are analyzed on the basis originally laid down by the late Mr. John Field, whose work has been much improved upon by his successor. As this is the fortieth year of publication, the book does not call for detailed notice. It may be mentioned, however, that the first part is devoted to the accounts of the London and Suburban Companies; the second, to those of selected English Provincial and also Scotch and Irish gas undertakings in the hands of companies and corporations; and the third, to comparisons of some of the principal items in the analyses with those of previous years—from 1904. These are followed by three appendices. The first furnishes details of the coal carbonized, oil and spirit used, and gas made; the second shows the amount of capital employed per 1000 cubic feet of gas supplied on the days of maximum delivery; and in the third will be found particulars of the number of ordinary and prepayment consumers at the close of last year. The "Analysis" is published by Messrs. Eden Fisher and Co., at the price of 15s.

INSPECTION OF FACTORIES.

ACCORDING to the report for last year of the Chief Inspector of Factories (Dr. Arthur Whitelegge, C.B.), there was an increase in the number of places under inspection; and at the close of 1908 it reached 260,000 factories and workshops, apart from warehouses, docks, wharves, quays, and other premises which, although not technically factories or workshops, come under the Factory Acts for certain purposes. Owing, however, to the general slackness of trade, there was a reduction in the volume of employment; and Dr. Whitelegge says that to this must be attributed in great part the otherwise satisfactory decline in the year's total of accidents—viz., 10,42 fatal, compared with 1179, and 121,112 non-fatal, against 123,146. The report of the Chief Inspector is followed by a summary of the sectional reports, prepared by his Deputy (Mr. H. M. Robinson), who directs attention to their various salient features. These reports occupy about 200 foolscap pages, and appended to them is a general index—a useful feature which has hitherto been absent. We notice below some of the matters of interest to "JOURNAL" readers referred to by the divisional and lady inspectors.

The Superintending Inspector for the South-Eastern Division (Mr. A. P. Vaughan), when alluding to the temperature of work-rooms, states that compliance with the provision in section 6 of the Act of 1901, requiring a reasonable temperature in factories and workshops, and with the condition that the means adopted should not interfere with the purity of the air, has improved and become more general, but not without much activity and vigilance on the part of the inspectors. He says "the objectionable and uneconomical method of warming by means of unventilated gas-jets, which contaminate the air, dies hard; and many occasions to condemn it have arisen, particularly in alien workshops in East London." The use of flueless gas and oil heating stoves has been noticeable; and the inspectors have not failed to explain to occupiers the objections to which they are open, including their possible interference with the purity of the air. He adds that certain types of flueless stoves are, however, alleged to consume the deleterious products of combustion. The extension of the manufacture and use of water gas and other similar gases for driving engines, heating furnaces, boilers, &c., and for many other industrial purposes, has drawn increased attention to the dangers of carbonic oxide poisoning. Mr. Vaughan says the inspectors have freely circulated memoranda showing the causes of past casualties, and furnishing structural and administrative precautions and "first aid" methods where gassing occurs. One case was due to an accumulation of unburnt gas; another to an escape through a testing cock being inadvertently left open; a third was owing to lack of competent first aid; a fourth was the result of repairing an engine before sufficient time had been allowed for the gas to escape; and a fifth was due to a leakage in a producer.

Mr. Augustus Lewis, the Superintending Inspector for the South-Western Division, records a case of poisoning by carbon monoxide, reported to him from Bristol. It occurred in a very remote part of the district, with electric lighting plant driven by gas-engines supplied with producer gas. A clearance or "sweeper-out" pipe had been left to end just outside the engine-room, about 8 feet from the floor, near one of the producers which the man affected had daily to keep fed with fuel. He did not get gassed in the usual way of sudden weakness and insensibility; but, if he were not consumptive (which appears doubtful), he seems to have been gradually weakened and poisoned by the periodical escapes of producer gas into the room where he worked, though the room was open to the air in parts. He is supposed to have breathed this gas daily in quite small quantities, until he died. No inquest was held.

Mr. J. A. Redgrave, reporting upon the Midland Division, says he learns from one of the inspectors that particular attention has been paid to the ventilation of engine-houses where Mond and suction-gas plants are used. He states that in one particular instance, the fumes from Mond gas were perceptibly noticeable in the rooms of the factory; and on inquiry he found the workers complained of headache very frequently. The occupier was requested to adopt better means of ventilating the engine-house, which was situate directly under one of the workrooms; and a fan was provided in the window of the engine-house. This had the effect of clearing the atmosphere of the room. But as the fan discharged the fumes into an enclosed yard, the remedy was not sufficient to clear them from the premises; and the manager agreed to provide a ventilating-shaft from the fan to a point above the eaves of the factory.

In the Wolverhampton district, there were last year several cases of small producer-gas plant houses in which no special ventilation at all was provided in the roof of the building, in spite of the fact that the whole plant had been installed by firms well acquainted with the properties of the gas, and with the danger consequent on even a small leakage of it in a close and badly ventilated house. Two fatalities from gassing recently occurred at the Birmingham Gas-Works. Both men were engaged in positions subject to escapes of gas, and were probably affected by carbonic oxide; but the actual cause of death in each instance was the injuries produced by falling. At the beginning of the year, a case was reported where a man, being "dazed" by suction gas, lay down in the open air. Later he was helped home, and in a few days developed pneumonia. The new sheet of instructions

orders the person overcome by gas to be taken into warm, fresh air. A case occurred in a chemical works, caused by sulphuretted hydrogen. The man was working in the open, and the gassing appears to have been due to want of care; but the oxygen bottle quickly restored him. The South Staffordshire Mond Gas (Power and Heating) Company's works, which are situated at Dudley Port, supply gas for power and heating to about a hundred factories in Wolverhampton, Bilston, Wednesbury, and Walsall. During the four years in which the works have been in existence, there has been no fatal accident from the gas, either in the Company's own works or in those of the people supplied. Each customer is furnished with a placard setting out clearly the danger from the gas, and containing instructions for the treatment of persons suffering from it. Mr. Crampton, the District Inspector, reports that there is every reason to believe that the Company faithfully observe all the restrictions imposed upon them.

The report by Mr. J. A. Hine, the Superintending Inspector for the North-Eastern Division, contains the following remarks on the subject of electricity:—

Electricity is being extensively used in the Stockton district as motive power; and during the past year it has been successfully applied to rolling-mills, where hitherto there has been difficulty in constructing electric motors capable of withstanding the sudden application and release of heavy loads, peculiar to such processes as rolling metals. Electrically driven machinery, newly introduced into works, is often found to be of a design dangerous to the persons employed—giving one the impression that the designer's attention was so taken up with securing the mechanical efficiency of the machinery, that the question of safety to the operator was left to be settled later as the result of stern experience. Cables carrying alternating currents at high voltages have been found loosely hung about the cabin of the operator, and even coiled about the floors; switches have been found with badly insulated handles, and fuse wires without any guard or cover. Portable electric lamps, with handles made wholly of brass, are frequently to be seen in use at various works. These defects become of greater importance owing to the increasing use of electricity in the manufacturing processes, where men totally unacquainted with the dangers of electricity have to take charge of such machinery. Two fatalities were due to electric shock. In the first case a boy stumbled and fell against an electric arc lamp which had been lowered close to the ground; in the second case, a young person was entrusted with the dangerous work of painting the fittings inside a transformer station, and he accidentally touched a live wire.

Mr. Hine's report also contains an account, furnished by Mr. Bennett, of a serious accident which occurred in the exhaust-house in a small gas-works, whereby two men lost their lives and a third was severely injured. The accident was noticed in our columns at the time. The exhauster was of an old type, with a bye-pass containing a hanging non-return flap-valve in the same casting. A blank flange had been put in place of the valve, and was being withdrawn and the valve reinserted at the time the accident occurred. To replace the valve, the covering of the bye-pass chamber had to be removed—thus allowing large volumes of unpurified gas to enter the room. The exhauster was to be driven by a gas-engine in the same room; and the ignition-tube of the engine had been lighted a little while previously, so as to be warmed-up and ready to start. As soon as an explosive mixture of gas and air had formed in the room, it was fired by the ignition-tube light, and a disastrous explosion followed. This accident, says Mr. Hine, emphasizes the necessity of having duplicate exhausters in all cases, with separate bye-passes, which can be completely isolated from the gas-circuit for necessary repairs.

Mr. R. E. Graves, the Superintending Inspector for the Northern Division, gives particulars furnished to him by Mr. W. Buchan, the District Inspector for Edinburgh, of two explosions due to accumulation of gas in bakehouse ovens, from the gas-jets being fixed within the oven to enable the baker to see inside. He says gas-brackets are now being fixed outside, and passed inside when required. Thus the oven door cannot be shut until the gas-pipe is withdrawn. Mr. Graves also learnt from Mr. A. Newlands, of Dundee, that he had noticed in some works the absence of safety lights in places where gas was likely to accumulate; and he said he had urged upon the occupiers the necessity for using portable electric lamps.

The report of the Principal Lady Inspector of Factories (Miss A. M. Anderson) contains some important remarks on the temperature and lighting of workrooms. She says the close connection between these matters in factories and workshops is again brought out by most of the inspectors, both in their routine and in their annual reports. Several of them point to the advance that has been made in means for artificial lighting, and contrast it with the slowness of the progress made in securing the full available daylight, and with the various obstacles to the satisfactory heating of workrooms. For the first time in her personal experience as an inspector, she learned early last year of a prosperous factory, with large workrooms containing many workers, in which the occupiers tried to maintain the position that a few unventilated gas and oil stoves were sufficient for the maintenance of a reasonable temperature. She says many more complaints reach her of low temperatures than of excessively high ones. Miss M. M. Paterson, one of the Lady Inspectors, who have charge of certain institution factories and workshops, makes the following remarks:—

In no respect has more advance been made than in the artificial lighting of factories and workshops. I wish this could be said with respect to the natural lighting, which is of more importance than is realized. The introduction of incandescent gaslight and of electric light has not only given the workers better light, but has done so without too greatly increasing the temperature, vitiating the air, or

leaving a sooty deposit on walls and ceilings. Of course, it is much best to have the lighting agent not also a heating agent; but in workrooms where ordinary gas-burners are used for lighting, for even an hour or two in the day, the introduction of other means of heating is very often resisted. The enforcement of the heating provisions of the Act seems to resolve itself largely—in the South particularly—into a warfare against unsuitable means of heating. The many varieties of stoves on the market seem, with their cleanliness and simplicity, so well adapted for heating small spaces, and they meet the requirements of the occupiers as well as of the insurance agents. They fail, however, to ventilate the room as a good coal-fire does; and when unprovided with flues they have a decidedly bad effect, and one hears from workers of headache and loss of appetite where these are used. As a rule, the provision of a flue is not a difficult matter; and objection to gas as a means of heating cannot be maintained if the fumes are removed. The chief danger, then, is undue economy in the number of stoves provided, for these do not, as a rule, heat a large area; and there is a tendency to put one where three are actually required. Gas is likely to be the chief means of heating, in small workrooms at least, until the cost of electricity is much less than now; and therefore it is of paramount importance that those means which tend to increase the impurity of the air should not be permitted.

Miss Anderson gives particulars of some proceedings she took against the occupiers of a factory in a northern town. It had been built fairly recently, but no means of heating had been provided. In the early morning, the gas-jets were lit; and this had the effect of partially heating the rooms. But at the same time it vitiated the air. Early in March, Miss Whitworth visited the factory, and not only noted the temperature of the rooms (which varied from 45° to 54°), but also took samples of the air, which, when analyzed, showed in one case as much as 32·8 parts of carbonic acid per 10,000. Although Miss Anderson realized that these conditions were serious, she was not prepared, when she began to collect evidence for the case, for the actual consequences entailed by work in the factory. She took into Court the death certificates of four girls who had been strong and healthy girls prior to working in the factory, and whose parents had shown no trace of consumption; yet after a few years of work these girls had died—in every case of phthisis. The standard of health was so low, that she had no hesitation in saying in her opening statement that, unless alterations were made, the factory must become, if it had not already become, a hotbed of consumption and disease. The case evoked the greatest interest in the district, and the Court was crowded. During the dinner hour, some of the workers from the factory collected outside the Town Hall, eagerly awaiting the decision. The Bench, which consisted of twelve Magistrates, listened with the greatest patience to the evidence. Among others called as witnesses were Mr. W. J. A. Butterfield, F.I.C., F.C.S., Dr. Legge, and Professor Symmers, of Queen's College, Belfast.

The case ended in a conviction, with a penalty of £1 and £5 costs. Miss Anderson says this prosecution was an important one; for it is difficult to imagine any way in which consumption could be more rapidly spread than by requiring workers to sit in rooms in which the ventilation is such that the air contains 32·8 parts of carbonic acid per 10,000.

Miss A. M. Newton offers the following observations on a case which she had under inspection:—

The rooms were generally well lighted; this being necessary in order to ensure careful work. It seems a pity, however, that one cannot forbid artificial light being used at times when daylight is available; and I found not a few rooms so constructed or situated as to render it impossible for the sunlight to reach to all parts of them. The air was then usually vitiated by gas fumes; but even where electric light is used the workers must be affected to some extent by being deprived of the health-giving properties of sunlight. The kind of artificial light used, was often undesirable, especially in tailors' factories and workshops, where, as a rule, one finds a large flickering fantail burner close to the head of each worker, which must be injurious to her sight and general health, and which renders the air of the room very impure on account of the large amount of gas consumed. Electric or incandescent gas lights have in a few cases been substituted with good results, though the workers have at first protested against the innovation, feeling that it was necessary for each to have her own burner.

The report of the Electrical Inspector of Factories (Mr. G. Scott Ram) furnished particulars of accidents which occurred in electricity generating stations and sub-stations last year. In the stations owned by companies and local authorities furnishing a supply of electricity by way of trade, as well as those in the possession of railway companies, there were 311 non-electrical and 74 electrical accidents; three of the former and two of the latter being fatal. The accidents in private stations numbered 51, of which 35 were non-electrical and 16 electrical; but in no case did death result. The largest number of electrical accidents (35) occurred during the cleaning, repairing, &c., of "live" switchboards or other conductors. There were 222 non-fatal and 12 fatal electrical accidents in factories, engineering works, &c., last year. Of the former total, 42 occurred in connection with portable apparatus, connectors, and flexible wires, and 26 with unprotected conductors, switches, terminals, fuses, &c. There were 32 persons (22 of them skilled) injured while working on live conductors; and 55 in testing operations and in other ways.

Daylight Saving Bill.—Giving evidence last week before the Daylight Saving Bill Committee, Mr. W. Willett, the promoter of the scheme, stated that, headed by the City Corporation, 112 popularly elected bodies, representing over 15 million people, had passed resolutions in its favour.

THE RECENT EXTENSIONS AT THE COLOGNE GAS-WORKS.

REFERENCE has been made in the "JOURNAL" in the past two years (Vol. XCVIII., p. 1002, and Vol. CII., p. 562) to the extensions which have recently been carried out at the Cologne Gas-Works, and in particular to the large installation of vertical retorts there. Herr Prenger, the Engineer of the Cologne gas undertaking, has published, in a recent issue of the "Journal für Gasbeleuchtung," some further particulars of the new buildings and plant at the works; and we propose to give in the sequel an abstract translation of this article, together with a few illustrations kindly furnished by Herr Prenger, some of which did not appear in the pages of our German contemporary.

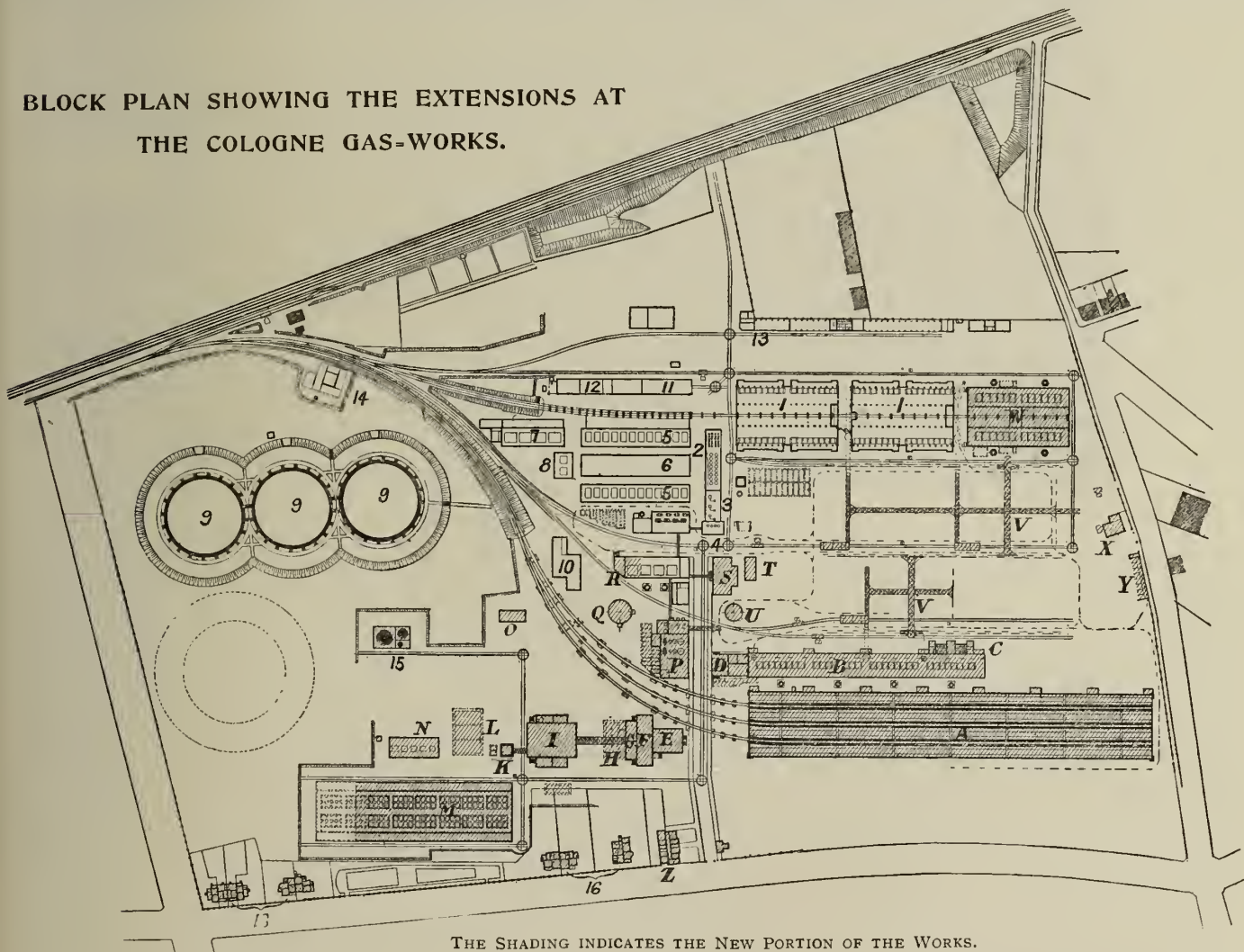
The Cologne Gas-Works were erected in the years 1875-6, according to plans drawn up by Herr A. Hegener, who then acted as Manager of the gas and water undertaking of the Municipality. The works are situated in the suburb of Ehrenfeld, and are bounded on three sides by public roadways and on the fourth side by the railway running from Cologne to Aix-la-Chapelle. The site has an area of 27 hectares (about 66½ acres)—sufficient for the erection of plant of a productive capacity of about 17½ million cubic feet per diem. The plant installed in the first instance on the site had, however, only about a quarter of this capacity. The ground level was such that railway communication by an easily-graded incline could be secured, with the viaducts running to the coal-stores. The rails of the viaduct are 14 ft. 9 in. above the level of the retort-house stage. The coals can thus be shot direct from the trucks on to the coal-stores at the back of the charging stages. Each coal-store, when filled to a height of about 10 feet, accommodates 2500 tons of coal. This storage was adequate so long as the coals were delivered in quantities approximately corresponding to the consumption at the time. When, however, the coal deliveries were uniformly distributed over the whole year, the storage space was no longer adequate, and stacking in the open was resorted to. It was found that not only was

considerable expense incurred in wages for picking up the coal stored, but also that great depreciation of the coal ensued.

The coal was charged into the retorts by means of scoops manipulated by hand. The coke was also drawn by hand and conveyed by waggons to the coke-yard, which was at the same level as the retort-house stage. The coke was carried up an incline from the yard to waggons on the railway. Mechanical elevators and conveyors were thus dispensed with. There were three retort-houses, each of which originally contained four benches, each comprising ten settings of seven retorts; so that there were in all 120 settings. The retorts had a cross section of about 15 in. by 21 in., and were charged five times in twenty-four hours. The charge amounted to about 3 cwt. of coal. Each setting therefore produced some 53,000 cubic feet of gas per diem; so that the maximum output of each retort-house was 2,120,000 cubic feet. In course of time, however, nine benches were converted, so that each contained eight beds of nine retorts of larger cross section, and accommodating charges of nearly 4 cwt. The productive capacity of each retort-house was thus increased to 2,825,000 cubic feet per diem, except that three benches of the old beds of seven retorts remained in one of the houses.

With the increase in productive capacity, the difficulties of manual stoking became intensified, and trials were constantly being made with charging machinery; but the results were not sufficiently promising to justify its introduction. The dimensions of the existing retort-houses were unfavourable to mechanical stoking. Neither was it possible to instal inclined retorts without a complete reconstruction of the houses. On the other hand, the frequent cases of injury to the muscles of the back due to the lifting of the heavy scoops, and the general demand for improvement in working conditions, led to the decision to erect entirely fresh plant as soon as an increase of consumption called for extensions, and subsequently to rebuild the old retort-houses. The extensions were started in 1902. The make of gas has continuously increased from 1,033,780,000 cubic feet in the working

BLOCK PLAN SHOWING THE EXTENSIONS AT THE COLOGNE GAS-WORKS.



THE SHADING INDICATES THE NEW PORTION OF THE WORKS.

- | | | | | |
|---------------------------|-----------------------------|-----------------------------|----------------------------|---------------------------|
| A. Coal-Store. | I. Washers. | R. Boiler-House. | 1. Old Retort-Houses. | 9. Gasholders. |
| B. Inclined-Retort House. | K. Reservoir Tower. | S. Electric Power Station. | 2. Condensers and Washers. | 10. Governor-House. |
| C. Bath-Rooms. | L. Liquor Wells. | T. Condensing Tower. | 3. Exhausters. | 11. Locomotive-Sheds. |
| D. Experimental Works. | M. Purifiers. | U. Experimental Gasholder. | 4. Tar-Extractors. | 12. Workshops. |
| E. Condensers. | N. Meter-House. | V. Coke Distributing Plant. | 5. Purifiers. | 13. Laboratory. |
| F. Exhausters. | O. Carburetting Plant. | W. Vertical-Retort House. | 6. Revivifying Space. | 14. Fire-Clay Mill. |
| G. Tar-Extractors. | P. Water-Gas Plant. | X. Coke Screening Plant. | 7. Check Purifiers. | 15. Oil and Benzol Tanks. |
| H. Tar-Tank. | Q. Water-Gas Relief Holder. | Y. Coke Retailing Dépôt. | 8. Meter-House. | 16. Officials' Houses. |
| | | Z. Offices. | | |

year 1898-9 to 1,650,400,000 cubic feet in the year 1907-8. These figures represent a make of 3092 cubic feet per head of the population of Cologne in 1898-9, rising to 3566 cubic feet per head in 1907-8.

The extensions contemplated in 1902 comprised: (1) The erection of water-gas plant of a productive capacity of 3,390,000 cubic feet per diem; (2) the construction of coal-gas plant to make 6,360,000 cubic feet per diem; and (3) reconstruction of the old works for a make of 6,360,000 cubic feet per diem. The capacity of the works would thus be raised to a maximum of about 16,104,000 cubic feet per diem, or to an output of about 3200 million cubic feet per annum. When this extension has been completed, further increase in the consumption of gas will best be met by erecting a second gas-works in another part of the town, as the mains to the town and the railway connections at the present works will then be working up to their full capacity. It is intended that this second works shall have water as well as railway communication.

The extensions first put in hand comprised the erection of water-gas plant of a productive capacity of 1,695,000 cubic feet; two sections of coal-gas plant, of 4,240,000 cubic feet total capacity; and the equipment of one of the old retort-houses with 24 beds of vertical retorts. The last-named plant has been described in detail, with illustrations, in the "JOURNAL" for June 25, 1907, p. 1000; and the results obtained on working were given in the issue for June 2, 1908, p. 562. On reference to the plan of the works given to-day, it will be seen that the new retort-house, marked B, has been erected parallel to the old retort-houses; the

large intervening space having been set aside for the storage and sorting of coke from both plants. Regard had to be paid to the regulations of the Prussian State Railways as to the disposition and working of sidings communicating with the State Railway lines, and also to the regulations which require that a circular space 394 feet in diameter round about the storage tanks for oil and benzol must be left free from any building. The oil and benzol for the use of the carburetted water-gas plant had therefore to be stored in tanks in the isolated position shown at 15 on the plan. The position of the boiler-house at R rendered it expedient to group round it the buildings requiring steam—such as those containing the water-gas plant, and the exhausters and the electric power station—so as to reduce as far as possible the length of the steam-mains. The water-gas plant, indicated by P in the plan, moreover, had to be near the coke yard, with a view to reducing the distance over which the coke would have to be conveyed to it. The opposite end of the coke yard was devoted to the breaking and sorting plant, and to the dépôt for sale by retail. The foregoing indicates the main considerations on which the arrangement of the various buildings on the works was settled. The position of the works on the outskirts of Cologne rendered it desirable to provide dwellings on the spot for the officials. The necessary houses, indicated by 16 on the plan, were erected on one side of the works near the offices Z.

The constant increase in wages and in the price of coal, and the more difficult relations with the workmen, made it advisable in the designs of the new gas-works to provide, as far as possible, for replacing manual labour by machinery, and even where



Interior of the Coal-Store, on the Level of the Viaducts.

machinery could not actually be employed, to lighten as much as practicable the character of the manual labour. It was also necessary to be prepared for fluctuations in the delivery of coal by providing storage space for a very large quantity, and to protect the coal thus stored from risk of fire and of depreciation by exposure to the weather. This entailed the erection of a large coal-store A. It is true that opinions differ as to the value of a covered coal-store; but regard must be had primarily to the description of coal which is dealt with. At Cologne, practically Westphalian coal only is used; and experience has shown that for such coal a covered store is essential and economical. The apparatus generally selected for the works was chosen so as to deal with an increase over the present nominal output of the retort-houses of about 20 per cent. The situation of the various buildings was also decided to some extent with regard to the existing main, of 48 inches diameter (leading to the town), which intersects the works.

THE WATER-GAS PLANT.

The water-gas plant P is intended primarily as an auxiliary for use in winter, to take up the large fluctuations in consumption. As, however, only a limited proportion of water gas can be reasonably added to the coal gas, the size of the plant has for the time being been restricted to a make of 1,695,000 cubic feet per diem. It is intended ultimately to double it, so that when the coal-gas extensions are completed it will be possible to add 25 per cent. of water gas to the coal gas. In order not to be restricted to one mode of carburetting, the plant has been arranged to use either

oil or benzol. Advantage can thus be taken of fluctuations in the market prices of the two carburetting agents. The water-gas plant was erected by the Cologne Engineering Company, and started work in January, 1905. It proved of great service during the strike of coal miners in the Ruhr district, and while there were some difficulties with the workmen on the gas-works. There are two sets of plant, each capable of making 847,500 cubic feet a day. Adjoining the generator room is the machinery room, in which there are two fans driven by electric power. Above the machinery room, and on the level of the working stage, is storage space for coke, which is conveyed thereto by an automatic overhead line worked by electric power.

The relief holder Q is of 35,000 cubic feet capacity, and may ultimately be extended to double this size. The condensers are placed in an adjoining room. Four purifiers of 1405 square feet area each are provided for the water gas in the same house (M in the plan) as the purifiers for the coal gas. They are placed on an upper floor in order that the ground floor may be available for the revivification of the oxide. The lids are dry-sealed. The changes are made by means of hydraulic valves, which are all operated from one point. The revived oxide is raised to the upper floor by means of an elevator. After leaving the station meter the water gas passes into the carburetting house O, in which there are four small benzol tanks, which feed four evaporators heated by means of steam. The benzol vapour thus produced is passed into a large main, in which it is mixed with both the water gas and the coal gas.

The tanks for oil and benzol (No. 15 on the plan) are placed



Upper Part of the Retort-House, with the Coal-Conveying Plant.



Another View of the Upper Part of the Retort-House.

in pits sufficiently large to receive the whole of their contents. Benzol tanks of a capacity of over 10 tons have further, by the regulations of the local authorities, to be surrounded with masonry to a height of 8 feet, and with provision all round for quenching fire. Three tanks have been provided—one for oil, one for benzol, and one for tar oil, which is to be used for the extraction of naphthalene from the coal gas. The tanks are of sufficient capacity to provide for three to four weeks' full working of the water-gas plant. The store has a fire-proof roof; and artificial lighting is dispensed with. A 4-inch steam-pipe is laid direct from the boiler-house to the oil-store, to be used for quenching purposes in case of an outbreak of fire.

The transport of the coal on the works is carried out entirely on viaducts. The coke and constructional materials, however, are conveyed about the works on lines laid at the ground level; and where it has not been practicable to have curves of sufficiently great radius, turn-tables have been introduced. The waggons are shifted and the turn-tables actuated by means of electrically driven capstans. The smallest curve on the line has a radius of 590 feet, and admits of the passage over it of the largest goods waggons which ever come on to the works. The large-capacity

coal-waggons in use on the railways have all been constructed to take curves of this radius. The viaducts are constructed of longitudinal girders supported on iron and masonry columns, so that a clear view of the works' yards is obtainable from them.

THE COAL-GAS PLANT.

The new coal-gas plant, as already stated, is to be a daily make of 6,360,000 cubic feet. It will comprise three independent sections, which, however, will be so disposed that the gas can be transferred from one section to another between any two sets of apparatus, so as to avoid interruption of the work should it prove necessary to shut out a particular piece of apparatus. Only two of the three sections in question have so far been constructed. The coal-store shown at A in the plan has a length of 892 feet and a width of 148 feet, and accommodates about 35,000 tons. The substructure is of massive masonry, divided into 24 large and 8 small holds; so that any outbreak of fire should be confined to one of these holds. The coal is conveyed into the store by three railway viaducts, and is discharged by hand into the holds. The bottoms of the holds are sloping, so that the coal naturally remains at a uniform level without spreading by hand. This

uniform levelling of the coal does not appear to have been secured by any of the pre-existing methods of constructing coal-stores. It is extremely useful when coal arrives in a very wet condition, as the coal can then be readily stored in thin layers until dry. The holds are emptied from above by means of three grabs, which are carried on travelling platforms so that they can traverse the whole of the store. The coal raised by the grabs is either transferred to an iron band conveyor, which runs along the north wall of the store, or to an electric line on the south side of the store, which transfers it to transverse band conveyors which take it directly to the breakers erected in front of the coal-store. The longitudinal conveying band on the other side of the store also deposits its coal in these breakers. The grabs can also load a train of eight Talbot waggons, which run along a viaduct to the old retort-houses; so that the new coal-store serves for the old part of the works also. The superstructure of the coal-store consists of iron lattice work. The roof is of corrugated iron, with a continuous louver for ventilation. A view is given of the interior of the coal-store, on the level of the viaducts, in which will be seen the travelling grabs and, at the side of the house, the longitudinal conveyor.

The new retort-house B is parallel to the coal-store. It is intended to contain seven benches, each comprising eight settings of nine inclined retorts; but so far only four of these benches have been erected. Between every pair of benches provision is made for the preparation of the coal by means of an annex to the coal-store which is equipped with a coal-breaker and an elevator, by means of which the broken coal is raised to the retort-house. It passes over an automatically registering weighing-machine to either a rake conveyor or an iron band conveyor for distribution thereby into the coal-bunkers, which traverse the whole length of the house above the settings. Each elevator may serve two benches of settings. The whole conveying plant has a capacity of 40 tons of coal per hour. The coal distributing plant in the retort-house is entirely cut off from the retort-settings proper, so that the dust resulting from the distribution of the coal is kept out of the house. The conveying plant is in a special superstructure separately ventilated. Two views of the upper part of the retort-house with the conveying plant are given. The coal is discharged from the bunkers through shoots closed with lids, direct into Drory waggons in front of each retort, and is charged thereby into the inclined retorts, which are 5 metres (16'4 feet) in length and have a cross section of about 24 by 16 inches.

The coke is discharged into a trough conveyor running longitudinally through the house, and is taken by it either to the screening and breaking plant or to the coke yard. From the screens the coke is tipped into large reinforced concrete chambers, from which it can be loaded direct into railway waggons, which

pass underneath the chambers. The coke in the yard is picked up by means of grabs or skips on a bridge crane, which can travel the whole length of the coke yard. The coke yard is 574 feet long and 394 feet wide; and the coke can be piled in it to a height of 26 feet. The coke conveying plant V, which was installed by the firm of Pohlig, of Cologne, is arranged so that the coke is not dropped from any appreciable height, and thus is not broken up seriously. At one end of the coke yard a new building Y has been erected for the sale of coke. For conveying the coke about the works, a narrow-gauge railway is provided. Attached to the new retort-house are bath-rooms C, having in the basement sixteen shower baths and two ordinary baths for the yard men; and on the first floor there are sixteen shower baths and five ordinary baths for the stokers.

At the western end of the retort-house an experimental gas-works has been erected. It is equipped with all the apparatus of a small gas-works for a make of 140,000 cubic feet per diem. It is not provided with a special setting of retorts; but any one of the eight settings in the first bench in the inclined-retort house, or two of the settings of vertical retorts, can be coupled up with it, as the settings in question have been provided with double gas and tar delivery pipes. The new works' condensers E, exhausters F, and tar-separators G, are all under one roof, but in separate rooms. The whole apparatus is arranged in two distinct sections. Each section has four atmospheric condensers, of circular cross section. In the exhauster-room there are three coal-gas exhausters, each capable of pumping 2,120,000 cubic feet, and one



The Tar Separator Room.

exhauster for the water gas, of 1,765,000 cubic feet per diem capacity. The exhauster room is large enough to take seven such exhausters.

The tar-extractor room contains two Pelouze and Audouin extractors for coal gas and one for water gas. In front of the room there is the tar well H. The gas passes by mains carried overhead to the washers I. Up to the present, naphthalene and cyanogen washers have not been installed; but space is provided for their introduction later. From the washers the gas enters the secondary condensers consisting of four wrought-iron tubular condensers for each section. It then passes into rotary washer-scrubbers of the brush type. Attached to the scrubber-house is pumping-plant for the supply of water to the works. It consists of three high-pressure centrifugal pumps which take water direct from three artesian wells and pump it into the high-level reservoir in the water-tower. There is also a room for the tar, liquor, and dirty-water pumps; another room for storing sulphate of iron; and another for other materials used in, and products of, cyanogen recovery.

The purifying-house M, already referred to, contains four vessels for each section of the works, as well as for the purification of the water gas. A new meter-house N has been erected, in which are installed one station meter for water gas, the drum of which has a capacity of 700 cubic feet, and two meters for coal gas, each with drums of 1050 cubic feet capacity. The floors of all the apparatus houses are placed 5 feet above the ground level,

so that beneath them are cellars lighted by daylight, in which the pipes and connections are readily accessible. Between the scrubber-house and the meter-house, the water-tower K and the liquor tanks L are placed. The tower is seven storeys high, and contains at the top the works' water reservoir, under that a drinking water reservoir, below which are a liquor-tank and tanks for separated tar and crude tar. In the basement are two centrifugal tar-separators driven by electric power. A view is given of this tar-separator room. The whole of the apparatus rooms are lighted by electric incandescent lamps. The switches and fuses are, however, placed outside at the entrance to each building. The globes are mounted gas-tight, and are surrounded by a glass protecting globe.

The old boiler-house R has been enlarged, and four new tubular boilers, each having 2150 square feet of heating surface, with superheaters and Perret grates for the combustion of coke breeze under blast, have been installed. Bunkers for the breeze are placed over the boilers, with the necessary conveyors. The electricity generating house S contains three steam-turbines, of 180, 350, and 500 kilowatts respectively, with surface and reflux condensers. The turbines have been installed in different sizes so as to meet the varying load of summer and winter working. The whole of the machinery of the new plant is driven by electric power; the current being alternating at 220 volts pressure. Although the City of Cologne owns its own electricity works, which are under the same management as are the gas-works, it

appeared desirable that the gas-works should have its own boiler and generating plant, especially as coke breeze could be used directly under the boilers on the gas-works, and current could be generated as cheaply as at the large electricity works. The electricity supply of Cologne, moreover, is single-phase current, which was not so well adapted for the special power requirements of the gas-works, such as the coal and coke breakers and elevators.

The extension of the gas-works also involved the erection of new offices, which were placed in a more central and convenient position than the old building. The old and the new works' plant is connected by means of a main of 24 inches diameter; so that it is possible to pass the gas from the new settings into the old condensers and other apparatus, and the gas from the old settings into the new apparatus. This arrangement should prove invaluable in case of any breakdown of the plant, and also to enable apparatus to be put out of work entirely in the summer for thorough examination and cleaning.

Coal was first shot in the new coal-store on June 23, 1906. In the following September, the four new tubular boilers were brought into use, as well as the electricity generating plant. Before the end of the year, the electrically-driven plant previously employed was disconnected from the town supply and connected up with the new works' supply. Work was started in the new inclined retort-house on Nov. 28, 1906, with four settings; and by the end of that year sixteen settings were in action, and about the same time the first sets of the new apparatus and machinery were brought into use. The vertical-retort house, as already recorded in the "JOURNAL," started work in June, 1907. For the completion of the scheme of extension of the works, it has proved necessary to lay down a second high-pressure main from the works to the town, of 48 inches diameter, with, of course, a second governor. The working of the new plant has proceeded in a perfectly satisfactory manner, and any small initial troubles which were experienced were soon overcome.

EDUCATION & RESEARCH IN APPLIED CHEMISTRY

THIS was the subject of the address delivered by Professor R. Meldola, when, in the capacity of President of the Society of Chemical Industry, he opened the proceedings at the annual general meeting, held at the University of London last Wednesday. He pointed out that the lack of active interest by manufacturers in the educational side of applied chemistry, had been detrimental to their own cause. If left alone by the manufacturers, teachers were apt to become too purely "bookish;" and, on the other hand, if the manufacturers cut themselves adrift from the academic side of chemistry, they were likely to become too narrowly practical. The manufacturers could not afford to leave out of account the scientific chemist any more than the teachers could afford to ignore the technologist. The research chemist ought to be producible from Universities and Technical Colleges. With respect to the chemical technologist, the question was whether he could be produced under any of the existing educational curricula, or whether the factory was the only proper training-ground. He was a chemist *plus* a great deal more.

The factory was not the proper place for beginning technological training. During the supplementary period following the preparatory training in the technical school, there should be opportunity for research work. The supplementary advanced or technological training should do for industrial chemistry what the post-graduate training did for academic chemistry—it should enable the different orders of faculty to be sorted out. A few students would be found capable of development as research chemists; and a larger number as chemical technologists. The omission of research from their educational curricula meant a loss to their industry of a class of chemical technologist of whom they were in need—the man who had been trained in scientific habit of thought by the most effective of all known methods. If the preparatory training took three years, it was not too much to ask for an additional two years for the advanced course.

There was practically no technical school in the country which provided a complete and co-ordinated course of training such as he had advocated. For the chemical industries, the technical education movement had been arrested just at a stage where the true technical training should begin. The technical institutions were not wholly nor for the greater part to blame. The manufacturers had not sufficiently encouraged them. The Universities were now developing schools of applied science. The point was whether they ought not to create departments of applied chemistry. If the ordinary graduate courses were not suitable for the chemical technologist, they could be adapted without very much difficulty. But if the higher work was to be taken over by the Universities, the *raison d'être* of the technical school for chemical industry would become a thing of the past. It would be deplorable and wasteful if the University and the Technical Institution in the same town became rivals instead of colleagues. The rational solution was that the Technical Institution should become a school of the University, as was the case at Manchester. Such a solution carried with it the implication that the Technical Institution would raise its technological teaching to the University standard. This was precisely what was wanted. In framing any educational policy of practical value for their subject, the Society of Chemical Industry could play an important part.

SEVENTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The Seventh International Congress of Applied Chemistry, to which the King and the Prince of Wales have given their patronage, was formally opened by His Royal Highness, who was accompanied by the Princess of Wales, in the Albert Hall last Thursday. This is the first congress to be held in London; the previous gatherings having taken place in Brussels, Paris, Vienna, Berlin, and Rome. Sir Henry Roscoe, F.R.S., and Sir William Ramsay, F.R.S., are respectively Honorary President and Acting-President. The work of the congress covers a wide field, as shown by the large number of sections—eleven in all—into which it is divided. The sectional meetings commenced last Friday at the University of London, the Imperial Institute, and the Royal College of Science, and were continued till yesterday. The official closing of the congress will take place to-morrow morning. Upwards of a hundred papers in various languages were entered for the consideration of the delegates; but only a few of them are of special interest to our readers. We notice two to-day, and others may be dealt with in future issues.

Herr A. VICTOR KOCHS, of Sheffield, submitted the following paper:—

THE KOPPERS COKE-OVEN AND BYE-PRODUCT PLANT.

Herr Heinrich Koppers, the inventor of these ovens, perceived all ovens laboured under the disadvantage that the walls could not be uniformly heated by the methods formerly in use. Hence arose the special feature of the original Koppers oven—a separate distribution of the gas and air for combustion on each side and along the whole length of the ovens, thus causing combustion to take place from a separate jet in each separate flue. The flues of the Koppers oven are vertical; and there being about thirty flues in each wall of the ovens, each oven is heated at about sixty different points, as against from six to twelve points in all other constructions of the time. The internal distribution of the gas and air among the heating flues rendered it absolutely essential that each jet should be accessible for regulation, so as to enable each jet to be adjusted in order to attain uniform heating; and the subsequent development was directed to the provision of means for controlling the regulation. The first improvement in this direction was to provide an opening over each single flue at the top of the oven, which was furnished with metal or fire-brick plugs. The removal of the plugs was effected in a few moments; and it was possible to ascertain and remedy any irregularity in the heating without the slightest difficulty, and almost as soon as the defect became noticeable.

The next improvement Herr Koppers introduced for regulating the combustion was the provision of a regulating sliding brick over the top of each vertical flue, and at a point where the gases of combustion pass out of the vertical flue into the top horizontal flue leading to the downtake to the chimney flues. This improvement has been found of the greatest advantage, inasmuch as it enables both the air and gas supply to be regulated to a nicety, which is not possible of attainment to anything like the same degree by any other system.

All regenerator ovens which were formerly built, and all others at the present time, with the exception of Koppers', are arranged with a single set of regenerators to serve the whole battery of ovens. Herr Koppers' next step was to provide separate regenerator chambers for each oven, thus rendering each oven entirely independent of the other. Of necessity, the heating of regenerators is of an alternating character, as the heating takes place in one period of time (usually 30 minutes) in one-half of the oven walls, while in the next period the heating takes place in the other part of the oven walls. When only one set of regenerators is employed, the primary regulation of the air, as well as the draught on each oven, is effected by a single slide, which thus has to serve a dual purpose. It therefore follows that it is not possible to efficiently regulate the whole of the ovens in a battery, as while each oven would require practically the same quantity of air, there would be a variation in the draught of the oven according to whether the ovens are situated more remote from, or nearer to, the chimney, in which latter case, of course, the pull of the chimney would be the greater. The new system of regenerators enables both the quantity of air and the draught to be regulated with exactitude for each single oven, which is an advantage of great importance.

Until recently, the system of bye-product plant employed in connection with the Koppers coke-ovens was of the ordinary description, and such as is universally employed at all gas-works. About eighteen months ago, Herr Koppers conceived the idea of recovering the ammonia direct from the gas in the form of sulphate of ammonia, without the employment of a water scrubbing process. A system having the same object in view, and known as the Brunk principle, was brought out a number of years ago. In this system, the foul gases coming from the ovens were conducted directly into a sulphuric acid bath. But the system proved unworkable owing to the salt being contaminated with tar

and organic matter, and owing to the tar being detrimentally affected by passing through the acid. To overcome the difficulty which was experienced in this system, Herr Koppers cooled the gases down to the ordinary temperature for condensing the ammoniacal liquor and tar, and then conducted them into an acid bath after passing them through a superheater. The superheating enables the gas to be passed into the acid bath without condensation taking place, and even to evaporate the water released in the formation of the sulphate. This system has worked with the very greatest success; and though it is only within the last twelve months that the process has been put on the market, there are now five large plants in operation and six under construction—plants which together will deal with the gases from 900 ovens.

The advantages of the new system are numerous, and of a most important character. The main features are the simplicity in the design of the plant, the reduction in the amount of water necessary, the reduction in the quantity of effluent by one-half, the reduction in the consumption of steam, increased yield of ammonia, and less wear and tear on the plant.

Professor E. J. CONSTAM, Head of the Federal Fuel-Testing Laboratory at Zürich, submitted a paper, of which the following is an abstract, on the

DETERMINATION OF THE AMOUNT OF VOLATILE MATTER IN SOLID FUELS.

The amount of the volatile matter in, or the gaseous content of, coals, by which the different varieties of coal are distinguished in regard to their technical applicability, is calculated from the amount of coke yielded by, and the ash and moisture contained in, average samples of the fuels in question.

Different methods of determining the yield of coke are used in different countries; and from one and the same sample different values are thus obtained for the proportion of volatile matter. Consequently, in districts in particular where coal from different places of origin is used, the need of a uniform method of determining the yield of coke is imperatively felt. The author and his collaborateurs have therefore investigated the methods of Rougeot, Schläpfer, Streit, and Kolbe, the crucible methods of Hinrichs, Muck, Mahler, Goutal, and Finkener, and the Belgian, American, and Bochum methods of determining the quantity, chemical composition, and calorific power of the coke produced.

The yields of coke found by these methods, and the chemical and calorific properties of the coke formed in the crucible, were compared with the coke formed from the same fuels by distillation at 830° C. in a small gas-retort. The composition and the calorific power of the combustible substance in these retort cokes proved to be very similar to those of the cokes produced on gas-works and in ovens, after the ash and moisture were deducted from the coke. These relations are indicated by tables and curves which have been drawn up. Pyrometric determinations showed that different temperatures prevailed in the different coking methods in which the crucible was used. Further, it was established that no portion of the coke was burnt in coking by either the Bochum or the American method. When, however, the younger fossil substances, such as lignite and peat, and wood, are coked, the samples ought to have been previously air-dried, pressed into tablets, and then carbonized and cooled to the temperature of the room in a current of hydrogen, carbonic acid, or nitrogen.

The experimental results obtained lead to the conclusion that the differences in the yield of coke by the various methods are primarily due to more or less thorough carbonization of the fuels. The chemical composition of the coke produced in a crucible from coals is not affected by the composition of the original coal, but depends only on the temperature and the duration of the heating. The crucible coke produced according to Finkener's method at 700° C. resembles coal more closely than the cokes obtained at 900° to 910° C. according to the Bochum or the American method. The latter approach nearest in composition and calorific power to the cokes formed on the large scale in gas-works and in coke-ovens. The slower rise of, and the lower final temperature in, dull platinum crucibles cause the yield of coke to be greater in them than in polished crucibles.

Notwithstanding the contentions of Hinrichsen and Taczak, and of Geipert, to the contrary, the author is of opinion that it is not possible to find a crucible coking method which will afford the same yield of coke as different working methods, which, indeed, differ between themselves. On the other hand, the author would prescribe as a standard method one which gives a coke most closely resembling in composition and calorific power the gas and oven coke. Such a method is the American one, which is convenient to carry out, is applicable to all solid fuels (including those which carbonize without luminous flames), and affords very closely concordant results in parallel tests. As this method is already in general use in those countries—viz., the United States of America and Great Britain—which produce the most coal, it appears to the author that its general adoption is desirable in all conclusive analyses of fuels.

The results of the examination are only comparable for different coals if they are referred to the coal or coke free from moisture and ash. The author therefore proposes in general to take for the volatile matter in a fuel—referred to the dry and ash-free substance—the figure obtained by subtracting from 100 the yield

of coke as determined by coking 1 gramme of the fuel in a polished platinum crucible according to the prescription of the American Committee on Coal Analysis. This prescription is as follows: "One gramme of the fresh, undried powdered coal is heated for 7 minutes over the full flame of a bunsen burner in a platinum crucible weighing 20 to 30 grammes, and provided with a tightly fitting cover. The bottom of the crucible, which is supported on a platinum triangle, should be from 6 to 8 cm. above the top of the burner. The flame when burning free should be 20 cm. high; and care should be taken to protect it from draughts during the determination. The under surface of the cover should remain coated with carbon; but the upper surface should always keep free from it."

Analyses for arbitration purposes made in different places by this method on the same sample show differences for the most part of less than 1 per cent. in the yield of coke, and only rarely of as much as 2 per cent.

UPWARD FILTRATION OF WATER.

In September, 1907, an experimental filter of the upward type, which had previously been tested with Mississippi River water near St. Louis, was installed at the Jerome Park reservoir, New York. It was operated continuously under the direction of Mr. John C. Sparks until quite recently, when Dr. Walter Bensel, the Sanitary Superintendent of the Department of Health of the city, began a six weeks' test of the plant. The Department of Water Supply, Gas, and Electricity has also had an opportunity of examining the operation of the system. This filter uses Croton River water, which tests conducted by this department have shown to be exceptionally easy to purify. Another experimental plant has been constructed at Niagara Falls, using the water of the Niagara River, which is not so easily filtered as the Croton supply. Examinations of the operations of this filter have been made by Dr. Lederle, of the State Water Supply Commission, and also by Mr. Sparks; and the following account of them has been given in "Engineering Record."

The filter at the Jerome Park reservoir is a reinforced concrete structure about 21 ft. by 27 ft. 6 in. in plan and 10 feet high. It consists of an outer box or container and an inner chamber about 15 ft. by 20 ft. 6 in., which holds the filter. The inner chamber has walls of concrete 4 inches thick, reinforced with 3 in. by 12 in. wire mesh, having $\frac{3}{8}$ -inch wire. The filtering material is supported by a row of thin boards. The chamber is supported by four 12 in. by 8 in. concrete beams, reinforced with 1-inch rods. The beams rest upon piers 12 inches high, so that between the lower edges of the box and the floor of the container there is a clear space of 24 inches on the ends and 12 inches on the sides.

The method of operating the filter consists essentially in flooding the space between the outer and inner compartments with raw water. This flows downward, underneath the bottom edges of the inner box and up through the filtering material. The filtered water collects on top of the sand in the inner chamber, and is carried off through piping. The difference in elevation between the top surfaces of the raw and filtered water is stated to be generally about 8 or 10 inches. One of the strongest claims made for this system of operation is that the head required for operation is small in comparison with that considered necessary for the satisfactory operation of sand and mechanical filters.

The inner chamber, near its bottom, is fitted with a screen of thin boards, laid at an angle of 45° to the horizontal. These not only support the filtering material, but also intercept any coarse suspended substances in the raw water. Above the boards is a layer of galvanized wire netting, No. 8 mesh, over which is spread a 7-inch layer of screened charcoal. This is covered with copper wire netting, No. 30 mesh, and a layer of sand 20 inches deep.

The raw water is taken direct from the reservoir and admitted to the filter through a pipe provided with a ball-cock regulator. The channel between the inner and outer chamber is stated to have some efficiency as a settling-basin, and a blow-off is provided in the bottom of the tank for the removal of the sediment. At the top there is an overflow-pipe connecting with the sewer.

The filter is operated at the rate of about 15 million gallons per acre daily—being 50 per cent. higher than the rate adopted by Mr. de Varona in the preparation of his plans for the filters at the Jerome Park reservoir—and is cleaned at periods varying between two weeks and several months, depending upon the condition of the water. The average bacterial removal by the filter since it was brought into operation is said to have been 99.2 per cent., and that of the Niagara Falls filter 99.6 per cent. To clean the bed, the inlet-valve is closed and the blow-off opened; thereby emptying the outer tank very quickly. The filtered water on top of the sand flows back through the bed, washing the clogging material into the blow-off pipe. An advantage claimed for the filter is that it is always cleansed with filtered water. The process occupies very little time, and can be repeated as often as necessary until the discharge-pipe gives a clear effluent.

Creosoted piles driven on the Louisville and Nashville Railway in sea water in 1882 are still in service, though it has been necessary to protect a considerable number of them by casings of cement or vitrified pipe, on account of the damage done by the teredo.

VERTICAL FURNACES,

AND THE EXPERIENCE WITH THEM TO PRESENT DATE.

By E. KÖRTING, of Berlin.

THE introduction of the vertical furnaces into gas-works practice, and the demands made upon the staff for their supervision, have vividly reminded the author of the days in the seventies and eighties when generator furnaces were first introduced and tried. The generator furnace represented nothing less than the transformation of the old mechanical rule-of-thumb into scientific retort-house practice. Whereas, in the good old days, there was nothing to do beyond seeing that the stokers carried out the manipulation which time had shown to be the best, the management of generators, on the other hand, demanded of engineers and chemists careful observation of the following points:—

- 1.—The regulation of the primary air.
- 2.—The regulation of the secondary air.
- 3.—The observation and regulation of the draught.
- 4.—The observation of the influence of points 1, 2, and 3 upon the other.
- 5.—Control of the combustion and production of gas in the generator.
 - (a) Height of the fuel.
 - (b) Timely clinkering.
 - (c) Influencing the formation of clinker and gases by appropriate steaming.
- 6.—Correct mixing of generator gas and secondary air in the furnace.
 - (a) Equal subdivision of the heat.
 - (b) Avoidance of too sudden combustion (blow flame).
 - (c) Provision of heat-resisting fire-clay material for the hottest parts.
- 7.—Observation of the composition of the furnace gases, with reference to:
 - (a) Setting the dampers.
 - (b) Gas-tightness of the regeneration.
- 8.—Construction of the generator and the regeneration in such a manner that imperviousness and durability are insured and mutually detrimental influences avoided.

The above recapitulation shows that the problem to be solved was a many-sided and complicated one. It is not to be wondered at that years of trial were necessary, and that a great number of failures, faulty constructions, overheated and melted retorts, pervious and useless regeneration, &c., were registered before good and generally satisfactory solutions could be found, and that the generator furnaces made great calls on the perseverance and intelligence of the works' engineers, furnace builders, and retort-house foremen, especially as the mistakes and imperfections in the furnaces are as a rule not noticeable at first, but only in the course of months or even years.

The Dessau vertical furnaces, like the generators, have set fresh tasks on the staff of the gas-works. If, however, the question is carefully considered, it will be seen that the extra work and the greater responsibility are insignificant when compared with the leap from fire-bar to generator furnaces. The main principle of the Dessau vertical furnace lies in the fact that, while making full economical use of the furnace, a temperature is kept up in the lower zone of the retort which approaches the permissible limit of heat in regard to the retort's durability. From this the following conclusions may be arrived at:

- 1.—The temperature of the furnace must not exceed a certain maximum, but must be kept at a regular and equal height.
- 2.—This high temperature must be distributed equally in the lowest zone of the furnace, and in every flue of every furnace.

It may be seen that the new supplementary tasks are not heavy ones; but as neglect of them would endanger the furnace, a certain amount of care is imperative. The means to be employed in order to cope with No. 1 are as simple as they are effective. The furnace draught is kept constant, as well as the openings for secondary air; and those for primary air are regulated from one clinkering of the generator to the other, so that the chimney gasses have their proper composition—a maximum of carbonic acid and a minimum of oxygen.

The problem of dealing with No. 2 is also easy to solve, as with vertical furnaces the carbonic oxide holes are all placed parallel to one another, and may be observed and regulated from the front of the furnace; whereas in the case of generators, they are one behind the other, and almost beyond the reach of control. In view of the high temperatures which vertical retorts are subjected to, and the danger of the furnaces which would ensue should this be exceeded, the works engineer or foreman must not rely on his eye alone in judging the temperature, but must have scientific instruments to assist him—the Wanner pyrometer for occasional, and Seeger cones for constant, control. The writer makes a point of recommending that the Seeger cones should be exchanged for new ones every fourteen days or three weeks.

When once the staff have become accustomed to carry out the regulating as in No. 1 regularly, and the inspection necessary to No. 2 of all the flues several times a day in a reliable manner, there will be found to be no difficulty in managing the vertical furnaces. It cannot, of course, be denied, and should indeed be emphasized here, that on some gas-works a number of furnaces

or retorts have become defective through overheating in a few days in consequence of careless supervision. Everywhere, however, where proper care has been exercised, the results have hitherto been most satisfactory. For instance, the installation at Oberspree has been working since Feb. 1, 1907, without interruption, and without any marked diminution of the sliding qualities of the retorts. The Mariendorf retorts have been working uninterruptedly since Oct. 1, 1907, and are in absolutely good condition—that is, each separate retort empties itself automatically of the first charge after scurfing. The rough surface of the retorts causes then at times some sticking of the charge. There are no visible signs showing that the furnaces are likely to require any repairs for some time. This should be sufficient testimony to the ample durability of the furnace.

The opinion of the writer on this point is shared by such distinguished experts as Herr Prenger, of Cologne, and Herr Weiss, of Zurich, who, on being questioned in the matter, replied as follows:—

Cologne Gas, Electricity, and Water Works.

Dear Mr. Körtling,—The vertical furnaces of the Cologne Gas-Works have been working very satisfactorily. Of the 24 furnaces, 12 have been constantly in action since June, and 12 since August, 1907. As these furnaces are just sufficient to cope with the summer requirements of our works, I propose to keep them in action until the latter end of the summer, and then, after about 900 days under fire, to renew the lower part of the retorts in the case of some furnaces.

During the last period of scurfing, I caused a thorough examination of the retorts to be made by Dr. Leise, which gave a satisfactory result generally. There was no serious damage to the retorts, such as might have made it necessary to let some of them down. Of the 240 retorts which comprise our installation, only 14 showed signs of wear in places on the narrow side of the lower parts, and contraction at the joints, thereby occasioning the sticking of the charge, especially after the retorts had been freshly scurfed. I put this down partly to overheating at the first period of working, when the staff were not yet fully acquainted with the new type of furnace. With adequate and technically able working management, I consider the durability of the retorts as thoroughly good and in every way satisfactory.

(Signed) H. PRENGER.

Zurich Town Gas-Works.

Dear Mr. Körtling,—The question of the estimated durability of the Dessau vertical furnaces was repeatedly brought up when our vertical furnace installation was erected, and a guarantee was required of the Dessau Vertical Company, corresponding to the claims of the constructors (the Stettin Chamotte Factory). It is well known that the durability of retort-furnaces in general is not dependent on the system of furnace and quality of the fire-clay material alone, but in a very marked degree on the proper handling of the furnace in respect to temperature, &c. On these grounds, the fire-clay manufacturers do not care to give guarantees, as it is naturally very difficult, and not always possible, to find out through what causes the retorts of a furnace have suffered. We have in our works—that is, in the earlier works, where furnaces with horizontal retorts were built—sufficiently proved by experience that the life of such a furnace could be lengthened or shortened according to the right or wrong way it was treated.

We have had especially favourable results, as may be seen from our yearly reports, on our gas-works at Schlieren-Zurich with the Coze furnace installation, as these furnaces, thanks to the good quality of the material and proper treatment of the furnaces, were able to show a duration of from 1350 to 2000 working days. The latter figure may be considered abnormally high, and attained only in the rarest cases. In general, a duration of 1000 days is a satisfactory result for a retort.

As is well known, the temperature in vertical furnaces, at least in the lower part of the retorts, is from 200° to 300° C. higher than in furnaces with horizontal and inclined retorts. Hence a certain mistrust in regard to the duration of the life of the vertical furnaces, because fire-clay material begins to get soft and liquid at a temperature of 1400° C. and beyond, and, consequently, endangers the durability of the furnace.

Vertical furnaces, consequently, require an especially careful treatment and daily observance, and the Vertical Furnace Company have given what was in fact a not very high guarantee (500 days) as to the durability of our furnaces, which, however, has now expired. Our vertical retorts have done very well, and show up to the present no deformation; whereas with our Coze furnaces, notwithstanding their aforementioned great durability, depressions of from 25 to 30 mm. were often observed in this short period. Small cracks which occur in vertical, as well as horizontal and inclined retorts, have to be filled up, after scurfing, with fire-clay mortar. We confidently hope to keep our vertical retorts in action for another one-and-a-half years, so that they show 1000 to 1200 working days. Should, contrary to our expectations, the life of these retorts not reach 1000 days, it would only be a matter of repairing the lower part of the retorts, which would take but little time and material, and cost comparatively little money. The remaining technical and economical advantages of the vertical furnace installation are such that we should be perfectly satisfied even with a shorter duration of the retorts.

(Signed) A. WEISS.

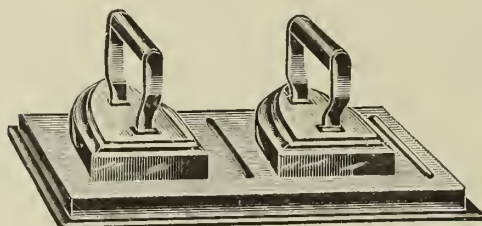
Books Received.—We have received from John Wiley and Sons, of New York, through Messrs. Chapman and Hall, "Gas-Engine Theory and Design," by Mr. A. C. Mehrtens, Instructor in Mechanical Engineering in the Engineering School of the Michigan Agricultural College. We have also received from Messrs. Stevens and Sons, Limited, of Chancery Lane, "The Law of Private Railway Sidings and Private Traders' Traffic," by Mr. John H. Cockburn, author of "The Law of Coal, Coal Mining, and the Coal Trade." We hope to notice both books more fully in early issues of the "JOURNAL."

A GAS ECONOMIZER.

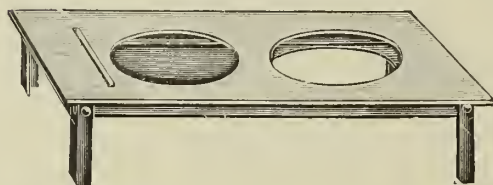
THERE is a mistaken notion abroad that appliances which produce an economy in the consumption of gas are regarded by gas suppliers as detrimental to their interests. The contrary, our ordinary readers need not be told, is the fact. In the gas industry, economy in gas consumption is synonymous with popularity; and suppliers are ever alive to this. In our "Register of Patents" last week, there was brief mention of a patent for a cheap form of economizer for use on the top plates of cooking-stoves or over boiling-rings; the patentee being Mr. W. May. The article is already on the market; and many consumers who have had it brought to their notice by the agents have adopted it. Mr. H. R. Hammond, one of the agents (of 5, Matham Grove, East Dulwich), has introduced a sample to us. The one for use on the top of a gas-cooker is in the form of a shallow tray with, in the bottom, a central circular opening, and at top a couple of circular openings.



The New Economizer.



The Economizer Heating Flat Irons.



The Economizer for Independent Boiler-Ring.

If this tray is placed over one of the boiling-rings of the gas-stove, the effect is to deflect the flame to the two openings in the top, and thus two saucepans, a kettle and a saucepan, or a saucepan and a frying-pan—in fact, any vessels that require heating—can be used over the same ring simultaneously. It is an all too common thing, under ordinary conditions, to go into a kitchen and see a saucepan or kettle on the top of a cooking-stove, with the flames wasting away all round it. This is uneconomical—and sometimes unpleasant. With this small and inexpensive invention, however, the heat otherwise wasted can be profitably utilized. Of course, this adjunct to the cooking-stove can be employed for the heating of two flat-irons. The same arrangement is equipped with legs, so that it can be used with an independent boiling-ring.

FLUELESS GAS-STOVES IN WORKROOMS.

THE Annual Report of the Chief Inspector of Factories (Dr. Arthur Whitelegge, C.B.), issued last Thursday, giving details of the work carried out by the various inspectors under his supervision in the year ended Dec. 31 last, contains the following remarks on the use of flueless gas-stoves in workrooms.

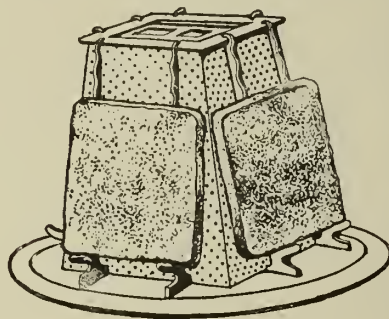
The requirement of section 6 of the Act of 1901, that adequate measures shall be taken for securing and maintaining a reasonable temperature in each room in which any person is employed, and that the measures so taken must not interfere with the purity of the air in the room, has again given rise to much discussion between the inspectors and the makers and users of flueless stoves. In view of the terms of the section, the Department cannot regard the provision of stoves which discharge the products of combustion into the room as compliance with the requirement. It has been contended that they are no worse than unventilated gas-burners for lighting, which the Act does not forbid; that their yield of carbonic acid and water vapour is only akin to that of respiration; and that no poisoning, or large proportion of carbonic oxide, has been demonstrated to attend the use of certain stoves of the kind. In some instances, analyses have been produced tending to show that, contrary to the usual experience, the products of combustion of gas contained no sulphur compounds, carbonic oxide, or organic matter.

The section was intended to prevent an abuse which was found not to be remediable under the older Acts—viz., the "warming" of workrooms, even in daylight, by means of unventilated gas-jets normally used for lighting purposes only. The objection to this

is not removed by burning the gas on a larger scale, and still without local ventilation, in stoves instead of brackets or pendants. The criterion established by the section is the avoidance not merely of poisoning, but of additional pollution of the air by the products of combustion. Beyond this, the section does not limit the choice among the various means of warming. But as compared with open fires flueless stoves have a double disadvantage. They fail to contribute to ventilation, and they increase the need for it. If, therefore, they were admissible as means of complying with section 6, a higher standard of ventilation would be required.

GAS TOASTING APPLIANCES.

THOSE who are fond of toast (and who is not?), and at the same time possess among their kitchen arrangements the luxury of a gas-cooker, are being catered for by means of two very unassuming little appliances which have been introduced on the market by the Elbard Stove Company, of No. 108, Queen Victoria Street, E.C. The larger of these—the "Rapid" gas-toaster—is shown in the accompanying illustration; and it is so simple that hardly any more explanation of it is called for. As will be seen, it is four-sided; and each side is provided with a rest, on which a slice of bread can be placed—the whole standing on a broad circular rim. Thus four pieces of toast can be simultaneously prepared (and in a remarkably short space of time); while the flat top can, during the process, doubtless be also employed for the heating of a small vessel, if desired. The sides are perforated all over; and within the appliance, placed crosswise, is a plate which serves



The "Rapid" Toaster.

effectually to deflect the heat in the first instance to just the part where it is required for the operation of nice, even toasting. All that is needed is to stand the toaster over the lighted ring-burner, place four slices of bread on the rests, and wait for results—which will not be long arriving. The contrivance is strongly made of sheet steel, and of British manufacture; and among its advantages, the extremely moderate price at which it is sold may fairly be included.

The second pattern—named the "Handy"—is still cheaper, and is intended to make only one piece of toast at a time; the bread being laid flat upon bars which are fitted on top of a perforated plate. These little toasters, of course, constitute only a small item in a well-stocked kitchen; but they must not be passed over for that reason—in fact, nowadays nothing must be passed over that can be utilized to usefully consume gas. The grilling burners of a gas-cooker are not a really satisfactory method of making toast; and observation suggests that they cannot be so economical for this purpose as the placing of the "Rapid" toaster over one of the ring-burners. The possession of a toaster may therefore lead to gas being used in the making of toast much more frequently than would otherwise be the case; and if this should prove to be so, the appliances will be a boon to both the suppliers of the gas and the users of the cookers. It should be pointed out that they can also be employed in connection with a gas-ring, with which toasting would otherwise be practically out of the question.

Professor Ira Remsen, President of Johns Hopkins University, Baltimore (U.S.A.), has been elected President of the Society of Chemical Industry for the ensuing year; and the invitation of the Scottish section to hold the next annual meeting in Glasgow has been accepted.

The stirring of chemicals in the solution tanks of the Oberlin (Ohio) water-softening plant is accomplished by the use of power furnished by a Pelton water-wheel. The wheel is 12 inches in diameter, operates under a pressure of from 9 lbs. to 22 lbs. per square inch, and consumes about 50 gallons of water per minute. The wheel drives a main shaft, to which the stirrers, or revolving arms, are belted. The waste water from the wheel is used for preparing the lime solution. The speed of the wheel is 180 revolutions per minute; those of the lime and soda agitators being respectively 38 and 13 revolutions per minute.

Water-hammer in some of the large mains of the Detroit Water-Works has been materially reduced by the use of an air-chamber, according to the annual report of Mr. George H. Fenkell, the Engineer of the Water Board. The direct pumping system is used. About half-a-mile from the station an emergency station has been built and equipped with a 1000 cubic feet air-chamber, an electric motor and air compressor, and other apparatus. This chamber is connected to two 42-inch force-mains, and since it was installed the pressure-gauges on a 24-inch connecting-main a few miles distant have shown a reduction in the ordinary water-hammer from about 12 lbs. to 3 lbs., while the hammer on one of the 42-inch mains with which the chamber is directly connected has been reduced from 10 lbs. to 4 lbs.

ELECTROLYSIS OF WATER=MAINS.

Damage to portions of the water-works of New Bedford (Mass.) by electrolysis has been recently investigated by Mr. W. E. Foss, of Boston; and his conclusions are given in detail in the report of the Massachusetts Water Board for the past year. They are summarized in a recent number of "Engineering Record," from which the following particulars are taken.

The water-works have about 110 miles of cast-iron distributing mains, from 4 to 36 inches diameter, laid with lead joints, a riveted steel force-main about eight miles in length and 48 inches in diameter, and 75 miles of lead service-pipes about $\frac{3}{4}$ inch in diameter. Water is pumped to the city reservoir through the 48-inch main, and delivered from it by gravity through a 36-inch cast-iron supply-pipe. The investigations showed that the return currents of the Old Colony Street Railway were a source of great danger to the large steel main—the only means of conveying water from the source of supply to the city; so that any damage to it which would shut off the supply would be attended with very serious consequences. For about three miles of its length, the force-main runs parallel to, and comparatively near, the railway line, and crosses it at one point. Water-pipes in an area located within about half-a-mile from the railway power station were found to be pitted to depths of from 5 to 15 per cent. of the thickness of the metal where the ground was comparatively dry. In wet ground, however, the disintegration in some spots extended entirely through the pipes. A 2-inch service-pipe leading from the 48-inch main to the engineer's house near the pumping-station has been renewed five times on account of damage from electrolysis. Tests on the service-pipe disclosed the fact that it was positive to the rails by as much as 45 volts at times, and that a current of several amperes flowed from it to the rails. At the intersection of the railway line and the steel main, the latter was positive to the rails by some 25 volts; and an examination of it at this point showed that electrolytic corrosion had taken place.

These conditions are stated to be due entirely to the operation of the street railway with insulated return conductors. The road-bed and foundations are stated by Mr. Foss to be poor, the rails light, and the cars heavy—a combination of circumstances which renders it difficult to maintain the rail-bonding in proper condition. Except for a very small part of their length, the rails are not reinforced with supplementary copper cables, while the location of the power station, about nine miles from the end of the line, would cause an unusually large fall of potential in the return conductors, even if these were of ample size and well bonded. The return drop in three miles of the railway line was 38 volts; so that on this basis the total drop for the whole nine miles would be upwards of 100 volts. The conductivity of both the steel main and the return system of the railway were tested. The pipe showed a conductivity seven times greater than that of the rails. The rails used weighed 60 lbs. per yard.

Mr. Foss states that the unusually large return drop could readily be reduced by 30 per cent., or to 70 volts, by feeding current for operating the cars from each end of the line instead of from one end only, as is now the case. A further reduction of about 50 per cent. in the remaining return drop would be obtained by relaying the track with 100-lb. rails instead of the 60-lb. rails now in use, and thoroughly bonding the joints. This would lower the drop to about 35 volts. A further reduction to only 10 or 15 volts could be effected by installing a booster in the line about four miles from one of its ends.

Periodic testing and examination of the rail bonding and drainage connections after the necessary repairs have been made are strongly recommended; and all the return cables should be thoroughly insulated from the ground. Insulated copper cables should be run from the power station to several points in the vicinity; in order to minimize the electrolytic corrosion which is now taking place in the neighbourhood. Metallic connection between the steel pipe and the cover sheaths of the telephone cables is advocated, so as to bring them to the same potential. In fact, anything that can be accomplished to reduce the excessive fall of potential on the return circuit of the railway line would, it is stated, work to good advantage in preventing the destruction of the 48-inch main by electrolytic action.

FAILURE OF TWO WATER-TANKS.

A recent issue of "Engineering Record" contained particulars of the failure of two iron water-tanks, each 65 feet in diameter and 40 feet high, and of about a million gallons capacity, at Parkersburg (W.Va.). They were located side by side, separated by a distance of about 11 feet, upon Prospect Hill, in a rather populous district of the city, and formed part of the water supply system. They were built upon a concrete foundation, which was covered by a $\frac{3}{4}$ -in. double-riveted bottom plate, to which the tank walls were attached around the circumference by means of a 4-in. by 4-in. by $\frac{3}{4}$ -in. angle-iron with 1-in. rivets through the leg attached to the walls, and $\frac{3}{4}$ -in. rivets through the leg attached

to the bottom plate. A course of stone was laid round the bottom. Each tank was built with 10 plates, each 4 feet wide, with thicknesses varying from the bottom upwards from 3-4ths to 3-16ths inch; the top 12 feet being of the minimum thickness. Both tanks were constructed about 1885. The two tanks evidently failed within a minute of each other, since testimony is quite general that there were two distinct reports within this period. These were followed by noise due to the rushing water, to falling trees, and the wrecking of buildings. The destruction of the tanks and the consequent release of about 2 million gallons of water wrecked two buildings—one a church, and the other a large residence—and seriously damaged some fifteen other residences. Two people were killed and three or four seriously injured. The damage in all is estimated at about \$50,000.

An examination of the wreck showed that both tanks were ripped along a vertical line. The wall of the southernmost of the two tanks was flattened out in a single piece with its outside up, about 75 feet from its former base. The bottom edge, which had been riveted to the base-plate, lay away from the foundation. The wall of the other tank was torn into two pieces; the nearest end of both lying 50 to 60 feet to the north of the base. The smaller of the pieces lay with its inside upwards and its bottom edge towards the tank; while the larger sheet had been twisted through a 180° angle, lying in part with its outside and in part with its inside upwards. There were indications that the tank to the north failed first—an old crack, about 3 feet long, being disclosed in the angle at one of the vertical ripped ends—and that in flying outward the free end was thrown against the other tank, which failed as a result of the blow. That this was probable was indicated from the fact that if a line was swung round, unrolling from the circumference of the northern tank, beginning at the point of rupture, it would strike the other tank at the point where the failure seemed to have occurred.

The tanks separated from the foundations by tearing along the line of $\frac{3}{4}$ -in. rivets holding the angle to the foundation-plate. Along the line of failure of the south tank, six of the sheets were torn through; two of the sheets parted along the vertical rivet line; and the ends of the other two sheets were turned under, so that they could not be readily examined. Seven of the sheets of the north tank were torn; two parted along the line of rivets; and one was in part torn and in part failed along the rivet line. None of the rivets, either in the tank walls or in the bottom, were broken.

There were no unusual conditions at the time of the accident, though there was a light rain shortly before. Since the minimum temperature during the night was 50° Fahr., and there had been no severe weather during the previous day, it was not thought that there was any ice in either tank. Moreover, no indications of ice were discovered after the accident. There was very little wind at the time. The superintendent of the water-works states that he never saw any indication of leaks in either tank, and that they seemed to be in good condition. Though a number of people passed near them the day previous to the accident, no leaks or signs of failure were noticed.

Illuminants and Illumination.—A paper was recently read before the Birmingham and District Electric Club, by Mr. W. Smith, on "Illumination." In comparing different illuminants, the author gave the comparative cost of lighting by oil, gas, and electricity as in the ratios of 1, 0.46 and 1.1 respectively—taking paraffin oil at 9d. per gallon, gas at 2s. 3d. per 1000 cubic feet, and electricity at 4d. per unit. In considering the amount of illumination required in rooms, he stated that 1 candle-foot was about sufficient to enable the average person to read with comfort; but a great deal depended on the colour and reflecting power of the decorations. In the course of some remarks upon workshop and exterior lighting, Mr. Smith referred to the glaring effects of powerful flame-arc lamps outside shops, and suggested that Mr. Lloyd-George might do worse than make these "blinding annoyances" a source of revenue. With reference to street lighting, he said that side streets should have something like 1-candle power per 200 square feet of ground area, but leading thoroughfares should be much more liberally supplied.

Reflection of Light from Rough Surfaces.—At a recent meeting of the Royal Dublin Society, Professor W. F. Barrett submitted a communication on methods of determining the amount of light irregularly reflected from rough surfaces. The law of inverse squares being inapplicable to such surfaces, the author has employed two methods, which are stated to yield satisfactory results. According to an abstract of his communication given in "Nature," a Lummer-Brodhun or other similar type of photometer is employed, and the intensity of the stronger light is reduced by (1) a rapidly revolving opaque disc having a sector cut out, the size of which can be accurately adjusted until a photometric balance is obtained; or (2) by an adaptation of the author's instrument for determining the "light-threshold" of the eye. In this case the stronger light is reduced by absorption through a column of liquid of neutral tint; the length of the column being capable of easy and accurate adjustment. By this means measurements can be made of the light diffused at various angles from small surfaces, which are used to replace the silvered mirror that reflects the standard light through the liquid column. This arrangement also affords a convenient method of testing different systems of lighthouse illuminants.

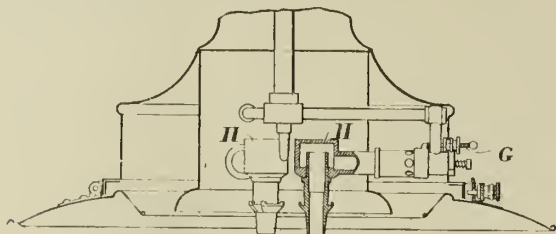
REGISTER OF PATENTS.

Incandescent Gas-Lamps.

WM. SUGG AND CO., LIMITED, and WRIGHT, E. S., of Regency Street, Westminster, S.W.

No. 15,644; July 23, 1908.

This invention relates to the burners of inverted incandescent gas-lamps provided with means for regulating the gas and air supplies from outside the lantern.



Sugg's Incandescent Gas-Lamp.

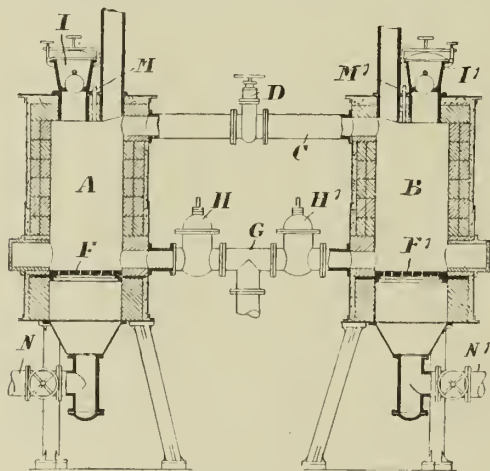
As shown, there are three horizontal branches from the gas supply pipe, turning at right angles to carry the burner-tubes, each of which has a screw needle valve and a hit-and-miss air adjustment—both accessible from outside the lantern—the latter by means of a screw G carried by the lantern. The burner-tubes have at their inner ends bulbs or chambers H, into which the gas and air mixture enters near the bottom. The inner ends of the burners extend into the bulbs some little distance beyond the inlet of the gas and air mixture, so that the latter has to deviate from its direct course and pass over the edge of the burners before entering them.

Obtaining Gas from Tar in Gas-Producer Plant.

RINCKER, F. G. C., and WOLTER, L., of Watergraafsmeer, near Amsterdam.

No. 10,422; May 13, 1908.

The essential feature of this invention is that the tar gas is produced in two alternately working generators. The tar which is conveyed through the glowing coal is first converted into gas in one generator, and then carried off through its own expansion; and the tar-vapours left in the generator are forced by a current of air conveyed from below into the second generator, from which, passing through glowing coal, they flow out in the form of gas—the first generator being simultaneously blown-up by the current of air carried through.



Rincker and Wolter's Tar-Gas Process.

The generators A B are of similar construction, and lined inside with fire-brick or the like. They are connected at the top by a pipe C, in which a valve D is inserted; and at the bottom near their fire-bars F F' by a pipe G, in which two valves H H' (independent of each other) are inserted. Each generator is, moreover, furnished with a feed hopper I I' for introducing the coal, with chimneys for carrying off the combustion gases, and with pipes M M' for introducing the tar. Pipes N N' are provided in the lowest part for introducing a current of air for the blowing-up of the generators.

The action of the apparatus is as follows: The valves H, H', D, those on the pipes N N', and the tar-pipes M M' are shut off and the valves in the chimney opened. The generators are filled with a quantity of wood, and to a certain height with coke, and a fire started in each. The valves on the pipes N N' are opened, and a current of air is introduced into the generators through these by means of a fan (not shown), whereby both generators are blown up, the fires started, and the required heat obtained. The combustion gases pass through the chimneys to the open air. When the fuel has acquired a certain temperature, the valves on the pipes N N', and those in the chimney pipes, are closed and the valve H opened. The tar is conveyed through the pipe M into the generator A and constantly comes into contact with fresh layers of glowing coal, is vaporized, and, at a maximum temperature, passes out as gas through its own expansion by way of the valve H and the pipe G. When the temperature in the generator A is so far reduced as not to be sufficient to form gas from the tar, the tar is stopped from entering it, and the necessary valves opened and closed, so that the current of air from the pipe N forces the tar vapours left in the generator A through the pipe C into the generator B. Passing

through the glowing coal in it, the tar vapours are converted into gas and are carried off, as gas, through the valve H' and the pipe G. So soon as the gas formed by the action of the coke on the air has reached the valve H', the valve D is closed, so that the current of air passing into the generator A will act upon the fuel and resuscitate the fire to again establish the desired heat; and the products of combustion will pass away by the chimney. The valves are again manipulated so that the generator B is blown in by a current of air conveyed through the pipe N' to resuscitate the fire, which has been deadened by the generator being closed. The combustion gases again escape through the chimney; and when the fires have obtained the required degree of heat, a repetition of the operation takes place in the generator B.

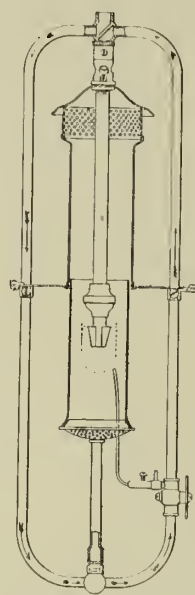
The air, it is pointed out, is only used for creating or resuscitating the fire and forcing out the remaining vapours, and does not mix with the gas, which is said to burn "quite brightly when it leaves the generator, without being further treated, and has great calorific value."

Gas-Lamps with Inverted Mantles.

PODMORE, A. E., of Herne Hill, S.W., and THOMAS, J., of Hanley Road, N.

No. 14,835; July 13, 1908.

The patentees propose to provide an incandescent gas-lamp with special arrangements for preventing flies and other insects from getting to the interior of the burner or on to the mantle—thus making the lamp especially suitable for use in hot climates.



Podmore & Thomas's Insect-Proof Lamp.

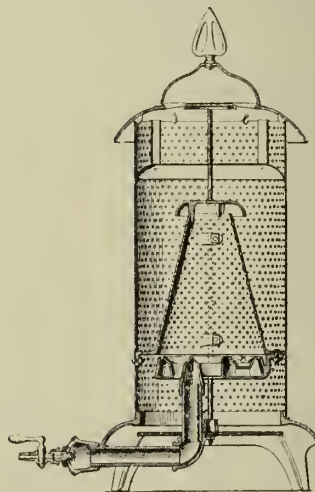
In carrying out the invention, they employ (as shown) an oval frame made of brass—a harp—which carries a circular metal enamelled plate about half-way between the top and bottom, and on which is mounted a metal chimney, terminated by a cap of perforated metal. Depending from the top portion of the harp is the burner, which passes down the interior of the metal chimney. A glass globe or chimney, surrounding the mantle and lower part of the burner, is supported at the bottom by a hollowed or saucer-shaped glass holder—made, preferably, of perforated metal; the concavity of the hollow being such as to concentrate the current of air passing through the perforations on to the lower part of the mantle. This holder is, in turn, supported by a short pillar, rising from the bottom part of the harp and made capable of removal by means of a cone and socket.

Gas-Stove.

BROCK, J. M., of Flushing, New York, U.S.A.

No. 18,941; Sept. 9, 1908. Date claimed under International Convention, Sept. 16, 1907.

This invention relates more particularly to gas-stoves "wherein a comparatively massive hollow reticulated body may be maintained in an incandescent state so as to emit both light and radiant heat by a relatively small burner and small consumption of gas."



Brock's Gas-Stove.

As shown, the hollow reticulated member forming the combustion chamber has a relatively small opening at its top and a relatively large one at its bottom, with a burner arranged to direct the flame into the combustion chamber so as to heat the member from the inside. The means include a diaphragm and an outer shell or casing for protecting the outer surface of the member from cold air; the shell being, in part at least, permeable to light. The diaphragm extends between the shell and member, and divides the shell into two compartments—one containing the member, and the other the burner, whereby the member may be maintained in a state of incandescence with a slight consumption of fuel.

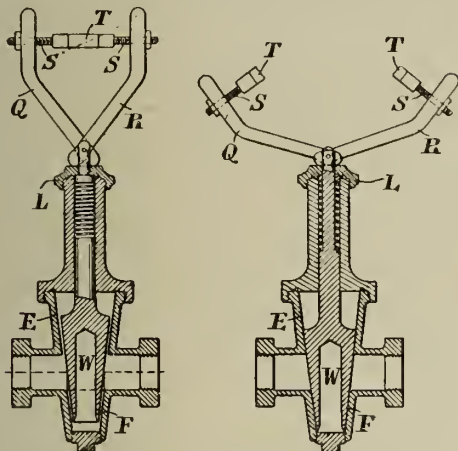
An important feature of the invention resides in the provision of means for "perfecting and augmenting combustion," thereby serving the two-fold purpose, among others, "of greatly increasing the heating efficiency of the apparatus and consuming dangerous gases and eliminating disagreeable odours and other objectionable features incident to constructions of this character." This means comprises a hollow member which forms a combustion chamber, and is adapted to be

heated to incandescence. In the embodiment illustrated, this member is formed of metal, preferably cast iron, and is situated above the burner, where it is subjected to the heated air and products of combustion, which pass along its inner surface and heat it to incandescence. The incandescent member is made in the form of a hollow upwardly tapering member or cone. To bring it to a state of incandescence, it is perforated so as to secure more intimate contact of the flame and the heated gases with the heated member, and also to increase the area of the heated member with which the gases and flame come in contact.

Thermal Gas Cut-Off Device.

SCHWAGER, A. C., of New York, and HOLLANDER, J., of Boston, U.S.A.
No. 21,361; Oct. 9, 1908.

This invention relates to a device for shutting off the supply of gas to a house-meter and piping in case of fire, when the temperature rises to a point where it will melt a fusible element having a low melting point. It is especially adapted to cut off the supply of gas to a house-meter when the temperature rises high enough to melt the meter casing.



Schwager and Hollander's Automatic Cut-Off Device.

The illustration shows the valve in its open position, in which it is held by a pair of external levers and a co-acting fusible element; also when the valve is forced to its seat by the release of the external levers normally held under restraint by the fusible plug.

The cut-off device contains the usual tapered plug valve, working in a valve-casing, having a tapered seat, and generally in direct communication with the supply main and the meter. The inlet and outlet openings are connected by a passage which intersects the tapered seat of the casing—dividing the valve seat into two portions E and F. At the upper end the cylinder I is closed by a threaded cap. The valve-stem shown is of two diameters—the upper portion being reduced and being encircled in this instance by a strong coiled spring normally tending to close the valve, but held under restraint. The spring rests at its lower end against a shoulder on the valve-stem; at its upper end it bears against a packing-ring provided to prevent any escape of gas through the opening in which the valve-stem works.

The means suggested for holding the valve open consists of two external levers Q R pivoted to the upper end of the valve-stem and connected by a threaded bar S, consisting of two parts made of metal having a relatively high melting point, and a third (fusible) element T joining the two main parts—a piece of solder of the proper size and strength connecting the threaded portions of the bar, the ends of which have stop-nuts for holding the handles in position. The lower ends of the handles are formed in this case with curved cam-surfaces, which permit the valve-stem, and thereby the valve, to be readily raised.

The normal positions of the parts are first shown and then the positions of the parts in case of a fire, when the fusible element T has been melted. It will be noticed that the tapered plug gas-valve has been forced downward by the spring, and the tapered surface of the valve is in close contact with the co-acting tapered surfaces E F of its seat—cutting off communication between the main and the meter. The valve itself is bored out at W, for the double purpose of providing a space into which accumulations of hydrocarbons in the casing may be forced, and to enable the lower end of the valve to be tapered to a sharp edge, such as will assure its cutting through any accumulations and finding a positive seat when the spring is released. The normal positions of the parts first shown will remain unchanged until the connector T is melted, when (the force normally holding the valve open being removed) the spring comes into action and effects a positive closing of the valve to the position shown in the second view.

Burner-Tubes for Inverted Pressure-Gas Lamps.

GRAETZ, M., of Berlin.

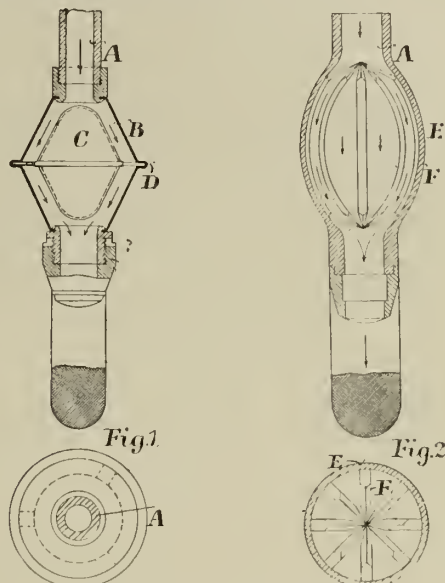
No. 23,830; Nov. 6, 1908.

This invention relates to preheaters used in the burner-tubes of incandescent inverted gas-lamps working with pressure gas.

In the case of pressure-gas lamps, the patentee points out, two great difficulties are encountered in the application of such preheaters. There is first of all the danger of back-firing; and, in the second place, there is the difficulty caused by the great expansion of the gas and air mixture under the heating action of the burnt gases. To avoid the danger of back-firing, he proposes to arrange the preheater directly above the burner-head, or in the lower part of the burner-tube, "so that a considerable column of comparatively cool mixture is above the preheater." In this way, the expansion of the mixture under heating does not materially affect the flow of the mixture in the column; so that the velocity of this flow of mixture, which is under pressure,

remains greater than the velocity of the flame at back-firing. It has already been proposed to arrange a preheater near the burner-head in ordinary pressure lamps; but the arrangement involves the restriction of the passage of the mixture through the preheater in order to prevent back-firing. According to the present invention, far from restricting the passage, means are employed for preventing fluid frictional losses in the preheater.

These features are embodied in a preheater for inverted gas-lamps working with pressure fluid arranged in the lower part of the burner-tube, and in the form of a widened chamber containing a deflecting or division piece such that the mixture passing through the preheater is divided into thin streams, "which do not materially or suddenly depart from the original direction of flow."



Graetz Pressure-Gas Burner-Tubes.

In fig. 1, the burner-tube A has at its lower end fixed to it a widened part B of double conical form, and merging at its upper and lower ends into substantially the diameter of the burner-tube. Within the chamber there is supported a deflection or division piece C, which conforms substantially to the internal shape of the double conical chamber, and is formed with lugs which engage in a fold D on the chamber. The mixture passes downwards, as shown by the arrows, and, by means of the deflection piece, is divided into thin streams, which are heated by contact with the outer walls of the chamber B, which is heated by the hot gases rising from the burner. With this device it will be seen that the direction of flow of the gas receives no substantial or sudden change, and "thereby very little resistance is offered to the flow of the mixture."

In fig. 2 the burner-tube A is at its lower end widened into bulb-form, so as to form a preheater chamber E in which the deflecting piece F is arranged in the form of a spider composed of several radial arms, which meet in the centre. By means of this spider, the mixture passing from the burner-tube is, as before, divided into several thin streams, which are heated by contact with the exterior walls of the bulb E, and also by the arms of the spider. It will be seen that in this case the arms of the spiders are in metallic connection with the walls of the chamber E and thereby become heated, "so that with this construction a still greater heating surface for the mixture is obtained."

Manufacture of Gas.

LAKE, W. E.; a communication from the INTERNATIONAL GAS DEVELOPMENT COMPANY, of New York.

No. 20,014; Sept. 23, 1908.

The claim for this invention is for a process of manufacturing gas consisting of passing steam through a bed of hot coke to form water gas, passing the water gas up through powdered coal falling freely through a distilling chamber, and collecting the products.

An illustrated description of the process appeared in the "JOURNAL" for April 20 last, p. 152.

Treatment of Spent Oxide.

WILLIAMS, P. E., of Leytonstone, Essex.

No. 596; Jan. 9, 1909.

This invention has for object the treatment of spent iron oxide and like material containing sulphur "for the extraction therefrom, in an economical manner, of sulphur."

For this purpose, the spent oxide, or like material in the form of sulphide of iron with more or less free sulphur in admixture therewith (and whether previously subjected to a revivifying treatment or not), is treated in a closed vessel to the action of strong ammoniacal liquor, which is caused to circulate through it so as to extract the sulphur present and form therewith ammonium polysulphide, which is afterwards treated for the recovery of sulphur, and also, it may be, of the ammonia and any other gaseous or volatile matter present therein.

The spent material may be treated with the strong ammoniacal solution *in situ* in the purifiers, which, during the recovery of the sulphur, are disconnected from the other boxes in which purification is proceeding. Or the spent oxide may be removed, as usual, from the purifiers and exposed to the atmosphere in the ordinary way, so as to revivify the spent material and produce a mixture of oxide of iron and free sulphur. In this case, the mixture of oxide of iron and free sulphur is arranged preferably in layers on perforated trays or supports in a separate vessel,

the lower part of which is adapted to contain ammoniacal liquor. The oxide of iron may then be again converted into sulphide of iron by passing through it crude coal gas, or ammoniacal liquor containing sulphuretted hydrogen. In either case, the lower part of the vessel (or a separate vessel) is then charged with ammoniacal liquor through which coal gas or other gas rich in ammonia and sulphuretted hydrogen is caused to pass, as by a perforated pipe, or some other gas-washing apparatus is employed, to produce a strong ammoniacal liquor, which is then sprayed over the mixture of sulphide or oxide of iron and free sulphur, so that it circulates through the material until it is saturated with sulphur—the operation being, if necessary, repeated with additional strong ammoniacal liquor until practically the whole of the free sulphur is found to be removed from the material under treatment.

The resulting ammonium polysulphide thus obtained is then treated for the recovery of the sulphur. For this purpose, it may be heated to boiling point by steam in a suitable vessel (such as a still or boiler) to drive off the ammonia and any other gaseous or volatile matter present, and leave the sulphur, which may be recovered by filtering off the liquid and washing and drying the separated sulphur. The ammonia driven off during the treatment may be recovered for re-use, for which purpose, after cooling, it may be passed back into the stream of coal gas supplied to the vessel containing the ammoniacal liquor and spent oxide.

The gas rich in ammonia used for preparing the strong ammoniacal liquor, may be that leaving the exhauster used for withdrawing coal gas from the retorts; or where coal gas is being treated with ammonium polysulphide for the extraction of cyanogen therefrom, the gas leaving the cyanogen washer and containing ammonia and sulphuretted hydrogen may be passed through the ammoniacal liquor in the bottom of the vessel containing the material to be treated.

After removal of the free sulphur as described, the remaining material, consisting of sulphide of iron, can, after revivification and drying, be returned to a purifier for again absorbing sulphuretted hydrogen from the gas.

By means of the invention it is claimed that the sulphur required in gas-works for the production of ammonium polysulphide for purification or other purposes, "can be obtained in an economical manner from the coal gas produced in such works."

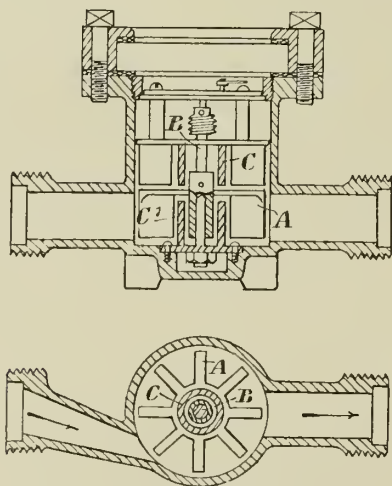
Rotary Inferential Water-Meters.

CREMER, R., of Leeds.

No. 746; Jan. 12, 1909.

This invention relates to turbine water-meters in which the water current is directed only against part of the circumference or along one side of the fan-wheel, thereby producing one-sided pressure on the latter.

In this class of meters, it has been heretofore proposed to provide an integral semicircular partition for confining the current in a channel within the water-chamber, so as to concentrate the flow on to the overhanging operating blades of the wheel; and the present invention is limited to turbine meters in which the main arbor has a direct drive and is immediately coupled to the spindle of the recorder.



Cremer's Inferential Water-Meter.

The illustration shows a vertical section of the meter, and a horizontal section through the circular water-chamber.

The fan-wheel A has its arbor B extended upward, and adapted to actuate the recording gear. For the purpose of preventing the pressure of the water-current from affecting the arbor, there are provided above and below (or between) the vanes of the wheel stationary screens C C' interposed between the wheel-hub and the water-current. If movable screens are employed instead of stationary ones, they must not turn simultaneously with the arbor.

Movable screens must not be directly or rigidly attached to the wheel-hub or the arbor, because they would practically become part of it, and so intensify the action of the water-current in the same manner as it occurs in an existing inferential water-meter. Therefore, the most reliable arrangement is that of stationary screens placed in proximity to the arbor within the inner circle of the wheel-blades.

APPLICATIONS FOR LETTERS PATENT.

11,604.—WANGEMANN, P., "Conveyance of incandescent coke." May 17.

11,639.—OSWALD, T. H. & T. H., JUN., "Suction or pressure gas plants." May 17.

11,675.—FARNHAM, R. V., "Gas-producer." May 18.

11,756.—GEORGE, J. R., "Gas-producers." May 18.

11,783.—LEA, J. W., and PERRINS, J. H., "Inverted burners." May 19.

11,785.—GUNN, G., "Preventing vibrations in pipes." May 19.

11,787.—THOMPSON, E., and SIMKINS, F. W., "Anti-dip gas-valve and hydraulic main." May 19.

11,800.—WILSON, K. R. M., "Apparatus for distilling coal." May 19.

11,801.—WARDALE, E. S., "Locking-devices for prepayment meters." May 19.

11,826.—BLAND, C. W., and GLOVER, T., "Regulating device for atmospheric burners." May 19.

11,890.—CROSSLEY, W. J., and RIGBY, T., "Gas-producer plants primarily designed for the recovery of ammonia." May 20.

11,901.—BÖHM, E. & R., "Imitation candles for gas." May 20.

11,925.—BUCKLAND, J., "Gas-economizer for stoves." May 20.

11,941.—ROBIN, J. I., "Cases for mantles." May 20.

11,942.—ROBIN, J. I., "Manufacture of mantles." May 20.

12,004.—HANSEN, E. D., and WINKLER, G. F. C., "Separating gas from liquid." May 21.

12,033.—TYLOR, H. E., "Locking gas-taps." May 21.

12,049.—ZECHNALL, L., "Inverted burners." May 21.

12,088.—PITT-PAYNE, W., "Gas-fires." May 22.

12,090.—THORP, T., "Bye-pass for gas-meters." May 22.

12,098.—HEATH, E., "Meter." May 22.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Livesey Memorial Fund.

SIR,—In revising the complete list to date of the above fund, I have to ask you to kindly note that I find two errors have unfortunately crept in—viz., the Newark Gas Company's subscription of £5 5s. has been entered twice (on Jan. 18 and Feb. 24); and that of Mr. W. E. Price, of Hampton Wick, £2 2s., twice (on March 12 and April 3). This reduces by £7 7s. the total amount announced.

W. T. DUNN, Secretary,
39, Victoria Street, S.W.,
May 28, 1909.

Institution of Gas Engineers.

The Local Government Board Audits and the South Metropolitan Gas Company.

SIR,—The letter of the Chairman of the South Metropolitan Gas Company in the "JOURNAL" for the 25th inst. just reaches us (the 28th), and your Whitsuntide issue goes to press early to-morrow. We write from Eastbourne, and must defer fuller reply with the documents before us.

Meantime, we may say that we did not tax your columns with the Woolwich report in addition to Bermondsey—

- (1) For the manifest reason that we were in ignorance of that report at the time, a copy having only since reached us.
- (2) The Woolwich surcharge, characterized by the Clerk as a "scandal," is in dispute; and the report is therefore *sub judice*.
- (3) The said report, unlike Bermondsey, simply extends reasons for the comparatively slight revision of the charges (£143 out of a total of nearly £1000, and as against the £846 claimed by the Company); but it significantly ignores every special contention of the Company, such as that "we had charged four times over for everything," and charged "120 guineas for ten conferences," &c.
- (4) In fact, the report dealt with the simple figures, without any reference to the Company's contentions. It therefore has no bearing on the merits, while it certainly gives not only no "ample justification" for the Company's proceedings, but ignores their allegations.

As to any advantage by protecting themselves as ratepayers, the Company's proportion of the surcharge in Woolwich (if it is confirmed) is 40s.

The two Auditors practically held joint inquiries, and we have reason to believe that our clear vindication of the Company's indictment of "exorbitant charges," though confined to the Bermondsey report, was the considered opinion of both Auditors.

Eastbourne, May 28, 1909.

THOS. DINWIDDY AND SONS.

At the annual meeting of Meters Limited last Tuesday, the Chairman (Alderman John Miles, of Bolton), in moving the adoption of the report, which was noticed in the "JOURNAL" for May 18, remarked that both it and the balance-sheet were very satisfactory. A year ago they had to deplore the fact that the prices of some of the staple articles used in their manufactures had gone very much against them. Since then, he was glad to say, the reverse had been the case. But the better state of their affairs was not entirely due to this. The Directors always had their eyes open to the importance of seeing what improvements they could make, either in the management of the works or in the way of cheapening the cost of production. But they never cheapened cost at the expense of the quality of their products. They also believed in keeping their premises and machinery in the highest state of efficiency; and the condition of the works now was far better than it was when they acquired them. In spite of the bad state of trade generally, their turnover in the past year had been satisfactory, and they were able to return to their 6 per cent. dividend on the ordinary shares, and put £5000 to the reserve fund—making it £60,000. The Directors had kept steadily in mind the desirability of increasing the reserve to £100,000; but when they would be able to attain this he could not say. The report was adopted and the proposed dividend approved. Mr. George Braddock, the Managing-Director, said that if they might judge of the results of the current year by the progress already made, they would have every reason to be satisfied.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Bills down to the rising of the House on Wednesday for the Whitsuntide recess :—

Bills brought from the Commons, read the first time, and referred to the Examiners: Harrogate Gas Bill, Llanelly Water Bill, Pontypridd Water Bill, West Gloucestershire Water Bill.

Bills reported, with amendments: Salford Corporation Bill, Stourbridge and District Water Board Bill, Yorktown and Blackwater Gas (Electric Lighting, &c.) Bill.

Bills read the third time and passed: Eastbourne Gas Bill, Gas Orders Confirmation Bills (Nos. 1 and 2), Lisburn Urban District Council Bill, Stourbridge and District Water Board Bill.

Bills Royal Assented: Conway Gas Bill, Heckmondwike and Liversedge Gas Bill, Leyland and Farrington Gas Bill, Littlehampton Gas Bill, South Lincolnshire Water Bill, Wells Gas Bill.

The Provost, Magistrates, &c., of Coatbridge, have petitioned against the Coatbridge Gas Order, and the Glamorgan County Council against the Llynvi Valley Gas Order, in the Gas and Water Orders Confirmation Bill.

The Gas and Water Orders Confirmation Bill, the Mountain Ash District Council Bill, and the Northallerton Water Bill, have been referred to a Select Committee, consisting of the Duke of Devonshire (Chairman), the Duke of Wellington, the Marquis of Anglesey, the Marquis of Zetland, and Lord Manners; to meet on Tuesday, July 6.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the rising of the House on Thursday for the Whitsuntide recess :—

Bills brought from the Lords, read the first time, and referred to the Examiners: Gas Orders Confirmation Bills (Nos. 1 and 2), Lisburn Urban District Council Bill, Stourbridge and District Water Board Bill.

Lords Bills read a second time and committed: Alliance and Dublin Consumers' Gas Bill, South Staffordshire Water Bill.

Bills reported, with amendments: Donington Water Bill [Lords], Glamorgan Water Board Bill, Worksop Water Bill [Lords].

Bills read the third time and passed: Llanelly Water Bill, Oldham Corporation Bill, South Lincolnshire Water Bill [Lords], West Gloucestershire Water Bill.

LEGAL INTELLIGENCE.

ASSESSMENT OF THE PETERBOROUGH GAS-WORKS.

Peterborough Quarter Sessions.—Thursday, May 27.

(Before Mr. E. P. MONCKTON, Chairman, and a Bench of Magistrates.)

The hearing of the appeal of the Peterborough Gas Company against the assessment of their property in the parish of Peterborough Within, the first portion of the proceedings in which were reported in the "JOURNAL" for the 25th ult. (p. 533), was resumed last Thursday. The Assessment Committee, it may be remembered, fixed the rateable value of the property at £4360; and the Company are seeking to have the amount reduced to £2685—a difference of £1675.

Mr. W. C. RYDE and Mr. MORRES NICKALLS (instructed by Mr. W. B. Buckle) appeared for the Company; Mr. H. ST. JOHN D. RAIKES and Mr. H. L. WARD (instructed by Mr. H. B. Hartley) represented the Committee.

Further Evidence for the Company.

Mr. John Barton, the Manager and Secretary of the Company, in further examination, said that between the years 1902 and 1908 the receipts from the ordinary consumers fell by £1371, whereas those from prepayment consumers were multiplied ninefold. The growth of the Company's business, therefore, had been in the direction of having a larger number of consumers who cost the Company a great deal more in proportion to the quantity of gas they burnt. To-day the Company were paying more for their coal and charging less for their gas than they did in 1896; the object of reducing the price being to make gas more popular. In round figures, the increase in the assessment in Peterborough Within, from the last assessment in 1900, was £950.

In cross-examination by Mr. RAIKES, witness said that since 1902 the number of slot-meter consumers had been increased by more than 2000, though the ordinary consumers remained stationary. Last year the Company received £1300 less from the ordinary consumers than they did in 1902; and, on the other hand, £5000 more from the prepayment consumers. In 1902, the ordinary consumers represented 88 per cent. of the Company's customers, and only 44 per cent. last year; but this was due rather to the large increase in the number of slot-meter consumers than to any decrease in the ordinary customers. In 1908, when the price of coal went up, the Company were doing so well that the price of gas was not raised correspondingly, but reduced. At the close of 1908—the year when the mechanical stoker was purchased—the Directors' fees were increased, as was also the Secretary's salary. Asked what proportion of the electricity employed in Peterborough was used in competition with gas, witness replied that it was difficult to

say. All the principal streets, shops, and hotels—all their Company's best customers—had gone, and they had had to go further afield to make up their consumption.

In re-examination by Mr. RYDE, witness explained that the amount of capital raised by the Company up to December last included all that had been charged to capital for meters, which meant that it represented tenant's as well as landlord's capital. It also included £8575 for what might be termed paper alteration in capital, and £25,786 for old works, bought in 1868, which were not now in existence. There was nothing in bricks and mortar to represent these old works. All that remained were a few street lamp-posts, which were at least forty years old. In fact, therefore, the effective capital of the Company was only £85,000 now in use, which included all meters and cookers which had been charged to capital.

The CHAIRMAN: What is the price of coke?

Witness: It varies very considerably—perhaps 13s. or 14s. per ton. It is a drug in the market just now. We can scarcely give it away. We put it on rail at 10s. 6d.

Is it a fact that you are charging some of your consumers 16s. 6d. a ton for coke?—That is only in very small quantities, not by the ton. We are selling it at 14s. to merchants.

In further answer to the CHAIRMAN, witness said that in 1902 and 1904 the maximum dividend was paid—5, 7, and 10 per cent. In 1908 the Company were on the sliding-scale—5 per cent. preference, 7½ per cent. consolidated stock, and no 10 per cent. As to the value of the Company's shares, £10 worth of 7½ per cent. of the new stock could be bought for from £15 to £15 10s. Since the last assessment, the 4 per cent. debenture stock had been increased at various intervals by £21,000. In addition to this, there was an increase of £8575 in the watered stock. It was not correct that last year the capital account was overdrawn, and the sum of £1000 taken from the undivided profits to meet this.

Mr. Samuel Vergette, jun. (Messrs. Fox and Vergette, of Peterborough), presented a valuation which substantially agreed with those of the previous valuers. He also put in a structural valuation of the undertaking, showing the value of the land, buildings, and mains to be £62,500. Witness expressed the opinion that a tenant would require interest at about 20 per cent. at least in order to be induced to take on an "anxious" business of the nature of that which was carried on by the Company.

Mr. Corbet Woodall, re-called, explained a calculation he had made which showed that the present works and mains could be replaced for £60,000 to £70,000.

This concluded the case for the Company.

The Case for the Assessment Committee.

Mr. RAIKES then opened the case for the Assessment Committee by showing the effect of taking 10 per cent. on the hypothetical tenant's capital, instead of 17½ per cent. as claimed by the appellants, which would make a difference of £2000 in the assessment. He criticized certain items which made up the tenant's capital as put forward by the Company, and complained that in some respects the valuation of Mr. Ryde had been arrived at by rule-of-thumb or stereotyped methods, which, though perfectly lawful and proper in their way, were not sufficient in the present case. He claimed for the Committee's expert, Mr. Mason, that he had "gone one better" than Mr. Ryde, and had based his valuation direct on extracts from the books of the Company; the variation in the figures being partly accounted for by the fact that different periods had been taken. Mr. Mason started his year from July 1, 1907, and Mr. Ryde from Jan. 1, 1908; and he (Counsel) submitted that the former was the proper period to take.

Mr. W. A. Mason (Messrs. Hedley, Mason, and Hedley, of Birmingham) explained his valuation, amounting to £7919. The chief point of variation between this valuation and that of Mr. Ryde was the amount of capital required by the hypothetical tenant, which witness put at £14,900, of which he calculated £10,900 at 10 per cent. and £4000 at 5 per cent; making the interest on the tenant's share £1290.

Friday, May 28.

On the resumption of the hearing this morning,

Mr. Mason concluded his evidence on behalf of the Assessment Committee.

In cross-examination by Mr. RYDE, witness said his present valuation of the property in question was £7919, and the sum of £4759, against which the Company were appealing, was the valuation he had returned to the Committee, based on the obtainable profits. He had ascertained a profit of £7513, and had allocated £4900 of it to the landlord and the balance to the tenant, on the percentage of rather more than one-third to the latter and two-thirds to the former. His valuation ignored the reduction of 1d. per 1000 cubic feet in the price of gas as from Michaelmas last, and also the increases in the Directors' fees and the Secretary's remuneration, a part of which would go in as rent, and also because a portion was the landlord's charge and not the tenant's. He had not included lamp-posts in the tenant's capital, because he contended that they were on exactly the same footing as the main to which they were attached—a part of the freehold. It had once been his practice to omit transfer fees from the valuation; but he had not done so for many years. He had not included in the tenant's capital anything for the installation of prepayment meters, pipes, fittings, &c., which went to revenue and not to capital. The service-pipes were the property of the Company (who were in occupation right up to the meter), but not the cookers. The stock of coal in June last, when his valuation was made, was £900 worth, or 1200 tons. He accepted an average of 2162 tons for the past eight years, but contended that the incoming tenant would only take the coal found on the premises; and hence his valuation. He had given evidence in the South Metropolitan Company's case, and had allowed 15 per cent. on ordinary meters, 12½ per cent. on slot-meters, and 10 per cent. on the stock of coal, working capital, and local rates; but he was not the leading witness in that case.

Mr. RYDE: You do not suggest that you gave evidence on figures which you did not believe in?

Witness: They were excessive figures, in my opinion. The Deputy

Chairman of that particular Quarter Sessions had ordered the witnesses to allow 17½ per cent. on tenant's capital. This used to be a cast-iron rule; and a very unjust rule it was.

Do you not yourself allow 17½ per cent. on tenant's capital?—I have done in earlier days, I have no doubt.

Did you not, in valuing the undertaking of this very Company, allow 17½ per cent. on part of the tenant's capital.—Twenty years ago I dare say I did.

I have a valuation here which gives on meters, &c., 17½ per cent., cash balance 10 per cent.—I did not know so much about gas companies then as I do now.

You put half the tenant's capital in those days at 17½ per cent., and the other half approximately at 10 per cent.—Yes; in those days the stock of meters was very much smaller in proportion than it is now.

Mr. W. P. Ryan (Messrs. Morris and Ryan, of London) gave a valuation based on similar lines to that of Mr. Ryde for the appellants; one difference, however, being that he had taken four instead of three months' receipts from the prepayment meters, and four instead of five months' working expenses for the hypothetical tenant, during which period the tenant would require in cash £2549, as against Mr. Mason's estimate of £2600 taken from the Company's books. His valuation of the meters and cookers came to about £9500, against the £13,500 given for the appellants. He brought the tenant's total working capital to £12,675, and the tenant's share to £1419; so that within £200 or £300 he had practically arrived at the same result as Mr. Mason by following, in effect, the method adopted by the valuers for the Company.

Mr. RAIKES, in summing up the case for the Assessment Committee, said the period chosen by the appellants as the basis on which to make their valuation—the twelve months ended December, 1908—was not that on which the assessment was framed. He thought, however, it would be simpler, fairer, and probably more satisfactory, to decide the case practically upon broader grounds than those which could be furnished by the mere working-out of figures on either side. The Committee's valuation had been taken from the Company's books; and he said with considerable confidence that it did not lie in their mouths as a business company, after keeping books for the information of themselves and their shareholders, to come there and say that they desired a reduction in the rates, that their books were wrong, and that no attention must be paid to them. He asked the Justices to support Mr. Mason's valuation, and to say that the written documents in possession of the Company spoke for themselves. If they spoke against the Company, and gave an untrue result as regards values, so much the worse for the Company; but they were binding on the Court. As business men, he asked the Justices to consider what amount of return would tempt them, knowing the circumstances of the case, to invest money not in similar property but in this particular property. He contended the Company were not over-rated under the assessment.

Mr. Ryde's Reply for the Company.

Mr. RYDE, in reply, said a great deal of difficulty which had been introduced by the other side would disappear if they bore in mind his answer to the assertion that the Gas Company were earning large profits—viz., that they were not rateable for profits but for the rent they would give in order to earn those profits. His friend had quoted something; and he would adapt the quotation. He would not say "the lady" but rather "the two gentlemen" on the other side, Messrs. Mason and Ryan, "do protest too much." They were asked to believe that a tenant could be found to take these premises, and pay to the landlord £400 more than the profits he would earn, according to the £7500 valuation. Was he not therefore justified in saying that a valuation, on the face of it, which disproved itself like that could not be relied on, and must discredit the man who put it before the Court? The results arrived at by the other side were so impossible, having regard to the divisible profits, that the Court might well adopt the Gas Company's figures; nor did he ask the Court to split the figures between him and the other side, on the ground that his were a little bit exaggerated, as Mr. Raikes seemed to think that his might be.

The CHAIRMAN announced that the decision of the Court would be given at the next Quarter Sessions, on the 1st of July.

The Malvern Water Pollution Case.—In the House of Lords last week, an appeal was heard from an order of the Court of Appeal, setting aside a judgment and verdict for £7500 awarded in an action brought by the appellant, Dr. John Campbell Fergusson, the lessee and proprietor of a hydropathic establishment at Malvern, which was erected about 1843, and of which the appellant took a lease in 1891. The respondents were the sanitary authority of the district; and the action was brought to recover damages on account of the sewage pollution of water supplied by them. The appellant had been compelled to pay large sums of money by way of compensation to the visitors, patients, and inmates of his establishment. The case was noticed in the "JOURNAL" when it was before the Lower Courts. At the conclusion of the arguments, the Lord Chancellor said that in his opinion the ground had not been laid for interference with the decision of the Court of Appeal. Lord Macnaghten, Lord James of Hereford, and Lord Shaw concurred.

A Water Company Fined.—A case of great interest to water companies, also to consumers of water, was heard by the Guisborough Magistrates last week. The Guisborough Water Company were summoned for having neglected to supply sufficient water for domestic purposes to a dwelling-house in Bennisson Street, Guisborough; and for about two hours the Magistrates were occupied hearing arguments for and against the supply having been cut off. A pipe which supplied a cottage in the street burst, and the official plumber to the Water Company was asked to repair it. This he refused to do unless the supply-tap was transferred from the back yard into the kitchen. Another plumber was engaged to do the necessary repairs, and the tap was not moved. The Company had the water cut off at the main, and the house was for some weeks without a supply. It was argued that the Company, in order to prevent waste of water, had issued regulations for taps to be fixed in the houses. Already owners of about 200 houses had had the position of the taps changed. The Bench decided to fine the Company £1, and £1 14s. 6d. costs.

MISCELLANEOUS NEWS.

SALFORD CORPORATION BILL.

Gas Clauses to be Withdrawn.

We learn from the "Manchester Guardian" that a meeting of the General Purposes Committee of the Salford Corporation, adjourned from the previous day, was held in private last Thursday, to consider what action should be taken on the Corporation Parliamentary Bill. Sir William Stephens presided; and there was a large attendance of members. The meeting lasted nearly two hours; and at the close it was stated that the portion of the Bill dealing with the gas undertaking was to be withdrawn. Alderman Phillips, the Chairman of the Gas Committee, moved that this action should be taken. He said that the ratepayers had had no opportunity of considering the decision of the Lords Committee; and the proposal of the Corporation to extend the gas-works and reduce the illuminating power would never have been passed if it had been understood that the Corporation would need to increase the rates by 6d. in the pound. The Deputy-Chairman of the Committee (Mr. Steele) seconded the proposal to withdraw the clauses; and members agreeing that they were not prepared to increase the rates by reducing the price of gas, the motion was generally agreed to, though two councillors contended that possibly some arrangements could be made with the other districts concerned which would not be quite so onerous as the decision of the Lords Committee, and which might meet with the consent of the Lords. During the discussion, some of the speakers commented upon the way the evidence of certain witnesses for the Corporation was given, and expressed an opinion that, but for these witnesses, there would not have been an adverse decision by the Lords.

WEST BROMWICH GAS UNDERTAKING.

The Past Year's Working.

The Borough Treasurer and Secretary to the Gas Committee of the West Bromwich Corporation (Mr. Thomas Hudson) has presented to the Committee his report for the year ended the 31st of March, which is accompanied by an abstract of the accounts for this period. The report furnishes the following particulars.

The borrowing powers stand at the same amount as at the date of the previous report—viz., £209,309. The loan indebtedness amounts to £136,999—a reduction of £2000; the sinking fund having been applied to this extent in the purchase of stock for redemption. The debt is equivalent to 8s. 4d. per 1000 cubic feet of gas sold—a slight average increase over the year 1907-8, brought about by the decrease in the quantity of gas sold. There is still £9072 in the sinking fund, which, deducted from the outstanding debt of £136,999, leaves a net indebtedness of £127,927—a reduction of £4731 during the year. The capital outlay account was increased by the cost of the additional lift and other extensions carried out to No. 3 gasholder, amounting to £1361, which was defrayed out of the year's revenue, and not by further borrowing. The total amount debited to this account to date is £241,966, of which £136,999 is still owing to the stockholders.

The total income for the year on revenue account was £55,500—a reduction of £3201 compared with the previous year. During the financial period just closed, nearly all branches of trade and industry in the borough suffered from somewhat serious depression; and Mr. Hudson says it is not surprising that in these circumstances the revenue of the undertaking has in consequence been adversely affected, as well as from other influences which are well known to the Committee. A considerable increase in the number of consumers nevertheless took place in the year, no less than 167 new connections having been made; and the number of consumers per mile of main is now 246, compared with 243 this time last year.

The sales of gas amounted to £40,530—a drop of £1505, which is the largest in any one year in the history of the undertaking. All classes of consumers show a falling off except the smaller ones at 2s. 8d. per 1000 cubic feet, and those using gas for manufacturing purposes at 1s. 5d. per 1000 cubic feet, both of which are slightly in excess. There was also a decrease of £1587 in the revenue from residual products, owing to reduced output, and, with the exception of coke, to the lower prices prevailing throughout the year.

The total quantity of gas sold was 329,345,388 cubic feet—a reduction of 12,718,352 cubic feet, equal to 3·71 per cent., compared with the previous year. The loss by condensation and leakage was 21,628,612 cubic feet, equal to 6·07 per cent. The number of houses in the borough in November last was 14,924, of which 5445 are supplied with gas through ordinary meters, and 5765 by means of prepayment meters—a total of 11,210. The number of consumers of all classes at the end of the financial year was 11,522—or an increase of 164.

The total expenditure on trading account amounted to £43,892—a reduction of £2365, due to the diminished production and output of gas, which necessitated the purchase of a smaller quantity of coal, and caused a consequent lower expenditure on other items. The total manufacturing charges, including maintenance of works and plant, showed a reduction of £1755, spread over the various items of expenditure, with the exception of sundry expenses, which were slightly higher. Distribution expenses were lower by £74. The cost of lighting and maintaining the public lamps showed a reduction of £243; the previous year's expenses being considerably above the average. The costs of general management, as well as the amounts paid in rates and taxes, were very similar to those of previous years, excepting the item of bad debts, which, for the first time in the history of the undertaking, exceeded the usual small dimensions. The expenditure was practically the same as the year 1907-8, though the output of gas considerably decreased; the quantity of gas sold per mile of main being 7,032,938 cubic feet—a drop of 296,789 cubic feet per mile.

The gross profit on the trading account was £11,608, against £12,444 before. The balance standing to the credit of the profit and loss account at the commencement of the year was £14,611, of which £1390 was employed in relief of the general district rate, and £2724 placed to the credit of the extensions suspense account, in pursuance of the minute of the Town Council; leaving a net balance of £10,829 to be carried forward. The gross profit of £11,608 for the past year has been charged with the interest on loans and corporation stock, and the proper instalment for the redemption and extinction of the debt, amounting together to £8291; leaving a balance of £3317 as the net profit for the year, compared with £4114 before—a decrease of £797. The cost of the recent extensions to No. 3 gasholder, to which reference has already been made, has been charged against the net profits, instead of raising new capital; and the available balance is consequently reduced to £1956. The debit balance on the extensions suspense account has been reduced by the sum of £2724, transferred from the profits of the year 1907-8; leaving a balance of £7530 still to be provided.

Mr. Hudson's report is accompanied by that of the Borough Gas Engineer (Mr. Harold E. Copp), on the general condition of the works, as well as on the manufacturing results obtained during the past year, from which we make the following extracts.

The condition of the water gas-plant has been the subject of a special detailed report, and is now receiving the consideration of the Gas Committee. With this exception, the works and plant have been maintained in a high state of efficiency. The new outer lift added to No. 3 gasholder has increased its capacity from 658,000 to over 1,000,000 cubic feet. The inner lift is arranged to rise beyond the guide-framing. The additional storage capacity has therefore been obtained at a very low cost (£1361), and during the past winter proved to be of great convenience. The work was carried out in a most satisfactory manner by Messrs. Ashmore, Benson, Pease, and Co., of Stockton-on-Tees.

Owing to the increasing demand for the smallest size of cut coke, which is used principally for forging purposes, it has been necessary to fix an additional coke-cutting machine, and to raise the hydraulic coke hoist about 4 feet to accommodate the machine. This work was carried out by Messrs. Gibbons Bros., Limited, of Dudley. At the same time a subway was constructed from the retort-house to the foot of the hydraulic hoist, for facilitating the removal of coke.

The stoking machinery installed in 1906 continues to work in a thoroughly satisfactory manner. The maintenance of the plant amounted to 105d. per ton of coal carbonized for the discharging-machine, 0.21d. for the charging-machine, and 0.11d. for the engine and dynamo—a total of 1.37d. per ton of coal carbonized, against 0.68d. in the year 1907-8. The additional cost of repairs to the discharging-machine was due to the entire replacement of that portion of the machine which enters the retorts, and is consequently subjected to severe wear and tear. The total cost of carbonization last year amounted to £2107, or 1.41d. per 1000 cubic feet of gas made, compared with £2230, or 1.47d. per 1000 cubic feet, for the year 1907-8, and 2.11d. for the last year in which manual stoking-machines were used.

The quantity of coal carbonized was 27,331 tons, yielding 304,316,000 cubic feet of gas, or 11,141 cubic feet per ton, against 11,208 cubic feet per ton before; the slight drop being due to a somewhat increased difficulty with stopped ascension-pipes. The quantity of coke used for the production of water gas was 930 tons, yielding 52,131,000 cubic feet, or 53,300 cubic feet per ton of coke. The quantity of oil used was 31,766 gallons. The cost of water-gas manufacture, including oil gas and benzol for enrichment, amounted to £2433, or 11.2d. per 1000 cubic feet, against 12.46d. for the previous year. The proportion of water gas on the total production was 14.62 per cent., compared with 11.14 per cent.; and in spite of the increased proportion of water gas the calorific power of the mixed gas was 624 B.Th.U., compared with 621 B.Th.U. Mr. Copp explains that this is accounted for by the production of oil gas, which adds considerably to the heating value of the water gas, and renders it possible to use an increased proportion, in case of emergency, without detriment to the quality of the gas delivered, either as regards heating value or illuminating power. The total quantity of gas made was 356,447,000 cubic feet—a decrease of 8,799,000 cubic feet, or 2.41 per cent., on the previous year. The total manufacturing wages amounted last year to £5684, or 3.81d. per 1000 cubic feet of gas made, against £6064, or 3.98d. per 1000 cubic feet, in 1907-8. The total cost of manufacture and maintenance, including materials but exclusive of coal, was £6383, against £7313, which shows that the strictest supervision was exercised with a view to economy.

The coke produced was 16,971 tons, against 18,832 tons, of which 5888 tons were used for manufacture, compared with 6264 tons before. The cut coke amounted to 4278 tons—an increase of 130 tons. The yield of tar was 10.06 gallons, and of ammoniacal liquor 29.09 gallons, per ton of coal carbonized, as compared with 10.1 and 32.9 gallons respectively. The ammonium sulphocyanide recovered amounted to 1.4 lbs. per ton of coal carbonized.

The gas used on the works during the year was 5,473,000 cubic feet, against 5,470,000 cubic feet; the slight increase being due to gas employed for the generation of electricity for lighting purposes. The benzol used for enrichment was 52,615 gallons, or 0.147 gallon per 1000 cubic feet, against 50,137 gallons, or 0.137 gallon per 1000 cubic feet in 1907-8. The gas oil used was 32,016 gallons, or 0.088 gallon per 1000 cubic feet, against 14,951 gallons, or 0.041 gallon per 1000 cubic feet, before. The increased quantities of these enriching materials is stated to be due to the larger proportion of water gas last year.

In closing his report, Mr. Copp says the decrease in the sales of gas during the past year is a matter for much regret; and, in addition to the causes for the decrease to which reference has already been made, no small proportion must, he points out, be attributed to the generally increasing use of incandescent burners, and also to the continued improvement in illuminating efficiency obtainable from gas by the application of the most modern methods of lighting. He also expresses regret that the business of the fittings department showed

a further falling off during the past year. The unaccounted-for gas last year amounted to 21,509,000 cubic feet, or 6.02 per cent. on the total quantity made, against 17,772,000 cubic feet, or 4.8 per cent. before. There were, however, several serious fractures of mains, by which a considerable volume of gas was lost. With a view to reducing this loss, a systematic investigation of the condition of the mains, as well as the testing of all large meters, is now in progress; the pressures maintained throughout the past year having been much the same as during several previous years. The discrepancy between the average temperature at the station meter and the mean atmospheric temperature was 3.2° Fahr. in excess of that of the year 1907-8; and this fact accounted for an increase in volume of nearly 2 million cubic feet of gas accounted for. There was a considerable increase in the number of consumers' burners attended to by the Gas Department, and Mr. Copp says the system appears to be much appreciated by consumers, as no doubt incandescent gas lighting has suffered much loss of popularity through the indiscriminate sale of inferior burners and mantles.

The number of public lamps remained practically the same last year as before—viz., 1081, of which 797 were fitted with incandescent burners. Automatic lighters have been installed in one district, and have been found to work in a satisfactory manner.

DUNDEE GAS SUPPLY UNDERTAKING.

Accounts for the Past Year.

The "Dundee Advertiser" of Thursday last contained the following statement relating to the Corporation gas undertaking.

As already hinted in the "Advertiser," the price of gas for the current year is to be reduced by 1d. per 1000 cubic feet—making it 2s. 3d. instead of 2s. 4d. as last year, which will be the lowest price on record. This is the net result of the accounts and estimates of the department, which have just been issued. During the year the net income from gas was £91,128, as against £93,813 the previous year; coke brought in £20,776, as against £20,369; sulphate of ammonia, £9369, as against £10,157; tar, £3624, as against £4041; and waggon revenue, £1275, as against £1003. The total revenue was £126,172, as against £129,384. The expenditure included £79,167 for the manufacture of gas, as against £81,583 the previous year; £10,881 for distribution of gas, as against £12,295; £6438 for rents, rates, and taxes, as against £5889; and administration, £3983, as against £3797. The total expenditure on revenue account was £100,470, compared with £103,564 the previous year. The balance carried to net revenue account was £25,702; and, after paying annuities, interest, and sinking fund—£11,171—there is a balance of £2191 to be carried to the current year's account. The total amount of gas made was 875,887,000 cubic feet, of which 20,829,000 feet was carburetted water gas. In the manufacture there were employed 86,815 tons of coal, 72,343 gallons of oil, and 72,749 gallons of benzol. The yield in gas per ton of coal was 98.49 cubic feet. The cost of production was 1s. 3.64d. per 1000 feet of coal gas, and 1s. 3.53d. of carburetted water gas. There are at present 32,274 ordinary meters in use, and 15,606 automatic meters, or a total number of consumers of 47,880. The number of ordinary meter users has been gradually decreasing for the last six years. But the loss has been more than made up by increases in the automatic meter users; so that the total number of consumers has been steadily advancing. The cookers, grills, and rings on loan number 17,222—an increase of 3075. The balance of capital debt on the department at the end of the year was £378,717. The estimates for the current year, as already stated, provide for the price of gas being 2s. 3d. per 1000 cubic feet. The cost of production is expected to be: For coal gas, 1s. 1.84d.; and for carburetted water gas, 1s. 3.54d., per 1000 cubic feet. The total quantity of gas to be produced is 892,968,000 cubic feet. The total income is put down at £122,326, of which £89,964 will be from gas, and the balance from residual products. The expenditure is calculated to leave a balance of £793 to meet contingencies or emergencies.

HEYWOOD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Gas Engineer and Manager of the Heywood Corporation (Mr. W. Whatmough) has lately presented to the Gas Committee his report for the year ending the 31st of March last. The gross revenue amounted to £21,601, and the gross expenditure, less interest and sinking fund, to £15,947; leaving a gross profit of £5654, or a decrease of £1065 compared with the preceding year. The net profit amounted to £223, or a decrease of £1135, due principally to bad trade, the increased cost of coal, the reduction in the price of gas, and diminished consumption of gas for public lighting. The receipts for gas sold for all purposes amounted to £16,992, compared with £18,000, or a drop of £1008. The decreased sum received for gas for ordinary private consumption was £1056, and for public lighting £195. Prepayment meters and stoves and gas for motive power showed an increase of £115 and £128 respectively. The revenue from residuals was £4245, against £4504, or £259 less. There was a lower expenditure by £368 in respect of manufacture; but had the price of coal remained the same as in the preceding year, the total decrease would have been £690—showing that the higher cost per ton caused an additional outlay of £322.

With regard to manufacture, during the past year 576 tons of cannel and 11,689 tons of coal were carbonized—a total of 12,265 tons, against 13,085 tons in 1907-8, or a decrease of 820 tons. The gas made per ton of coal was 10,859 cubic feet, compared with 10,770 cubic feet, or an increase of 89 cubic feet. The total quantity of gas manufactured amounted to 133,190,000 cubic feet, or a decrease of 7,743,000 cubic feet; and the total quantity sold to 123,026,469 cubic feet, or a decrease of 5,549,079 cubic feet. The quantity not accounted for was 9,047,631 cubic feet, or 6.79 per cent., against 7.88 per cent. before, or a decrease of 1.09 per cent., which is equal to a saving of 1,452,000 cubic feet.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

Increase in Consumers, but Decrease in Sales.

The Ordinary General Meeting of the Company was held last Thursday, at the London Offices, No. 90, Cannon Street, E.C.—Sir DANIEL F. GODDARD, M.P., in the chair.

The SECRETARY (Mr. William Cash, F.C.A.) read the notice convening the meeting, the minutes of the previous meeting, and the Auditor's report; and the report of the Directors and the statement of accounts (noticed in the "JOURNAL" last week, p. 541) were taken as read.

The CHAIRMAN said the report was a brief one; but he thought it contained practically all that there was to say in regard to the position of the undertaking at the present time. At the last annual meeting, he ventured to remark that the Directors were hoping for a speedy day of improvement in the commercial prospects of Port Elizabeth; but he was sorry to have to say now that they were still hoping, for their hopes had not yet been realized. Trade continued to be very much depressed in Cape Colony and in South Africa generally; and, of course, the Association had felt the effects of this to a very considerable extent indeed. The competition, too, to which he referred at the previous meeting, had continued in a very strong way against them. Many of their large customers—such as the hospital, for instance, who were always an excellent consumer to the Gas Company—were now taking electric light. He did not know that it would be much consolation to the shareholders in the Association to learn that the Municipality were scarcely making a profit out of their electric light, for the competition certainly affected them. The current was probably sold at so low a price that it did not repay the owners of the electricity undertaking; but it injured the gas business. Notwithstanding all this, however—the bad times and the competition—it was satisfactory to note that the profit for the year now under review was slightly better than that for 1907. This perhaps, might seem rather strange, considering the circumstances of business, because there had been a decrease in the amount of gas sold—a considerable falling off, which, he was sorry to say, showed no check at the present moment. Both in quantity and in money value for the sale of gas they were worse off than they were twelve months ago; but the saving feature had been that they had obtained their coal at a lower price—at a better price, in fact, he thought, than they had ever had it before in the history of the Association—and they had also effected certain economies in the manufacturing part of the business. Thus they were enabled, notwithstanding the reduction in sales, to realize a somewhat better profit than was the case last year. With regard to coal, the Directors were much hoping that they would secure it at a yet cheaper rate than at the present time. The proprietors had heard him say on several occasions that the Board were looking forward to the day when they would be using Natal coal. This time had not, however, yet arrived. They were constantly testing

it; but there had hitherto been difficulties in connection with transport. The Directors were hoping—he might almost say they were monthly hoping—that they would get over these difficulties, and that as a result they would effect a very important saving in the cost of manufacture, when compared with the use of English coal, as at the present time. They had, of course, continually to press forward their business; and in this respect their Manager (Mr. William Arnott) was most energetic, and took care never to lose an opportunity. Therefore they were increasing the mileage of their mains. In this way, nearly 1½ miles had been added during the past year, within which period the number of consumers had also slightly increased. He wished, however, that they would consume as much gas per head as they used to do. But this was a significant feature: Everybody was economizing and cutting down the use of gas; and while the average consumption some years ago per consumer was something like 33,000 cubic feet a year, it was now not very much over 15,000 cubic feet—which was a reduction, roughly speaking, of 50 per cent. Still, the Association had a larger number of smaller consumers—that was what it really meant; and they were using the gas for cooking and so forth. The result was that they had just been able to keep things right. He did not wish to be too despondent; but, on the other hand, he would not like to be too hopeful, because it was difficult to say what would be the result of trading in the near future. The shareholders would notice from the report that at Grahamstown there had been a small increase in the sale of gas. This was also reported last year. Of course, Grahamstown was a place which was not affected by commercial depression in the same way as was Port Elizabeth. He would add that everything about the works was thoroughly well maintained. This was a matter that the Board always looked after. They had not felt it necessary, in the face of the facts to which he had drawn attention, to make any reduction in the dividend, though, of course, the shareholders would have seen that, in paying the same dividend as had been paid since the Association started, it was necessary to draw a little upon the carry-over, by which the sum carried forward would be reduced. In conclusion, he moved the adoption of the report and accounts.

Mr. ANDREW L. DON seconded the motion.

Mr. F. D. MARSHALL asked whether the Association worked under a concession.

The CHAIRMAN replied that there was no concession at Port Elizabeth, but there was one at Grahamstown.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. HENRY WOODALL, a dividend at the rate of 10 per cent., free of income-tax, for the past year (less the interim payment) was declared.

The retiring Director (Mr. Henry Woodall) was re-elected on the motion of the CHAIRMAN, seconded by Mr. A. W. OKE; and the Auditor (Mr. Percival D. Griffiths, F.C.A.) was re-appointed, on the proposition of Mr. F. R. SMITH, seconded by Mr. MARSHALL.

Mr. SMITH proposed a hearty vote of thanks to the Chairman and

MAINTENANCE



The
"NEW DAVIS."

IS the chief ground upon which we claim supremacy for the "NEW DAVIS" Screwless Cooker.

A Customer Writes:

"ENCLOSED please find Cheque in settlement of your account for No. 109 'NEW DAVIS' Cooker. I must also add that I am very pleased with it, and find it answers your advertisement in every way."

The Davis Gas Store Co. Limited

Diamond Foundry, LUTON.

Directors; remarking that they had had a most anxious time. All companies carrying on industrial operations in South Africa had, he said, suffered; and it was not to be wondered at that the Association had felt the effects of bad trade. In spite of this drawback, however, the Directors had managed to pay the same dividend—certain economies having been secured which had been of great advantage to the Company.

Mr. JAMES RANDALL seconded the vote, which was heartily accorded.

The CHAIRMAN, in acknowledging the compliment on behalf of himself and his colleagues, admitted that they had passed through a rather anxious time. To see some of one's best customers going away was, he said, never a pleasant thing; but the Directors believed that, by carefully watching the interests of the concern, they would be able to maintain their position to the satisfaction of the shareholders. The Association had very good servants both here and in South Africa; and he would not like this occasion to pass without thanking them for the efforts they had put forth on behalf of the Association. He was sure the shareholders would not grudge to those who were working so far away in their interests an expression of thanks, and also of confidence, which could be conveyed to them.

The vote was unanimously agreed to; and the meeting separated.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

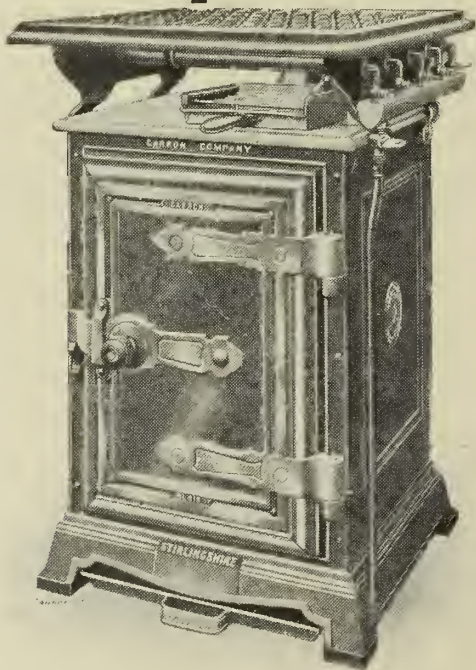
What appears to be another instance of officious interference on the part of the Scottish Office with the proposals of local authorities is reported from Hamilton, the Corporation of which are at present promoting a Provisional Order. The statement is that the Examiner appointed under the Standing Orders has reported that the Orders have not been complied with, inasmuch as by clause 11 of the Provisional Order powers are taken which will enable the promoters to erect gas-works and extend and enlarge existing works, whereas no notices have been served upon the owners, lessees, and occupiers of all dwelling-houses situated within 300 yards of the lands upon which such works may be erected, extended, or enlarged, as required by Order No. 15. Locally some dubiety, it is stated, has been created by this intimation, as to whether or not the Provisional Order has been dropped. The position of matters is that a clause was inserted to give statutory powers to the Corporation to use, for manufacturing purposes, portions of the gas-works grounds which have been acquired since the passing of the Hamilton Corporation Gas Act of 1878. The effect of the action of the Examiner may be that this clause in the Order may drop, if the Chairmen of Committees in both Houses of Parliament do not dispense with the Standing Orders. The Corporation were advised by their Parliamentary Agents that, following upon precedent, the serving of notices upon the owners, lessees, and occupiers of dwelling-houses

situated within 300 yards of the proposed new or extended gas-works was unnecessary where the ground was already included within the boundaries of the gas-works property. It is surely placing a finical interpretation upon law to say that a corporation possessing statutory powers for maintaining gas-works upon a site are not, if they subsequently acquire a piece of land adjoining, to be at liberty to erect any gas-manufacturing plant upon it until they have gone to the expense of obtaining further parliamentary powers. This may be the strict interpretation of the law; but it is not one which has been acted upon. I could cite an instance of such extension of gas-works which is going on at present, upon recently acquired ground, and where parliamentary sanction has not been asked for the new works. The procedure is regulated by section 18 of the Burghs Gas Supply (Scotland) Act, 1876, as to which, it is to be observed, there is no penalty imposed for non-compliance with the section. The Scottish Office seem to have regulations of their own, upon which they are acting.

In January last, the Corporation of Wishaw were so displeased at a suggestion by the Manager, that extensions (chiefly to the condensing and scrubbing plant) were necessary at the gas-works, that the proposal was made by the Gas Committee that the Manager should be granted a holiday; it being the intention, while he was away, to conduct the gas-works in such a way as to show that extension was not required. Though the proposal—an absurd one—received considerable support in the Council, it was defeated; and it was resolved to call in Mr. Thomas Wilson, of Coatbridge, to report upon the works, and as to whether or not extension was necessary. Mr. Wilson has reported; and the Town Council have, at a special meeting, considered his report. It has not been made public, but it is intimated that, after discussion, a recommendation that about £1000 should be expended upon the works was agreed to. By this it would appear that the Manager's position has been vindicated.

For some time past a difference of opinion has existed between the Gas Committee of the Perth Corporation and the Burgh Auditor as to the valuation of the stock of gas-meters in the hands of the Gas Department. The contention of the Auditor was that the valuation was overstated at £14,000. To settle the matter, it was resolved to have an independent valuation of the stock. This has now been done by Mr. Daniel Macfie, of Edinburgh, who has submitted a detailed statement, bringing out the value at £17,886.

At a meeting of the Edinburgh and Leith Gas Commissioners on Monday—Provost Smith, of Leith, in the chair—the Works Committee reported that, having taken up the remit as to the admixture of air with gas, and having read Mr. Pennell's letter to the Clerk, and considered his verbal explanation that his allegation was that the gas, after manufacture, was mixed with air, and in this state supplied to consumers (the grounds of such allegation, however, being refused to be disclosed), along with the Engineer's reply that the allegation was incorrect, but that air was, according to the invariable practice in the manufacture of gas, mixed in a certain small degree during such process, but afterwards and before distribution eliminated, Mr. Pennell



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Carron Company
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moved that a remit be made to an engineer—not a gas engineer—to investigate and report as to the procedure adopted at the Granton works. This was seconded by Councillor Douglas Elliot. Bailie Inches moved, as an amendment, that the Commissioners were satisfied with Mr. Herring's explanations; and Provost Smith seconded. The latter motion was adopted in Committee by fifteen votes to two. In the Commission, Bailie Bryson, the Convener of the Committee, moved the adoption of the report; and the Chairman seconded. Mr. Pennell asked for an inquiry; and moved that the matter be re-committed to the Committee. He considered that there should be a daily test of the gas, and thought the Board of Trade could not refuse to take cognizance of the admixture of gas and air, because they had issued regulations upon the subject. Mr. Herring said that the Board of Trade would never issue regulations for the mixing of air with gas. Such a statement was an absurdity from the very foundation. Mr. Pennell went on to say that there was a limit recognized by the Board of Trade, beyond which the admixture of air was inadmissible. Mr. Douglas Elliot again seconded, remarking that there was a very strong suspicion in the public mind in regard to the manufacture of gas. Mr. Herring pointed out that he had explained to the Committee the impossibility of air getting into the gas supply, and consequently into the gas when it was being tested. It was one of the complaints of the Commissioners before the Parliamentary Commission last year that the testing of the gas was only made about once a month; and the Commission arranged that the average of three tests was to be taken as the average illuminating power. So far as they themselves were concerned, the gas was tested at least four times a day. The testing-station in the City Chambers in Edinburgh was so far removed from the gas-works at Granton that any suspicion as to what might be done at the works could not hold good. The complaint about the pumping of air into gas had its origin more than a century ago. It was thought that air was pumped in in order to make consumers' meters go round. They would never dream of introducing 1 per cent. of air into the gas, and thereby lowering the illuminating power by 6 per cent. If it were considered economical to dilute gas, there were two or three other processes which they might use. But they did not want to dilute it; they wanted to give the public the best gas they could. He hoped they would excuse him for treating the matter seriously, as it was really a phantastic one. The report of the Committee was adopted by 13 votes to 3.

A question arose as to the illuminating power of the gas; Mr. Douglas Elliot asserting that Mr. Herring had told them that it was reduced to 17 candles. Mr. Herring said the present record was 18½ candles. Mr. Douglas Elliot reiterated that Mr. Herring told them that the illuminating power had been reduced as he had said, and that there had been no complaints, and he wished the Commissioners to take the responsibility. He (Mr. Elliot) had protested against this, and moved that the Commissioners do not reduce below 17 candles. They had had many complaints regarding the illuminating power of the gas. They had been told it was to reduce the price; but he thought the general community would rather pay a fair price and get a good article than

have a reduction in price and lower quality. There was no doubt they had to burn more gas to get the same amount of light out of it. Bailie Lindsay, of Leith, moved that the Commissioners take no action in the matter. The facts were that before the Works Committee Mr. Herring stated that the large quantity of cannell bought was, in his opinion, sufficient for the production of gas of not less than 17 candles; but that during the winter there was just the possibility of severe weather affecting the gas, which might go down to (say) 16.99 candles, and that it would be extremely injudicious to be, perhaps the next day, producing gas of 17-candle power. The majority of the Committee thought it would be just as injudicious to tie Mr. Herring's hands in this matter; and in order to safeguard themselves and Mr. Herring, they not only bought the ordinary coal, but also 10,000 tons of high-grade cannell, so that there would be no risk of the gas going below 17 candles. Mr. Calder seconded. It was agreed by 12 to 4 votes to take no action as regards the illuminating power.

An exhibition of the gas appliances of Messrs. R. & A. Main, Limited, was held in the Rifle Club at Wick last week. It was closed on Friday evening by Provost Ross, who referred to the splendid display of goods which the manufacturers had, at considerable expense, brought to Wick. It was, the Provost proceeded, due to their excellent Gas Manager, Mr. M'Giffen, that the exhibition had been held, as it was he who suggested the idea of having it. Mr. M'Ewen, replying for Messrs. Main, said they were greatly pleased with their visit to Wick. It had proved satisfactory in every way. Orders had been taken for upwards of seventy stoves; and he believed that in a short time the number would be doubled. Miss E. M. Dods, of Dundee, was the lecturer in the exhibition.

The annual report of the Directors of the Bothwell and Uddingston Gas Company, Limited, states that the balance at the credit of the revenue account, after charging all renewals and bad debts, amounts to £3077. The sum at the credit of the profit and loss account, including a balance of £1489 from the previous year's account, is £4478, which the Directors recommend should be applied in payment of a dividend at the rate of 10 per cent. for the year on £23,000, and in making an addition of £1000 to the reserve fund; leaving to be carried to this year, £1178. The sale of gas was 59,018,000 cubic feet, realizing £8419. There was derived from coke £1968; from tar, £335; from sulphate of ammonia, £892; and from the hire of stoves, £55. The total revenue was £11,669, and the total expenditure £8591. The quantity of coal carbonized was 7120 tons. The coke made during the year amounted to 4200 tons, of which 533 tons were used on the works, and 3677 tons sold. The figures show that the Company have had a year's business which is altogether satisfactory, and with regard to which the Manager—Mr. L. Hislop—deserves all credit.

At a parish meeting of the Streatley ratepayers called to consider the advisability of adopting the Lighting Act, 17 voted for the motion and 47 against.

POPULAR WITH EVERY GRADE OF CONSUMER!

The Simplest way to increase your Yearly output, you will probably agree, is to be in the position to offer Apparatus which puts Gas to a new use in the Home, and which is found indispensable day in and day out, all the Year round, when once used.

Such Apparatus (bearing in mind the admitted unpopularity of the Gas Griller for Toasting) is

THE "RAPID" TOASTER

already well known throughout the British Isles, owing to the large amount of advertising direct to the Consumer which we are doing, as **A MOST EFFICIENT APPARATUS**, making, as it does, *Four Slices of delicious Toast at once*, and very quickly.

We Reproduce here



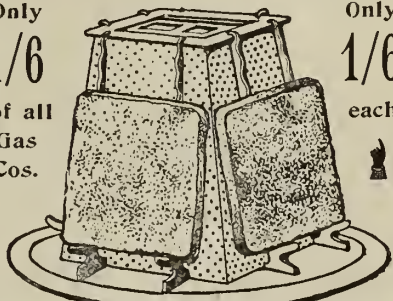
The essential part of an advertisement which we have inserted in many of the Daily Newspapers, and Ladies' Periodicals, and the success we have met with has encouraged us to take larger spaces in the various media, which are bound to cause you to get numerous enquiries for the Toaster from your consumers.

THE "RAPID" TOASTER.

Only

1/6

of all
Gas
Cos.



Only

1/6

each.

TOASTS FOUR SLICES AT ONCE!
Simply stand Toaster on Gas Ring and place four slices of bread on rests shown.

The "Rapid" Toaster is strongly made of sheet steel, and is manufactured by us in Birmingham.

Will you help us to help you, by placing a sample order with us?

To those in authority who are desirous of putting the "Rapid" Toaster through rigid tests, we will gladly send one **free sample** carriage paid.

We are in constant Receipt of Testimonials and Repeat Orders for "RAPIDS" from all over the Kingdom.

ELBARD STOVE CO.,

106 & 108, Queen Victoria St.,
LONDON, E.C.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, May 28.

The necessity for completing the covering of May contracts has induced greater activity, and for immediate delivery very full prices have in some cases been paid. At the close, however, the market is quieter; and the quotations are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 6s. 3d. per ton f.o.b. Leith. There continues to be inquiry in the forward position, but there has not been much actual business. There are buyers at £11 5s. per ton f.o.b. for delivery up to the end of the year; but this price is quite 2s. 6d. per ton below the ideas of makers. For delivery January-June, 1910, £11 15s. per ton is quoted; but £11 12s. 6d. per ton is probably about the value.

Nitrate of Soda.

The spot market is firm at 10s. 6d. per cwt. for 95 per cent., and 10s. 9d. for refined quality.

Tar Products.

LONDON, May 28.

The market remains in about the same position, with the exception of pitch, which is very firm and slightly improved in price. There have been one or two sales made direct with the tar distillers and Continental consumers; and an increased price has been demanded and paid. In South Wales, there is a slight lull owing to the unsettled state of the coal market; but it is confidently predicted in many quarters that a strike will not take place. Creosote continues firm; and in London, the makers are somewhat independent as to selling for forward delivery. In the Midlands and in the North, good prices have been obtained. Benzol is very quiet, and sales are difficult to negotiate. Solvent naphtha is inclined to be weaker, although the manufacturers are not willing to take a lower price. Heavy naphtha is steady; but there is very little further business. Crude carbolic acid is in about the same position.

The average values during the week were: Tar, 11s. 6d. to 18s. 6d., ex works. Pitch, London, 27s. 6d. to 28s.; east coast, 27s. to 27s. 6d.; west coast, 26s. to 27s. f.a.s. Mersey ports, 26s. 3d. to 27s. 3d. f.o.b. others. Benzol, 90 per cent., casks included, London, 5½d. to 6d.; North, 5½d. to 5¾d.; 50-90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6¼d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¼d. to 7½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11¼d.; North, 9d. to 9½d.; heavy naphtha, casks included, London, 10¾d. to 11¼d.; North, 9¾d. to 10¾d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is very little inquiry at the moment; and the only market where there appears to be any business doing is at Leith, where one or two parcels have been exchanged for delivery during the next month at £11 5s. to £11 6s. 3d. To-day, Beckton terms are £11; Hull, £11; and Liverpool, £11 1s. 3d.

COAL TRADE REPORT.

Northern Coal Trade.

There is (as is usual before a holiday week) a heavy demand for fuel, and a very full production; so that the shipments have been large, both of steam and gas coals. Best Northumbrian steams are in strong request. The price has been a little firmer, at from about 12s. 3d. to 12s. 4½d. per ton f.o.b.—the shipments to the Baltic being now regular and full. Second-class steams are from about 9s. 9d. to 10s. 6d. per ton; and steam smalls are in active request at from about 5s. 6d. to 6s. 6d. In the Durham coal trade, there is more briskness; for though the home consumption of gas coals is reduced at this season, there are increased needs from other quarters. Durham gas coals vary from about 9s. 3d. to 10s. 6d. per ton f.o.b., according to quality, for the usual classes; while for "Wear specials," up to 11s. 6d. is quoted. A contract for some 9500 tons of best Wear coals has been fixed for Randers at a price expected to leave about 11s. 1½d. per ton f.o.b.; so that it will be seen that the price obtained for this class of gas coal under contract is very near that currently quoted. In coke, the market is steady. This has its influence upon gas coke, which is only in limited output, and is now quoted from 12s. 9d. to 13s. 3d. per ton f.o.b. Tyne or Wear.

Scotch Coal Trade.

Ell coal and splint are still in poor demand. Steam coal is very plentiful. Evidently the belief in a strike or lock-out of the miners is not very widespread, as there is not much indication of a disposition on the part of consumers to stock coal. The prices quoted are: Ell 8s. 9d. to 10s. 6d., splint 9s. 6d. to 10s., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 316,281 tons—an increase of 1927 tons over the preceding week, but a decrease of 5146 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,362,340 tons—an increase of 295,099 tons upon the corresponding period.

King Brothers (Stourbridge), Limited, is the title of a Company registered on May 22 with a capital of £50,000, in £10 shares (171 5 per cent. cumulative preference shares, 1829 6 per cent. preference shares, and 3000 ordinary shares). The registered office of the concern is at Park Lane, Netherend, Cradley, near Stourbridge.

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Successful Pneumatic Switch Installations.

Pneumatic switches in connection with incandescent gas-burners have practically replaced the electric light at Madame Tussaud's well-known Baker Street exhibition. Some two years ago, a portion of the main hall was fitted with inverted incandescent gas-burners, on three and six light cluster pendants, actuated by the distance lighters of the Pneumatic Gas Lighting Company, Limited; and these have been found so satisfactory that there are now over 150 lights so controlled. The system has, the proprietors of the exhibition state, not only proved a great convenience, but has also effected a considerable saving in the consumption of gas. The building is now splendidly illuminated; the light being soft and well diffused. The Pneumatic Company have another installation just completed, and one that is also of importance to the gas industry. They have controlled the lighting of the Birds of Paradise House at the Zoological Gardens by means of two switches actuating six lights. This was brought about by the Superintendent with a view of minimizing the great mortality among the rare birds in this section. The birds of paradise occupy the outer cages; but in the centre of the room there are a great quantity of small and rare birds. The installation has now been carried out about three months; and it is stated that the result so far has been very encouraging. The two switches actuating the lights are placed in a switchbox outside the building. The keeper, in going his rounds at about 3 or 4 o'clock in the morning, switches on the lights in the building; and the birds then commence to feed, without being disturbed. This should be somewhat of a "poser" for those who prate about the deadly fumes of gas, for the authorities at the Zoological Gardens are not likely to have installed gas without being first assured that no harmful effects could possibly result from its use.

Paignton Water Supply.

In spite of the fact that the construction of the new water-works has only been completed within the last few years, the Paignton District Council are already considering the question of duplicating the main by which the water is brought from the Holne reservoir on Dartmoor to the town. The subject was discussed at the last meeting of the Council, when Mr. Milsom moved that, before anything was done in the matter, they should obtain the advice of Mr. Baldwin Latham, or some other competent Engineer, as to the best course to pursue. Mr. Milsom said they were informed by their own Engineer, Mr. Vanstone, that they could get a maximum supply of 600,000 gallons per day through the present main from the Holne reservoir; and after allowing 250,000 gallons per day for the supply of Teignmouth, they had 350,000 gallons for the use of Paignton and Brixham. In addition, there was a supply of about 200,000 gallons from the old Paignton reservoirs. This supply was in excess of their present needs, and ought to be sufficient for some time to come. Mr. Drew suggested a thorough discussion of the subject by the Water Committee, and moved an amendment which would have the effect of providing for this. Mr. Huggins was of opinion that an expert could not tell them anything which they did not know already. As a preliminary to any step which might be subsequently taken, a meter should be obtained so as to check the supply and prevent waste. Mr. Lamshead pointed out that they were under agreement with Teignmouth to duplicate the main, and that the matter had been thoroughly considered before coming to that agreement. They ought not, however, to proceed with the work unless they were satisfied it was absolutely necessary. Mr. Ham said the Teignmouth Council could not call upon them to duplicate the main for five years after they began to take water, and then they must give two years' grace. The Chairman (Mr. Parnell) thought the matter was one on which experts could be of little use. The question was referred to the Water Committee, with instructions to consult an Engineer or take any other step which they may consider necessary before coming to a decision. In connection with the new water supply, three Candy filters have been put down, with a view to neutralizing any plumbo-solvent tendency which may exist in the water, which is of soft moorland quality.

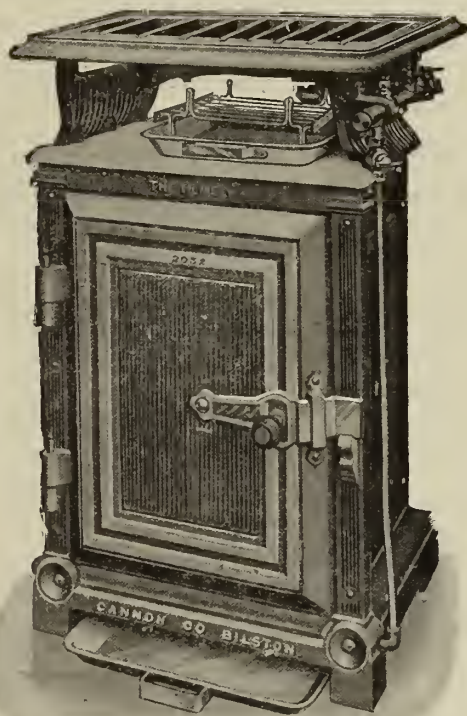
Newcastle-on-Tyne and Automatic Lamp Lighting.—At last Tuesday's meeting of the Newcastle City Council, Mr. Wallace asked with what object a deputation from the Watch Committee recently visited certain towns, thereby incurring expense to the extent of £85; and whether this amount was included in the estimates for the current year. Alderman Goolden, in reply, stated that the deputation referred to, which involved a total expenditure of £79, was appointed to visit Bournemouth, Tottenham, Lambeth, Windsor, and Liverpool, for the purpose of inspecting appliances for the automatic lighting and extinguishing of public lamps, and with a view to the adoption of one of the systems now in use, estimated to effect a saving to the city of from £2000 to £4000 per annum. The sum included in the estimates against this expenditure was £50. The report of the deputation, which would be issued in due course, would, he had reason to believe, show that a useful public service had been accomplished by the investigation.

Public Lighting of Launceston.—At the last meeting of the Launceston Town Council, a tender was submitted by the Gas Company for lighting the public streets for the year beginning Aug. 2 next, at the same rate as last year. The Company regretted that, owing to the continued high price of coal, they were unable to make a reduction in the cost of lighting the town. Mr. Hender pointed out that lighting cost the ratepayers more than 6d. in the pound of the rates; and he said that, while they did not want the Gas Company to supply them at a loss, they ought to get full value for the money. Alderman Treleaven expressed the opinion that there was no town in Cornwall which was so well lighted as Launceston. Mr. Reed thought the cost ought to be less; and said it was unfortunate that the Gas Company's purchases did not coincide with the drop in the price of coal. Mr. J. Treleaven, jun., remarked that gas coal was no cheaper; and Mr. Trood, as one engaged in the coal trade, said the price of coal was not any lower than last year. The tender was referred to the Lighting Committee.

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Gas and Commercial Securities Corporation, Limited.

On the 24th ult., there was registered the "Gas and Commercial Securities Corporation, Limited," with a capital of £100,000 divided into 20,000 shares of £5 each, and £100,000 in debentures; the present issue being limited to £50,000 in shares and £50,000 in debentures. The prospectus (which will not be advertised) states that the Company is formed more especially for the purpose of acquiring and holding debentures and preference and ordinary shares in gas and commercial undertakings, under the guidance of a Board of Directors intimately acquainted with the circumstances of the gas industry, and with practical business experience. It is hoped that in course of time the Company may render services to established gas and water companies which, when issuing additional capital, have, it is pointed out, frequently a residue that is not taken up by their shareholders. This the Company might acquire on favourable terms. The number of Directors will not be less than three, nor more than seven; and the first three are Mr. Robert S. Gardiner, Mr. Stephenson R. Clarke, and Mr. Arthur F. Phillips, who have agreed to take 100 shares of £5 each. No contracts have been entered into; and no shares or debenture stock are being issued as fully or partly paid up otherwise than in cash. There are no founders' shares. No promotion money has been paid, nor any commission for underwriting shares. The Company will commence its operations with no liability, beyond the cost of registration and the preliminary expenses. The registered office is at No. 39, Lombard Street, E.C.

Gas Discounts at Belfast.—The Belfast Gas Committee had reported to them last week that the Council, at their last meeting, had referred the question of discounts back to the Committee for re-consideration. After some discussion, it was pointed out by Alderman Craig that all gas consumers using up to 400,000 cubic feet of gas per annum on the same premises are entitled to a discount of 15 per cent., while those using over that quantity are in receipt of 20 per cent., provided the account is paid in the Gas Office within one month from the date of furnishing the account; and in order to equalize the discount over all consumers, he proposed that the discount of 15 per cent. be increased to 20 per cent. The motion was passed.

A Falling Off in Profits at Leeds.—The Leeds Gas Committee have had before them the statement of accounts for the year to March 31. This showed a surplus profit of £5245, as compared with £14,708 the previous year. The gross profit was £93,538, being a decrease of £8449 as compared with 1907-8. After paying interest on loans £47,679, and other charges, a net profit of £40,979 remained; and from this £35,734 had to be set aside for the redemption fund. From the surplus profit, £3000 is carried to reserve fund, and only £2245 applied for rate relief. The falling off in profits is attributed to the increased cost of coal, and the decreased receipts for tar and other residuals. The latter cause accounts for £7600; and the cost of coal was nearly £2000 more.

London County Council and the Daylight Saving Bill.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee recommended the Council to approve generally the provisions of the Daylight Saving Bill, 1909, and to authorize the Clerk to give evidence in support of the Bill. The General Purposes Committee, however, expressed the opinion that the circumstances did not warrant the Council in giving its unqualified approval to so highly contentious a measure, and Mr. Felix Cassel (the Chairman of the Parliamentary Committee) accepted an amendment proposed by Mr. D. S. Waterlow, M.P., to this effect, though, he said, it had been stated that if the Bill passed the Council would save £8000 a year. A vote was pressed for, and the amendment was carried by 40 to 28.

Wem Urban District Council and the Gas-Works.—At the last meeting of the Wem Urban District Council, a letter was read from the Secretary of the Wem Gas Company, Limited, to the effect that the two letters which had been received from the Council with regard to the gas-works had been laid before the Directors, who had requested him to state that they were not indisposed to consider the sale of their undertaking as a going concern at full value. Before entering into negotiations as to price, however, it would be necessary to have a valuation made; and they would not be justified in incurring this expense unless they were assured by the Council that they seriously contemplated purchase. Mr. Bowcock remarked that if the Company would offer their concern at a reasonable price, the Council would buy it. With regard to the question of a valuation, they would not be justified in paying for it. He proposed that the Council ask the Directors to state at their early convenience at what price they would sell the undertaking; and the motion was carried *nem. con.*

Staffordshire Potteries Water-Works Company.—In the report which was adopted at the annual meeting of the Company last week, the Directors stated that for the year ended March 31 the water revenue was £63,909, showing an increase of £484. The profit on the revenue account was £31,369. After providing for the interim dividend paid in December, there remained a balance of £16,806, which they recommended should be appropriated as follows: To the payment of a dividend at the rate of 9½ per cent. on the consolidated ordinary stock (free of income-tax), making, with the interim dividend, 9½ per cent. for the year; the payment of a dividend at the rate of 7 per cent. on the consolidated new ordinary stock (less income-tax), making, with the interim dividend, 7 per cent. for the year; balance for transfer to depreciation and contingent fund account, £2182. The Chairman (Mr. J. Maddock) said the meter revenue was less—a result which plainly showed that the trade of the district was not up to the average of the last few years. On the other hand, domestic rates, &c., showed an increase which more than made up the loss on sales for trade purposes. The Directors would ask the shareholders to sanction the raising of further capital, to enable them to carry out the work they were now engaged upon at Mill Meece, and for the extension of mains and other purposes, as might be required. At the subsequent extraordinary meeting, the Board were authorized to raise £12,000 by the issue of consolidated new ordinary stock, and £4000 by the issue of perpetual 3½ per cent. debenture stock.

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Assessment Appeal by the Cannock Gas Company.—At the Staffordshire Quarter Sessions, a few days ago, the Cannock, Hednesford, and District Gas Company appealed against the assessment of their works in the parish of Cannock. Their case was presented by Mr. W. C. Ryde, who submitted that the rateable value of the property should be reduced from £1607 to £1065. He failed, however, to convince the Bench; and the appeal was dismissed, with costs.

Liquidation of the British Cerofirm Company, Limited.—The report of the Official Receiver was issued last Friday to the creditors and shareholders of the British Cerofirm Company, Limited. The accounts show total liabilities of £10,508 and a deficiency in assets of £5623. The loss to the shareholders is returned at £115,723. The failure of the Company was, in the opinion of the Official Receiver, due to the fact that the original mantle purchased of the Cerofirm Gesellschaft proved valueless. Mr. H. M. Moody has been appointed Liquidator.

Coventry Superannuation Scheme.—The Coventry Corporation Gas Committee have re-considered their report as to the establishment of a scheme for providing pensions for certain men who have served in the department for long periods, but whose services it will be necessary to dispend with owing to the discontinuance of gas manufacture at the old works. The Committee have now decided to recommend the Council to adopt the following revised scheme of payments: (1) For men who have served 25 years and over, 10s. per week; (2) for those with 20 years', but less than 25 years', service, 8s. a week; (3) for those with 10 years', but less than 20 years', service, 6s. a week. Men under 45 years of age are to be placed in the third class notwithstanding that they have 20 years' service. The present scheme is regarded as equitable, and is likely to meet with general acceptance.

Reigate Electric Light Loan Refused.—The Reigate Town Council, at their last meeting, had before them a letter from the Local Government Board relative to an application to borrow a sum of £4000 for electric light purposes. The letter stated that the Board would sanction the borrowing of £1521 towards defraying excess expenditure up to March 31, 1908; but they were not empowered to authorize a loan for £133, paid in respect of the cost of the Provisional Order. In regard to the proposed borrowing of the sum of £2340 for prospective expenditure on mains, transformers, services, and meters, the Board "draw the attention of the Council to the very unsatisfactory financial position of the undertaking, and to the heavy losses which have been continuously incurred since the works were opened in 1901;" and they express the opinion that, "before any further loan is sanctioned, the Council should engage a highly qualified electrical engineer to investigate thoroughly the working of the undertaking, with the view of ascertaining what steps should be taken to place it on a more satisfactory footing." A Committee was appointed to interview the Board on the subject; it being stated that the Electric Lighting Committee as a whole are not in favour of having expert advice.

New Issue of Ilford Gas Company's Stock.—The whole of the £7500 of ordinary "C" stock and of the £2500 of 4 per cent. debenture stock of the Ilford Gas Company for which tenders were invited in the "JOURNAL" a few weeks ago was disposed of on the 25th ult. as follows: The ordinary stock at prices ranging from 133½ to 137½; and the debenture stock at prices ranging from 100½ to 101. The applications for the ordinary stock amounted to more than two-and-a-half times the quantity offered.

Former Belfast Timekeeper Sentenced.—At the Belfast Recorder's Court on Friday, Charles H. Moorhouse, a former timekeeper at the Corporation gas-works, was sentenced to twelve months' imprisonment with hard labour for falsifying his books and embezzlement during the past five years. Before sentence was passed, Mr. Campbell, for the accused, made an appeal to the Acting Recorder for leniency. The prisoner, he said, had been overwhelmed with domestic trouble. His wife, who was now with her two children living with the prisoner's father in Manchester, had been for a long period in delicate health; while for years he had had to support an invalid sister.

A new reservoir with sand filtration proposed to be provided at Croydon will, it is estimated, cost £91,000. The Town Council have deferred their decision on the matter.

The Lesmahagow Gaslight Company has been registered with a capital of £4000, in £1 shares, for which the public are not invited to subscribe. There has been a Gas Company in Lesmahagow since 1846.

On the recommendation of the Public Control Committee, the London County Council last Tuesday accepted the tender of Messrs. W. Sugg and Co., Limited, for the repair, reverification, and refixing of twelve gasholders at the Spitalfields gas-meter testing office.

The London County Council have decided to apply to Parliament for increased powers to deal with the smoke nuisance in London. One power sought is to spend a sum not exceeding £500 a year for the advancement of measures for the abatement of the smoke nuisance.

Mr. William Edgar, of Hammersmith, has been entrusted by the Hawera Gas Company, New Zealand, to fit up the town with the all-copper "Caxton" lantern, column cock, cast-brass street-lighting burner, and governor and distant lighters. These were all shipped quite a fortnight before the time specified.

At their meeting last Tuesday, the Directors of the Continental Union Gas Company, Limited, resolved to pay, on the 3rd prox., an interim dividend on the ordinary stock of 2½ per cent., free of tax, for the half year (being at the rate of 5 per cent. per annum), together with the half-yearly dividend of 3½ per cent. on the preference stock—the latter less income-tax.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER AND MANAGER. Bolton Gas Department. Applications by June 14.
MANAGER. Maryport Urban District Council. Applications by June 3.
DISTRICT SUPERINTENDENT. No. 5097. Applications by June 12.
WORKS CHEMIST. Preston Gas Company. Applications by June 14.
INSPECTOR, &c. No. 5100.
TRAVELLER. No. 5101.
SALESMAN. Canterbury Gas and Water Company. Applications by June 12.

Situations Wanted.

CLERK. No. 5099.
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COMPLETE GAS-WORKS. Northleach Gas Company.
GAS-COOKERS. Coventry Gas Department.
PURIFIERS, &c. Sutton Gas Company.

Plant, &c. (Second-Hand), Wanted.

LIVESEY WASHER. No. 5095.

Meeting.

INSTITUTION OF GAS ENGINEERS. Institution of Mechanical Engineers, Storey's Gate, S.W. June 15, 16, and 17.

Stocks and Shares.

PORTSMOUTH WATER COMPANY. June 15.
READING GAS COMPANY. June 14.
SOUTHEND WATER COMPANY. June 9.
WORKING ELECTRIC SUPPLY COMPANY. June 9.
YARMOUTH WATER COMPANY. June 9.

TENDERS FOR

Acid (Brimstone and Pyrites).

CHORLEY GAS DEPARTMENT. Tenders by June 15.

Coal and Cannel.

BARROW-IN-FURNACE CORPORATION. Tenders by June 8.
BURY CORPORATION. Tenders by June 14.
DEWSBURY GAS DEPARTMENT. Tenders by June 9.
GLOSSEFORD GAS COMPANY. Tenders by June 12.
HAVERHILL URBAN DISTRICT COUNCIL. Tenders by June 8.
LEEK GAS DEPARTMENT. Tenders by June 5.
LURGAN GAS COMPANY. Tenders by June 7.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by June 14.
NEW MILLS URBAN DISTRICT COUNCIL. Tenders by June 12.
NORTHWICH GAS COMPANY. Tenders by June 10.
PETERBOROUGH GAS COMPANY. Tenders by June 7.
SALISBURY GAS COMPANY. Tenders by June 12.
STOKE-ON-TRENT GAS DEPARTMENT. Tenders by June 10.

Furnace Slag, Fettling, Mill Scale, Tarpaulin Cuttings, &c.

GREAT WESTERN RAILWAY. Tenders by June 8.

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ROCHDALE GAS DEPARTMENT. Tenders by June 9.

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LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 30.

Oil for Gas Manufacture.

BARROW-IN-FURNACE CORPORATION. Tenders by June 8.

Retort Setting and Rebuilding, &c.

MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by June 8.

Tar and Liquor.

ACCRINGTON GAS AND WATER BOARD. Tenders by June 8.
BIRKENHEAD CORPORATION. Tenders by June 10.
CHORLEY GAS DEPARTMENT. Tenders by June 15.
DUDLEY GAS COMPANY. Tenders by June 8.
GREAT WESTERN RAILWAY. Tenders by June 8.
LEEK GAS DEPARTMENT. Tenders by June 5.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 12.
MACCLESFIELD GAS DEPARTMENT. Tenders by June 12.
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STOUBRIDGE GAS DEPARTMENT. Tenders by June 11.

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Queen Victoria Street, London, E.C. Director
Benj. T. King, A.I.M.E., British Chartered Patent Agent
(Regd. by Exam.). Telep. 632 Central. Teleg. "Geologic,"
London. We sustain over quarter of a century's Experience and Reputation for Patenting Inventions and Registering Trade Marks throughout the World.
Write or call. We attend and advise you free.

GAS TAR wanted,

BROTHERTON & CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
WAKEFIELD, AND SUNDERLAND.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger.

The one Machine which Discharges and Charges
at One Stroke.

See Advertisement, May 4, p. 11, of Centre.

ALDRIDGE AND RANKEN,

33, VICTORIA STREET, WESTMINSTER, S.W.

Telegrams:

Telephone:

"MOTORPATHY, LONDON."

5118 WESTMINSTER.

**KRAMERS AND AARTS WATER-
GAS PLANT.**

K. & A. WATER-GAS COMPANY, LTD.

39, VICTORIA STREET, S.W.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER
WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS,
BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

"GAZINE" (Registered in England and

Abroad). A radical Solvent and Preventative
of Naphthalene Deposits, and for the Automatic
Cleaning of Mains and Services.

It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West
Moor Chemical Works, KILLINGWORTH, or through his
Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-
TYNE.

Telegrams: "DORIC," Newcastle-on-Tyne. National
Telephone No. 2497.

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND

CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams:

Telephone:

"Dacolight London."

2336 HOLBORN.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

DESSAU PATENT VERTICAL RETORTS.

FOR list of Installations, see "Journal,"

May 18, p. 1, of Centre.

THE DESSAU VERTICAL RETORT COMPANY,

Care of Mr. CHARLES HUNT, Consulting Engineer,

17, Victoria Street, WESTMINSTER, S.W.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS
ACT, and Decisions thereunder," 1s.; "TRADE
SECRETS v. PATENTS," 6d.; "DOCTRINE OF
EQUIVALENTS, Mechanical and Chemical," 6d.;
"SUBJECT-MATTER OF PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent
Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
grams: "Patent London." Telephone: No. 243 Holborn.

PINCHBECK'S Meters and Burglar

PROOF STRONG BOX.

See illustrated advertisement, May 11, p. 1, of Centre.
PINCHBECK LIMITED, Adams Place, George's Road,
HOLLOWAY, N.

LUX'S GAS PURIFYING MASS.

See Advertisement on p. 606.

FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON & CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-
LAND.

TO Gas Managers, &c., Wanted, Old

Condemned GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
&c., also bought.

J. WILSON, Pleasadt Grove, York Road, King's Cross,
LONDON, N.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

Telegrams: "CHEMICALS."

GAS PLANT for Sale—We can always

offer NEW and SECOND-HAND GAS AP-
PARATUS, including Retorts and Fittings, Condensers,
Exhausters, Scrubbers, Washers, Purifiers, Gas-holders,
Tanks, Valves, Connections, &c. Also a few COM-
PLETE WORKS. Compare Prices and Particulars
before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, DEWSBURY.

**BRISTOL RECORDING GAUGES
AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 23, COLLEGE HILL,
LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIA.

Consumers in any form are invited to correspond
with CHANCE AND HUNT, LTD., Chemical Manufac-
turers, OLDBURY, WORCS.

METER INDICES

WITH AND WITHOUT DIALS.

A. ROUX & CO., Limited,

9, SOUTHAMPTON STREET, HOLBORN, W.C.

MOVEMENTS FOR CLOCKS, PHOTOMETERS AND
BAROGRAPHS, WHEELS, PINIONS AND WORMS.

WORKS, HANDSWORTH, BIRMINGHAM.

MR. W. B. MIMMACK, for many years

Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

CLERK, who has had Four Years' Ex-

perience in the Office of a large Gas Company,
wishes to obtain a SIMILAR POSITION. Good Writer.
Disengaged, June 12.

Address No. 5099, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

GAS Engineers attending the Meetings

of the Institution of Gas Engineers are cordially
INVITED TO VISIT us at 49, 50, and 51, Wool Ex-
change, Coleman Street, E.C. We can show you the
TWIN-LIGHT BURNER, which, on low pressure,
puts up Lighting Values at least 50 per Cent. This is
no idle boast.

ONE of the largest Gas-Stove Firms

requires a thoroughly Smart and up-to-date
TRAVELLER for London and the South of England.

Apply, in the first instance, giving all Particulars as
to Age, Experience, Salary required, &c., to No. 5101,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Preston Gas Company require the

Services of a Young WORKS CHEMIST. Salary,
£80 per Annum.

Applications, with copies of Testimonials, to be
received by the undersigned not later than June 14.

SAMUEL TAGG,
Engineer.

WANTED—An Inspector to Visit
Customers and obtain Orders for the Supply of Gas and Gas Appliances. Must be Conversant with the Relative Values of Gas and Electric Light.
Apply, by letter, stating Age, Experience, Salary required, and with copies of recent Testimonials, to No. 5100, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a District Superintendent
for Control of Out-Door Staff (Gas and Water). Thoroughly up to date in Modern Lighting and able to Secure Business in Competition with Electricity. Good Appearance, Tactful, and Enterprising. Age not to exceed 35.

Applications, by letter, with at least Three recent copies of Testimonials, stating Wages, and if Married or Single, to be received by June 12, 1909.
Address No. 5097, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CANTERBURY GAS AND WATER COMPANY.

THE Directors require an Experienced
Gas-Stove and Fittings Show-Room SALESMAN.
Applicants must be competent to Advise Consumers as to the use of Gas Cookers, Fires, Gas-Fittings, &c. Previous Experience and Knowledge of Gas Fitting and Electric Lighting essential.
Preference given to an Energetic Man of Good Address.

Salary, £100 per Annum, with House, Gas, and Water Free.
Applications, endorsed "Salesman," stating Age, and Qualifications, with copies of Two recent Testimonials, in own Hand-Writing, to be delivered at the Company's Offices, Castle Street, Canterbury, on or before the 12th of June next.

JAMES BURCH,
Secretary.

Canterbury, May 26, 1909.

MARYPORT URBAN DISTRICT.

APPOINTMENT OF MANAGER OF GAS-WORKS.

THE Maryport Urban District Council
invite APPLICATIONS for the above APPOINTMENT from competent Men thoroughly Acquainted with the Manufacture and Distribution of Gas and the Making of Sulphate of Ammonia. Preference given to a Practical Gasmaker.

Particulars of Duties may be had on Application to the undersigned.
Salary, £100 per Annum, with free House, Coal, and Lighting.

The person appointed will be required to give his whole time to the Service of the Council.

Canvassing, either directly or indirectly, will disqualify Applicants.

Applications, in Candidates' own Handwriting, stating Age, giving Particulars of Experience, and with Testimonials (not more than Three) of recent date, will be received by the undersigned up till Noon on Thursday, June 3 next.

F. KELLY,
Clerk of the Council.

Town Hall, Maryport,
May 21, 1909.

COUNTY BOROUGH OF BOLTON.

GAS ENGINEER AND MANAGER.

THE Gas and Lighting Committee of
the Bolton Corporation invite APPLICATIONS for the APPOINTMENT of a GAS ENGINEER and MANAGER, who will be required to devote the whole of his time to the duties of the Office and will not be permitted to undertake any other Business Employment.

Salary, £500 per Annum, rising by Annual Increments of £25 to £600 per Annum.

Two Works—Make of Gas, 1000 Million Cubic Feet per Annum or thereabouts. Mechanical Stoking Machinery in use at One of the Works, and Generative Furnaces in use at both Works.

Applicants must have had Practical Experience in the Position of a Gas Engineer and Manager, and be thoroughly versed in the Manufacture and Purification of Coal Gas, both with Lime and Oxide of Iron, with the Construction of Water-Gas Plant and the Manufacture and Purification of Water Gas, and with the Manufacture of Sulphate of Ammonia, and also must have a thorough knowledge of the Commercial Management of a Gas-Works.

Applications, endorsed "Gas Engineer and Manager," stating Age and previous Experience, together with copies of not more than Three Testimonials of recent date (which will not be returned), to be delivered to the undersigned not later than Twelve Noon on the 14th of June next.

Canvassing Members of the Council will be deemed a disqualification.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
May 21, 1909.

LIVESEY Washer Wanted, Modern

make, 10-inch Connections, to effectively deal with 250,000 to 300,000 Cubic Feet per day.

State Price to No. 5098, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER has to Offer, for Im-

mediate Delivery by Railway Trucks, in Large or Small Quantities, Fine Material from a large English Iron-Works, containing from 45 per cent. to 60 per cent. FERRIC OXIDE, and should be Useful for Gas Purification Purposes. Free Sample sent on Application.

Address No. 5102, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Three Purifiers, by Newton,

Chambers, and Co., 20 ft. square by 5 ft. deep. Planed Joints, 18-inch Valves and Connections, with Bye-Passes, Travelling and Lifting Gear. In Good Condition. Being Removed for Extension.

Apply to the SECRETARY, Gas Office, Sutton, Surrey.

THE Institution OF Gas Engineers.

THE ANNUAL GENERAL MEETING

WILL BE HELD ON

TUESDAY, JUNE 15 (10.30 a.m.)

WEDNESDAY, JUNE 16 (10 a.m.),

AND

THURSDAY, JUNE 17 (10 a.m.),

AT THE

INSTITUTION OF MECHANICAL ENGINEERS,

STOREY'S GATE, ST. JAMES' PARK,
WESTMINSTER,

By kind permission of the Council.

The Chair will be taken by the President,
THOMAS GLOVER, Esq.

In connection with the Meeting an Excursion to Norwich, will take place on the Friday, June 18.
Full Particulars are announced in the Programme.

THE BENEVOLENT FUND.

The Annual General Meeting of the Contributors to the Benevolent Fund will be held at the Institution of Mechanical Engineers on Wednesday, the 16th of June, at 10 a.m.

WALTER T. DUNN, Secretary.

39, Victoria Street, Westminster, S.W.,
May 24, 1909.

FOR SALE, Cheap, the undermentioned

GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkin's VALVES, 12-inch, 10-inch, 6-inch.
Apply to SAMUEL WHILE and Son, 60, Queen Victoria Street, LONDON, E.C.

TO CAPITALISTS AND OTHERS.

FOR SALE.

THE Directors of a Gas-Works in a

Small Country Town, Seven Miles from Railway, are, owing to insufficient Capital, offering the BUSINESS FOR SALE. Output increased from Half-a-Million to Three Times that amount in Eighteen Months. Inspection and Offers invited.

Particulars from the SECRETARY, Gas Company, Northleach, GLOS.

THE Coventry Corporation Gas Depart-

ment have FOR SALE about 170 WESTERN GAS-COOKERS, made by the Davis Gas Stove Company. These are excellent Gas-Cookers for Slot Consumers and are only offered for Sale because of being replaced by larger Cookers. They have been thoroughly Repaired, Cleaned, and Renovated, and supplied with New Grill Pans and Grids.

Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
April, 1909.

WE have the following New and Over-

hauled Second-Hand PLANT FOR SALE:—
GASHOLDER (Two-lift), 50 ft. by 18 ft., in BRICK or NEW STEEL TANK.

GASHOLDER (Two-lift), 50 ft. by 16 ft., in NEW STEEL TANK.

GASHOLDER (8500 cub. ft.), in NEW STEEL TANK (and smaller in stock).

Annular CONDENSERS, 8-in., 12-in., and 18-in. diameter Connections.

Water-Tube CONDENSERS (set of Three), 6-in. Connections.

Morris & Cutler CONDENSER, 8-in. Connections.

Pipe CONDENSERS, from 4 ins. up to 12 ins.

Clapham's WASHER-SCRUBBER, 6-in. Connections.

Tower SCRUBBERS, 7 ft. by 55 ft., 4 ft. by 16 ft., 3 ft. 6 ins. by 16 ft., &c.

EXHAUSTERS and ENGINES (Single and Combined) 2000 to 60,000 cub. ft.

PURIFIERS, 6 ft., 8 ft., 12 ft., and 20 ft. Squares. In sets of 2's or 4's.

STATION METERS, 4 in. to 18 ins., New Drums, Governors, 4 ins. to 10 ins.

TAR and LIQUOR PUMPS, for Hand Working and Steam Power.

BOILERS, TANKS, VALVES, and all Requisites for Gas-Works.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, Dewsbury, YORKS.

COAL.

THE Salisbury Gas and Coke Company

invite TENDERS for 1000 to 3000 Tons of GAS COAL delivered f.o.r. Salisbury as required over next Twelve Months.

Tenders (on Sender's Form) before June 12, addressed to Mr. N. H. HUMPHREYS, Gas-Works, SALISBURY.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Purchase of their Surplus TAR during the Twelve Months ending June 30, 1910.

Tenders (on our own Tender Form), endorsed "Tar," and addressed to the Chairman of the Gas Committee, to be sent to me on or before Friday, June 11, 1909.

By order of the Committee,

CHARLES H. WEBB,

Engineer and Manager.

Gas-Works, Stourbridge,
May 27, 1909.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF GAS OIL.

THE Corporation are prepared to re-
ceive TENDERS for the Supply of about 550 to 650 Tons of OIL, suitable for the Manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such quantities and at such times as may be required during the period ending June 30, 1910.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Oil," to be delivered at the Town Clerk's Office not later than Twelve o'clock Noon on Tuesday, the 8th of June, 1909.

The lowest or any Tender not necessarily accepted.

By order,

L. HEWLETT,

Town Clerk.

Town Hall, Barrow-in-Furness.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to re-
ceive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the Supply of Screened GAS COAL and CANNEL for the Year ending the 30th of June, 1910.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock Noon on Tuesday, the 8th of June, 1909.

The lowest or any Tender not necessarily accepted.

By order,

L. HEWLETT,

Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF NEWCASTLE-UNDER-LYME.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for
the Supply and Delivery of 9000 Tons of GAS FUEL during the Twelve Months ending June 30, 1910.

Forms of Tender may be had from the undersigned.
Tenders to be sent to the Town Clerk on or before June 14, 1909.

The Committee do not bind themselves to accept any Tender.

E. P. BASKEYFIELD,
Manager and Secretary.

Newcastle, Staffordshire,
May 22, 1909.

NEWCASTLE-UNDER-LYME CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee of this Corporation
are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR produced at these works for Twelve Months ending June 30, 1910.

Tenders, endorsed "Tar and Liquor," to be sent to the Town Clerk on or before June 14, 1909.

The Gas Committee do not bind themselves to accept the highest or any Tender.

The Tar and Liquor to be taken in Boats.

E. P. BASKEYFIELD,

Manager and Secretary.

Newcastle, Staffordshire,
May 22, 1909.

LOUGHBOROUGH CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Lough-

borough Corporation invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months from July 1, 1909, to June 30, 1910.

Estimated amount of Tar, 600 Tons; Liquor, 1000 Tons.

The Contractor to state the Price for Liquor at 5° Twaddell, and per Ton extra for every 1° above 5°.

The Corporation to Deliver both Tar and Liquor into Contractor's Boats at the Derby Road Wharf, Loughborough.

Tenders, to be endorsed "Tenders for Tar and Liquor," and addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than Saturday, the 12th of June.

The Committee do not bind themselves to accept the highest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

May 24, 1909.

LOUGHBOROUGH CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR LIME.

THE Gas Committee of the Lough-
borough Corporation invite TENDERS for the Supply of 800 Tons (more or less) of Best Hand-Picked LIME for Purifying purposes, to be delivered at Loughborough Station during the Twelve Months ending June 30, 1910.

Further Particulars may be obtained from the undersigned.

EDWARD ONIONS,
Engineer and Manager.

May 24, 1909.

TENDERS FOR GAS COAL.

THE Corporation Gas Committee of Stoke-upon-Trent invite TENDERS for the Supply of approximately 12,000 Tons of GAS COAL. Specification and Form of Tender may be obtained from the undersigned, or at the Gas Offices.

Tenders to be sent in not later than Twelve o'clock noon on the 10th day of June, 1909, addressed to F. Geen, Esq., J.P., Chairman of the Gas Committee, Stoke-upon-Trent, and endorsed "Tender for Gas Coal."

WM. PRINCE,
Engineer and Manager.

Gas Office, Stoke-upon-Trent,
May 27, 1909.

HAVERHILL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Haverhill Urban District Council invite TENDERS for the Supply of 600, 1200, or 1800 Tons of best GAS COAL, Screened or Unscreened, to be delivered free at the Haverhill (Great Eastern Railway) Station in such Quantities and at such periods as may be ordered from time to time between the 1st day of July next and the 30th day of June, 1910.

No Form of Tender is provided, nor will be supplied. The Council reserve the right to divide the Contract as they think fit, and do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed "Gas," to be delivered to me on or before the 8th day of June, 1909.

THOMAS BATES,
Clerk.

Haverhill, May 28, 1909.

BOROUGH OF CHORLEY.

(GAS DEPARTMENT.)

THE Chorley Corporation invite Tenders for the following for One or Two Years from the 1st of July, 1909—viz.:

- 1—Supply of BRIMSTONE ACID, 110 Tons or thereabouts per Annum.
 - 2—Supply of PYRITES ACID, 200 Tons or thereabouts per Annum.
 - 3—Purchase of the Surplus TAR for One Year. Approximate quantity, 650 Tons.
- Forms of Tender for Acid and any further Information may be obtained from Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, duly endorsed, to be sent to me on or before Tuesday, the 15th day of June.

The Corporation do not bind themselves to accept any Tender.

JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
May 28, 1909.

LURGAN GASLIGHT AND CHEMICAL COMPANY, LIMITED.

THE Directors invite Tenders for the Supply of 3500 Tons of Best Quality Screened GAS COAL, delivered into the Works at Lurgan, or placed on Lighters or on Rail at Belfast.

The Coal must be delivered in such Quantities and at such times as the Directors may fix, and the Weights as shown on the Company's Weighbridge to be accepted by the Contractor. Each Cargo to be accompanied by a Certificate as to place of origin.

Tenders (no Special Form in use), accompanied by Reference to Gas-Works using the Coal offered, should reach me not later than Monday, June 7, 1909, at 10.30 o'clock a.m.

The Directors do not bind themselves to accept the lowest or any Tender.

FRED. W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 10, 1909.

BOROUGH OF MACCLESFIELD.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of July next.

Tenders, for the Tar or Liquor separately, to be sent in not later than Saturday, June 12, 1909, addressed to the "Chairman of the Gas Committee, Town Hall, Macclesfield," and endorsed "Tender for Tar, &c."

For Conditions, Apply to Mr. W. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any Tender for the Tar or the Liquor separately.

The highest or any Tender not necessarily accepted.

F. R. OLDFIELD,
Town Clerk.

May 19, 1909.

BOROUGH OF ROCHDALE.

(GAS DEPARTMENT.)

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of 100 16-inch Square STREET LANTERNS, suitable for Incandescent Lights. They must be Storm Proof, made of Copper throughout, and fitted with Porcelain Reflectors.

Persons Tendering must forward Sample Lantern, unpainted, addressed to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Rochdale, from whom any further Information may be obtained.

Tenders, endorsed "Street Lanterns," containing detailed Description of the Lanterns offered, must be sent in to me, addressed to the Chairman of the Gas and Electricity Committee, not later than Noon on Wednesday, June 9, 1909.

By order,
WM. HENRY HICKSON,
Town Clerk.

Town Hall, Rochdale,
May 28, 1909.

COUNTY BOROUGH OF BURY.

THE Corporation of Bury are prepared to receive TENDERS for the Supply of about—
40,000 Tons of GAS COAL.
900 Tons of BOILER SLACK.
400 Tons of BURG.
300 Tons of HOUSE COAL.

Forms of Tender and Conditions may be obtained on Application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Tenders to be delivered to the Town Clerk, Bury, not later than Nine a.m. on Monday, June 14, 1909.

GREAT WESTERN RAILWAY.

THE Directors of this Company are prepared to receive TENDERS for the Purchase of:—
GAS TAR and AMMONIACAL LIQUOR.
FURNACE SLAG, FETTLING, and MILL SCALE.

TARPAULIN CUTTINGS and SHEET TIES.

Forms of Tender (upon which alone Tenders will be received) may be obtained on Application to the undersigned, by whom Tenders, marked outside "Tender for Residuals," will be received up to Ten a.m. on Tuesday, the 8th of June.

The Directors do not bind themselves to accept the highest or any Tender.

G. K. MILLS,
Secretary.

Paddington Station, London,
May 24, 1909.

LEEK URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at the Gas-Works during the Twelve Months ending June 30, 1910.

Sealed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, not later than Saturday, June 5, 1909, endorsed "Tender for Tar or Liquor," as the case may be.

Full Particulars, with Form of Tender, to be obtained from the undersigned.

By order,
HAROLD HENSHAW,
Clerk to the Council.

Town Hall, Leek,
May 20, 1909.

LEEK URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Supply of 10,000 Tons of Screened GAS COAL or Washed or Unwashed NUTS, to be delivered at Leek Station in Quantities as directed for the period of Twelve Months ending June 30, 1910.

Forms of Tender to be obtained from the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, not later than Saturday, June 5, 1909.

The lowest or any Tender will not necessarily be accepted; and the Committee reserve the right to Purchase the whole or any Portion of the Quantity offered.

By order,
HAROLD HENSHAW,
Clerk to the Council.

Town Hall, Leek,
May 20, 1909.

PETERBOROUGH GAS COMPANY.

TENDERS FOR BEST SILKSTONE GAS COAL.

THE Directors of the above Company invite TENDERS for One or Two Years' Supply of Best Screened SILKSTONE NUTS. Delivery to commence July 1, next.

The Tenders must state:—
Price per Ton in Waggon at Pit.
Railway Rate to Peterborough.
Wagon Hire to Peterborough.

Tenders must be sent in by the 7th of June, 1909, endorsed "Coal," and addressed to the Chairman of the Company, Gas-Works, Peterborough.

The Directors do not bind themselves to accept the lowest or any Tender.

Special Tender Forms are not provided.

JOHN BARTON,
Secretary and Manager.

Peterborough, May 21, 1909.

TO TAR DISTILLERS AND OTHERS.

THE Corporation of Birkenhead invite OFFERS for the Purchase and Removal of the Surplus TAR produced at their Gas-Works during a period of One, Two, or Three Years commencing July 1, 1909.

Deliveries will be made at the Gas-Works either into Contractor's Tanks on the Gas-Works Railway Siding or into Tanks for Conveyance by Water.

The Contractor whose Tender is accepted will be required to enter into a formal Contract or Agreement with the Corporation, upon the Specific Terms and Conditions contained in the Draft Contract which has been prepared by the Town Clerk and deposited in his Office for Inspection.

The Contract contains a Clause as to the payment of the Rate of Wages and the observance of the Hours of Labour recognized and agreed upon between the Trades Unions and the Employers in Birkenhead, or in the locality in which the work for carrying out the Contract is executed as the case may be.

Forms of Tender and further Particulars may be obtained from the Gas Engineer, Mr. T. O. Paterson, C.E., Gas-Works, Thomas Street.

Tenders, which must be on the printed form supplied, sealed and endorsed "Tender for Tar," to be sent in to me not later than Five p.m. on Thursday, June 10, 1909.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
J. FEARNLEY,
Town Clerk.

Town Hall, Birkenhead,
May 29, 1909.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, &c.

THE New Mills Urban District Council invite TENDERS for the Supply of 3000 Tons of Best GAS COAL and 500 Tons of CANNEL for the Year ending June 30, 1910.

Forms of Tender and full Particulars may be had on Application to the Gas Manager.

Tenders, properly endorsed, to be sent to me, the undersigned, not later than June 12, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

J. POLLITT,
Clerk.

Town Hall, New Mills,
May 24, 1909.

TENDERS FOR SURPLUS TAR.

THE Directors of the Town of Dudley Gaslight Company invite TENDERS for the Surplus TAR produced at their Works during the Year ending June 30, 1910. The Tar to be loaded into Buyer's Tank at the Gas-Works.

Further Information may be obtained at the Works. Sealed Tenders, addressed to the Chairman and endorsed "Tender for Surplus Tar," to be sent in not later than the 8th prox.

The Directors do not bind themselves to accept the highest or any Tender.

By order,
T. E. STILLARD,
Secretary.

Gas-Works, Dudley,
May 26, 1909.

THE Directors of the Glossop Gas

Company invite TENDERS for the Supply, during the Year commencing Aug. 1, 1909, of about 6000 Tons of Good GAS COAL and 500 Tons of CANNEL, which must be delivered, carriage paid, at the Great Central Railway Station, Glossop.

Forms of Tender may be obtained at the Company's Office.

Sealed Tenders, specifying the Description of the Coals and the Pit from which they are to be raised, must be sent to the Chairman of the Company not later than Saturday, the 12th of June next.

The Directors do not bind themselves to accept the lowest or any Tender.

J. SIDEBOTTOM,
Secretary.

Gas Offices, Glossop,
May 21, 1909.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board invite Tenders for the Surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Works of the Board during the Year from the 1st of July next to the 30th of June, 1910.

The estimated quantity of Tar is 2000 Tons; and Liquor, 6000 Tons.

Sealed Tenders, endorsed "Tar and Liquor," addressed to the Chairman of the Board, must be in my hands on or before Tuesday, the 8th of June.

By order,
CHARLES HARRISON,
General Manager.

General Offices, Accrington,
May 26, 1909.

BOROUGH OF DEWSBURY.

THE Gas Committee are prepared to receive TENDERS for the Supply and Delivery at their Gas-Works Siding, Savile Town, Dewsbury, of the following Quantities of Screened GAS COAL, during the period of One, Two, or Three Years commencing on the 1st day of July next:—

	Black Coal.	Cannel.
1st Year	22,000 Tons.	500 Tons.
2nd Year	22,000 "	200 "
3rd Year	22,000 "	200 "

Tenders must specify Prices for Delivery by Rail, and be made on Forms to be had on Application to Mr. George Wm. Fligg, Savile Town Gas-Works, Dewsbury, from whom any further Information can be obtained.

Sealed Tenders, endorsed "Tender for Gas Coal," to be sent to me, not later than Wednesday, the 9th day of June next.

The Committee do not bind themselves to accept the lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury,
May, 1909.

MOUNTAIN ASH URBAN DISTRICT COUNCIL.

TO GAS-PLANT CONTRACTORS.

THE Council invite Tenders for Supplying and Delivering to the Penrhwiellier Gas-Works the necessary MATERIALS, and Executing the LABOUR in RE-SETTING from Foundations Two (2) REGENERATIVE SETTINGS of Six (6) RETORTS, and RE-BUILDING One (1) Bed of Six (6) RETORTS from floor level, in existing Empty Arches.

The Council will provide the Retorts and all Ironwork except Retort Bolts.

Further Particulars required may be obtained from Mr. W. G. Thomas, Surveyor, Town Hall, Mountain Ash, on and after Thursday, the 27th inst.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, prepaid and endorsed "Gas-Works Renewals," to be sent to me so that they may be received not later than Ten a.m. on Tuesday, the 8th day of June, 1909.

By order,
H. P. LINTON,
Clerk to the Council.

Town Hall, Mountain Ash,
May 24, 1909.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1910.

Full Particulars and printed Form of Tender may be had on Application to the undersigned.
Tenders, endorsed "Coal," are to be sent in addressed to the Chairman, by Thursday, June 10, 1909.

SAM. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at Four o'clock p.m., on Thursday, the 10th prox., for the Half Year ending on the 30th prox., and WILL BE RE-OPENED on the Morning of Friday, the 11th prox.

The Interest for the Half Year will be payable on the 1st of July next to the Proprietors registered on the closing of the Books.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., May 27, 1909.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED during Thursday, the 17th inst., for preparation of the Interest Warrants for the Half Year ending the 30th of June, 1909, and that they will be RE-OPENED the next day for the ensuing Half Year.

A. G. SNELGROVE,
Secretary.

Gas-Works, Stratford, E.,
June 1, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £8000 NEW ORDINARY STOCK, AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 750 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, as above.

READING GAS COMPANY.

SALE BY TENDER OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

THE Directors of the Reading Gas Company invite TENDERS for:—
£5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

to be raised in Pursuance of the powers of "The Reading Gas Act, 1902."
Sealed Tenders, on the Form provided, must be delivered at the Company's Central Offices, 159, Friar Street, Reading, on or before Monday, the 14th of June, 1909.

The Stock will be allotted to the highest bidders, and will be Registered in the names of the Purchasers, or their Nominees, Free of Expense.

The Purchase Money for the Stock to be paid by the 30th of June, 1909.

The Debenture Stock ranks before the whole of the Company's Preference Shares and Ordinary Stock, and the interest on the same has priority of payment over the Dividends on the said Preference Shares and Ordinary Stock.

Particulars and Conditions of Sale and Forms of Tender may be obtained on Application to the undersigned.

By order of the Directors,
A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
May 18, 1909.

WORKING ELECTRIC SUPPLY COMPANY, LIMITED.

£1000 FOUR-AND-A-HALF PER CENT. DEBENTURE STOCK.

(DIVIDEND PAID ON ORDINARY CAPITAL, 5 PER CENT.)

MESSRS. EDWIN FOX & BOUSFIELD will include in their next STOCK AND SHARE AUCTION at the Mart, E.C., on Wednesday, June 9, at Two o'clock, the above STOCK, in Lots of £100.
Particulars at the AUCTIONEERS' OFFICE, 99, GRESHAM STREET, BANK, E.C.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT 20 & 21 VIC. CAP. XLV. (1857).)

ISSUE OF £3 10s. PER CENT. PERPETUAL DEBENTURE STOCK AT PAR.
(This is an Authorized Trust Investment Stock under the Trustee Act, 1893.)

NOTICE is Hereby Given, that the Directors of the above Company are prepared to receive APPLICATIONS for the above STOCK at par, being PERPETUAL DEBENTURE STOCK authorized under the Provisions of the Company's Acts of Parliament and Orders. The Stock will bear Interest on and from the date of payment of the money at the rate of £3 10s. per Centum per Annum, payable Half-Yearly in respect of the Six Months ending the 31st of March and the 30th of September in each Year.

Applications to be forwarded by post, addressed to the Secretary of the Company, on or before Tuesday, the 15th day of June, 1909.

In the event of Allotment, the amount must be paid within One Month from the date of the Allotment Letter. If this provision is not complied with, the Allotment will be thereby cancelled.

The Directors will endeavour to deal with Applications in the order in which they are received, subject to an option of conversion to the holders of existing Mortgage Debenture Bonds. But the Directors do not bind themselves to accept any Offer; and it is further stipulated that the determination of the Board of Directors in all matters relating to the Offer, Allotment, Issue, or otherwise in respect of the above Stock, shall be final and binding on all parties. No amount of Stock less than £50 will be allotted, and the Stock will be transferable in multiples of £1 only.

No Offer will be considered unless made on a Form of Application which can be obtained from the Secretary.

By order of the Board of Directors,

J. L. WILKINSON,

Secretary to the Company.

Offices: Commercial Road,
Portsmouth, May 20, 1909.

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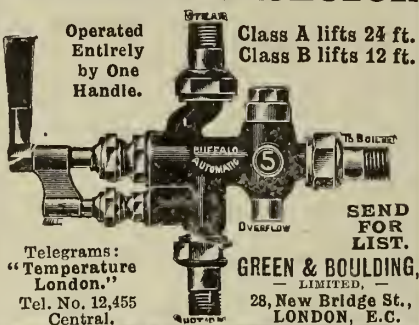
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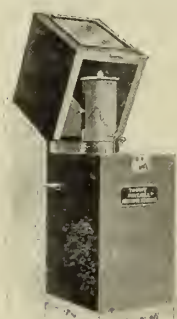
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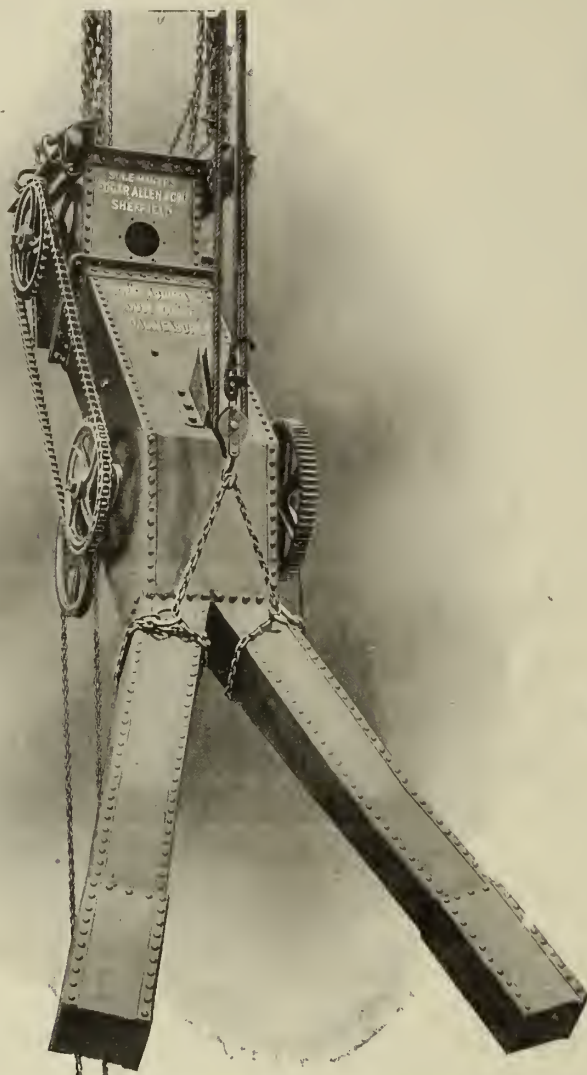
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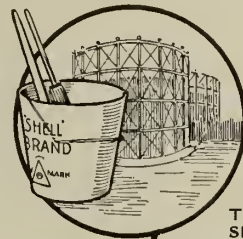
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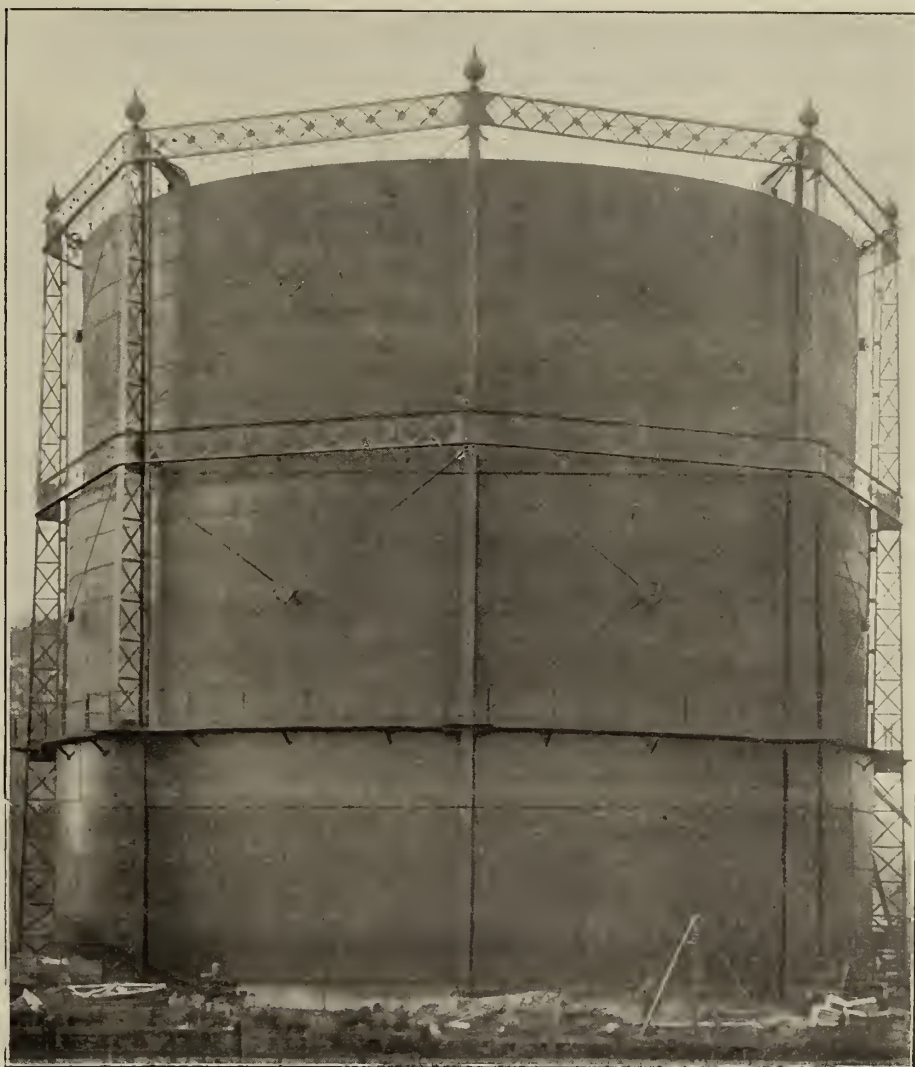
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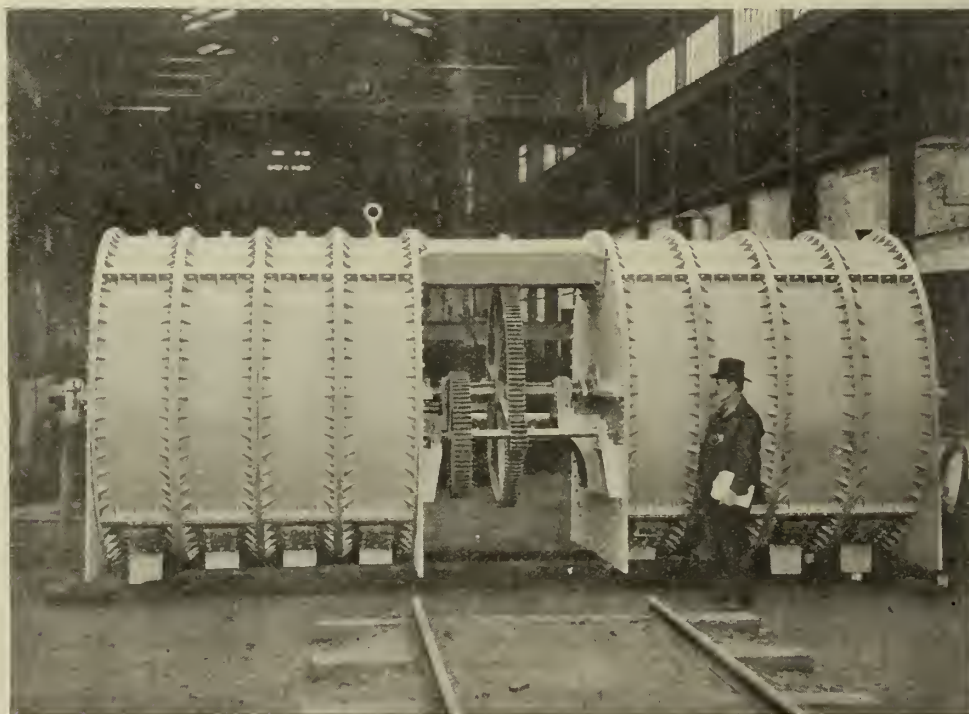
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A Few Recommendations for this System:—

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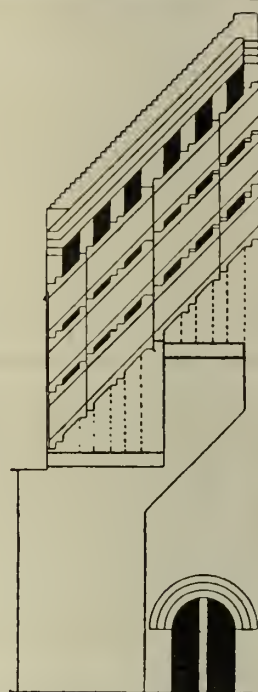
More liquid Tar.

Stopped Pipes unknown.

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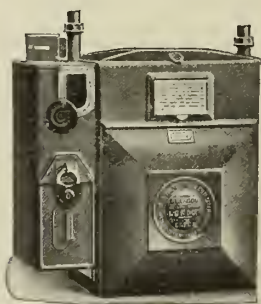
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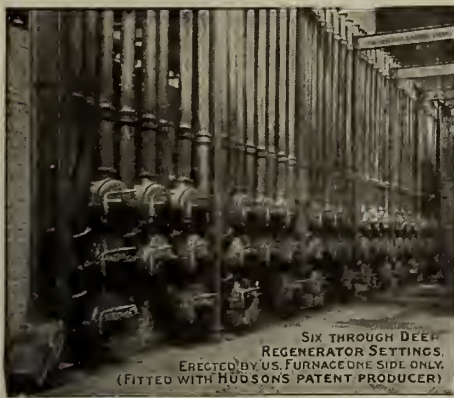


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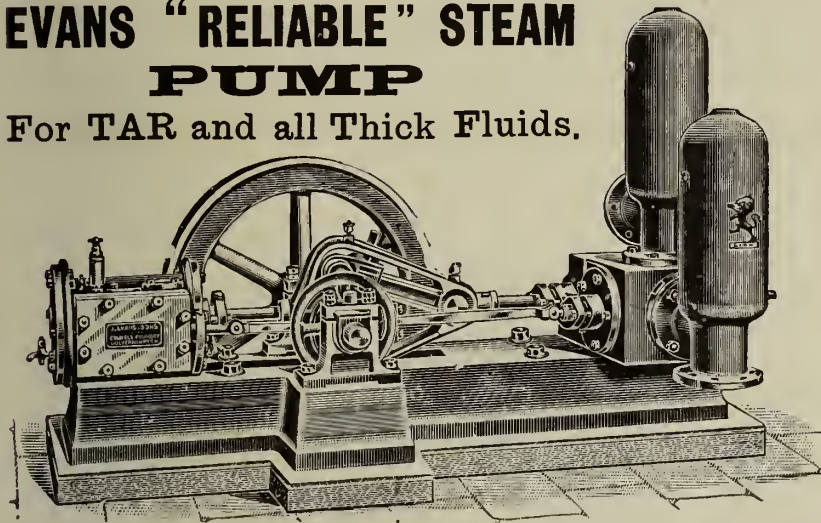
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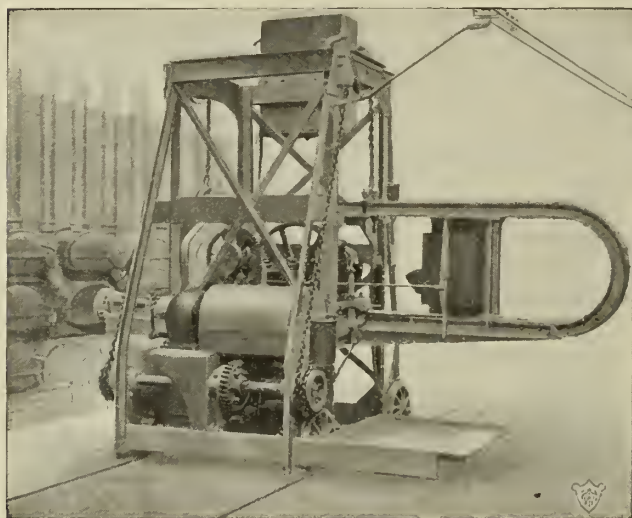
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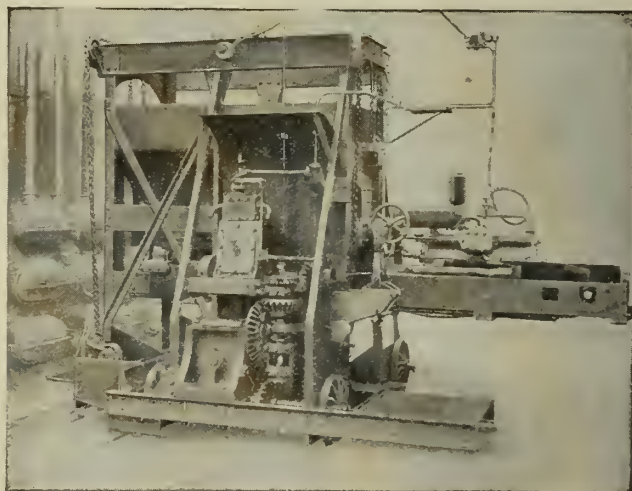
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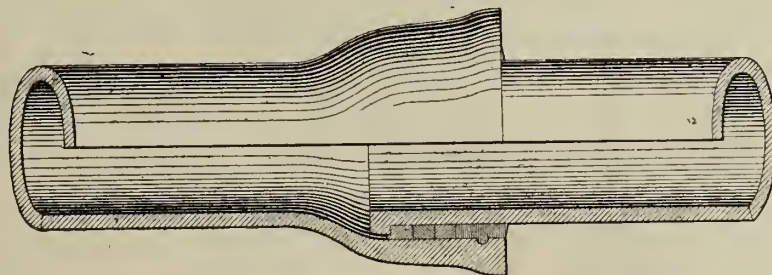
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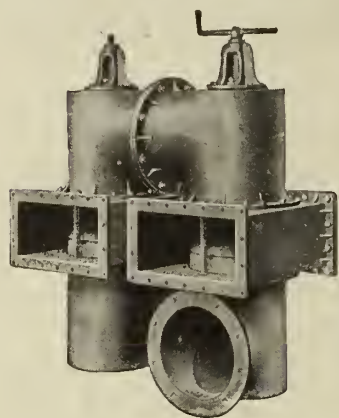


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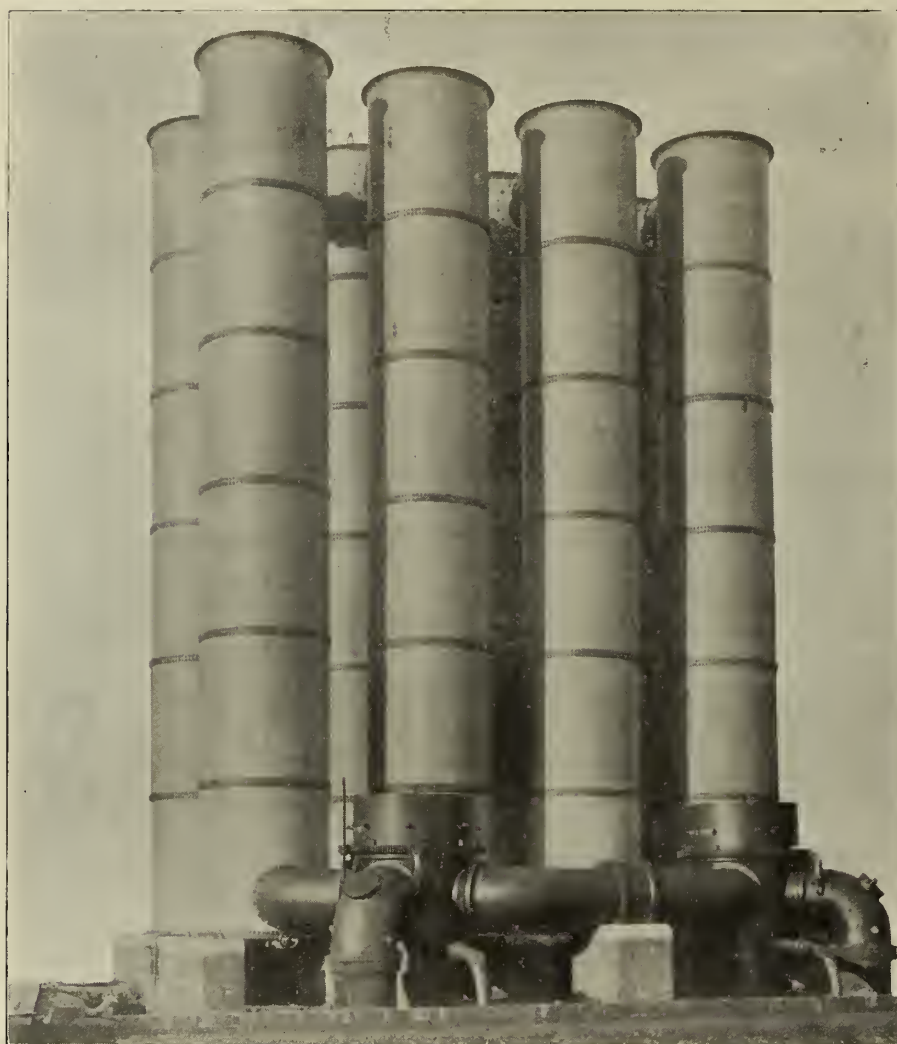
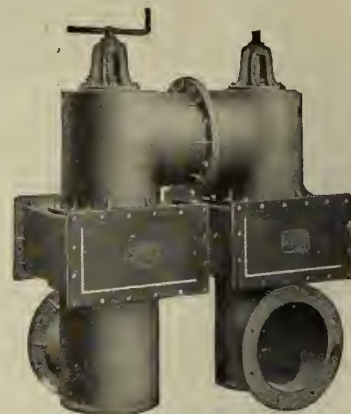
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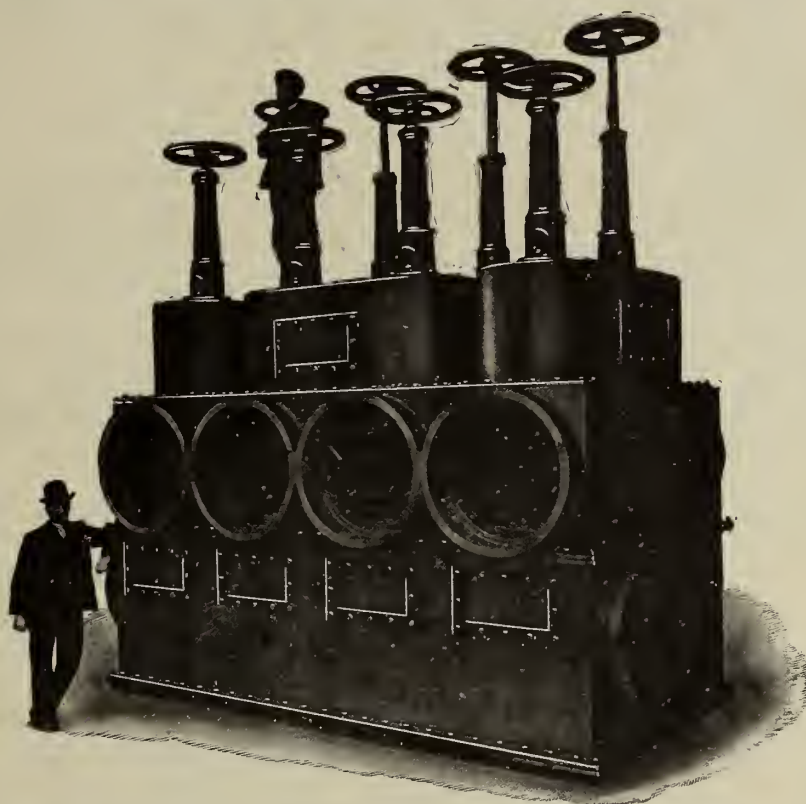
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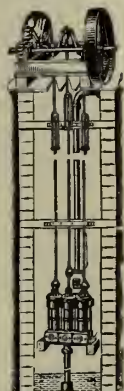
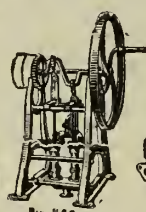
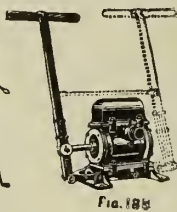
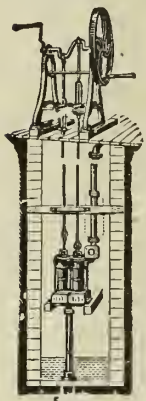
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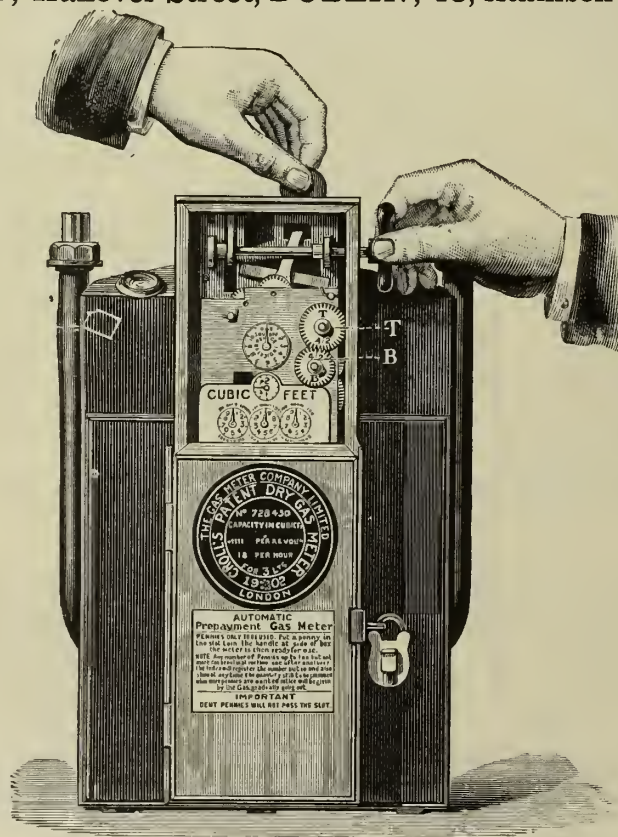
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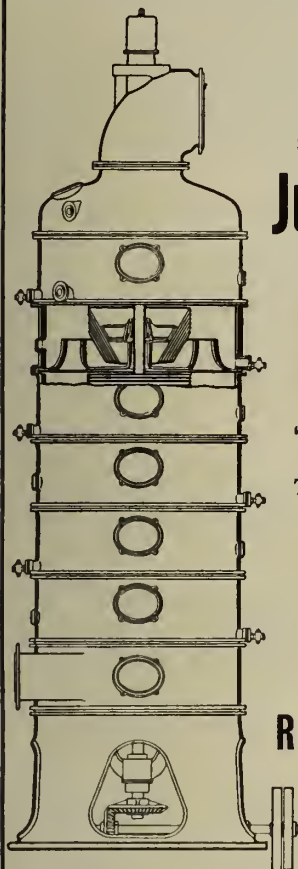
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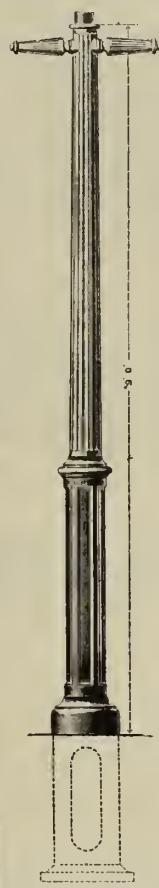
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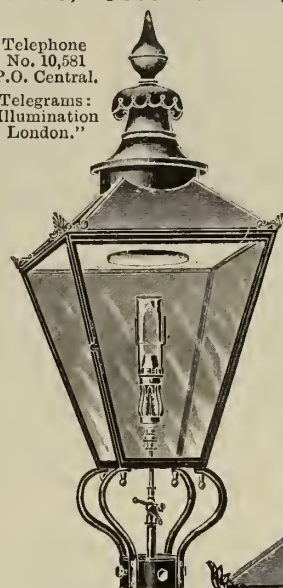
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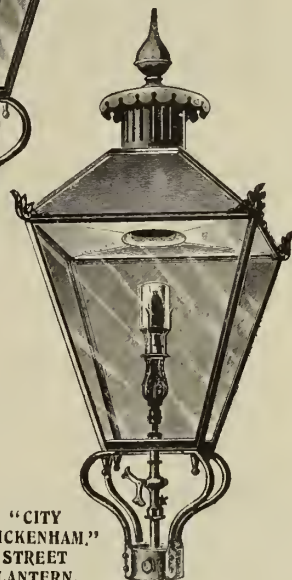
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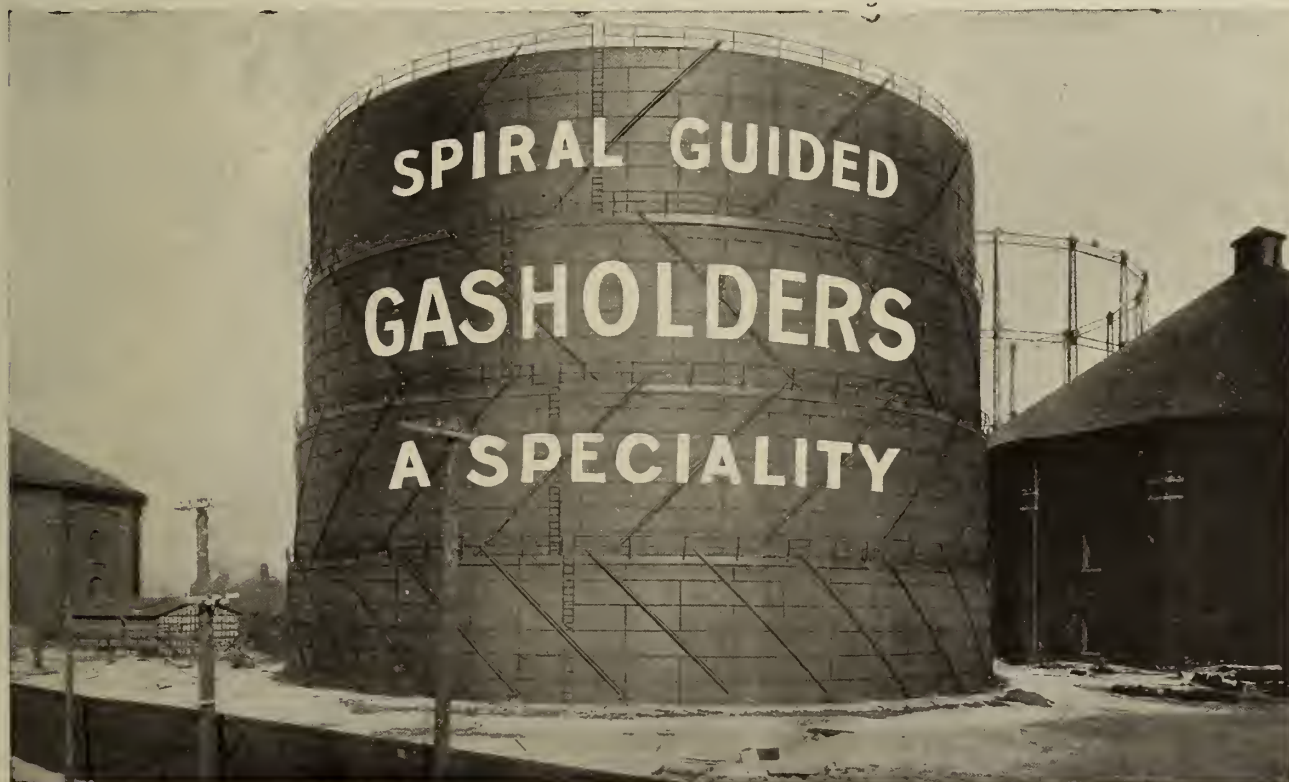
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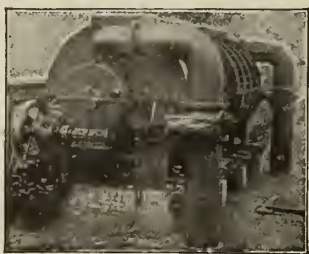
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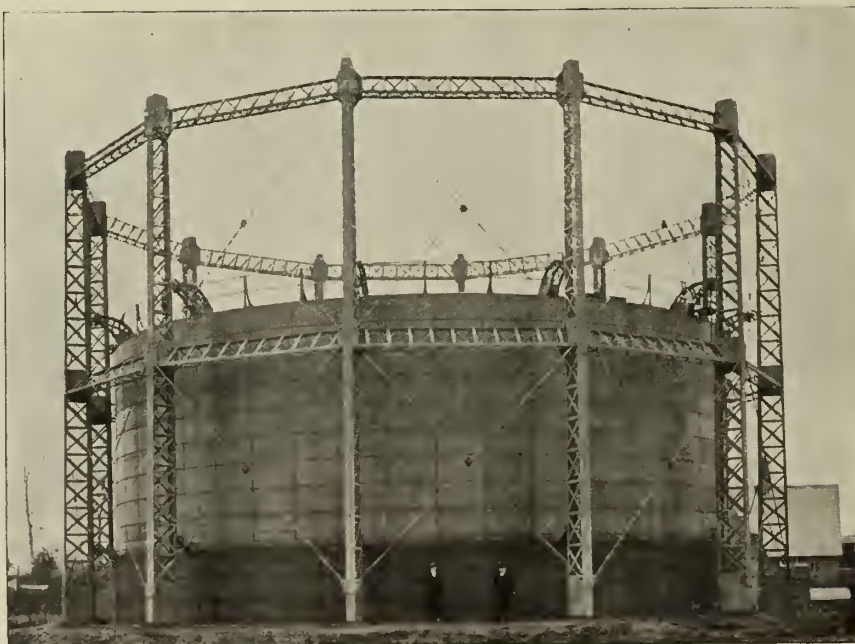
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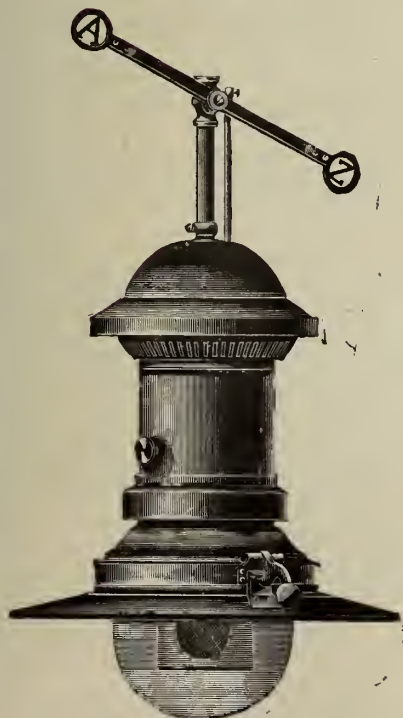
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Brussels-Koekeberg . . .	1,000,000	Leeuwarden, Holland . .	400,000	Stockport . . .	600,000
Brussels-St. Gilles . . .	1,000,000	Leiden, Holland . . .	500,000	Stockport (2nd) . . .	600,000
Brussels-St. Josse . . .	1,000,000	Leiden (2nd) . . .	575,000	Stockport (3rd) . . .	400,000
Brussels-St. Josse (2nd) .	600,000	Leigh, Lancs. . . .	350,000	Stockton-on-Tees . . .	500,000
Brussels-Ville . . .	750,000	Lemberg, Galicia . . .	260,000	Swansea . . .	750,000
Brussels-Ville (2nd) . . .	750,000	Lemberg (2nd) . . .	500,000	Swansea (2nd) . . .	1,000,000
Brussels-Ville (3rd) . . .	1,500,000	Liège, Belgium . . .	1,000,000	Swansea (3rd) . . .	450,000
Brussels-Ville (4th) . . .	350,000	Liège (2nd) . . .	750,000	Swindon . . .	300,000
Bucarest, Roumania . . .	1,100,000	Lincoln . . .	500,000	Sydney-Harbour . . .	500,000
Budapest, Hungary . . .	50,000	Liverpool . . .	3,500,000	Sydney-Harbour (2nd) .	500,000
Budapest (2nd) . . .	1,750,000	Liverpool (2nd) . . .	4,500,000	Sydney-Mortlake . . .	500,000
Carlisle . . .	600,000	Longton . . .	600,000	Sydney-Mortlake (2nd) .	500,000
Carlsruhe, Germany . . .	500,000	Louvain, Belgium . . .	800,000	Syracuse, N.Y. . . .	850,000
Chigwell . . .	350,000	Lubeck, Germany . . .	400,000	Taunton . . .	225,000
Chorley . . .	300,000	Maastricht, Holland . . .	200,000	Taunton (2nd) . . .	350,000
Commercial, London . . .	850,000	Magdeburg, Germany . . .	1,400,000	The Hague, Holland . .	1,000,000
Commercial (2nd) . . .	850,000	Maidenhead . . .	225,000	The Hague (2nd) . . .	500,000
Commercial (3rd) . . .	1,250,000	Maidenhead (2nd) . . .	225,000	Tilburg, Holland . . .	400,000
Commercial (4th) . . .	2,000,000	Maldstone . . .	500,000	Torquay . . .	350,000
Copenhagen . . .	700,000	Mallines, Belgium . . .	500,000	Tottenham . . .	750,000
Copenhagen (2nd) . . .	2,500,000	Malmö, Sweden . . .	350,000	Tottenham (2nd) . . .	750,000
Courtrai, Belgium . . .	250,000	Malta . . .	400,000	Tottenham (3rd) . . .	350,000
Coventry . . .	600,000	Manchester . . .	3,500,000	Tottenham (4th) . . .	1,000,000
Coventry (2nd) . . .	600,000	Manchester (2nd) . . .	3,500,000	Tottenham (5th) . . .	1,000,000
Cracow, Galicia . . .	200,000	Marlborough . . .	100,000	Tottenham (6th) . . .	1,250,000
Cracow (2nd) . . .	200,000	Mayence, Germany . . .	700,000	Tunbridge Wells . . .	1,000,000
Crefeld, Germany . . .	500,000	McKeesport, Pa. . . .	500,000	Utrecht, Holland . . .	1,000,000
Croydon . . .	1,250,000	Merthyr Tydfil . . .	300,000	Utrecht (2nd) . . .	1,000,000
Croydon (2nd) . . .	625,000	Middlesbrough . . .	1,250,000	Verviers, Belgium . . .	1,000,000
Croydon (3rd) . . .	625,000	Namur, Belgium . . .	175,000	Vienna . . .	3,500,000
Croydon (4th) . . .	550,000	Neison . . .	400,000	Vienna (2nd) . . .	2,500,000
Debreczin, Hungary . . .	100,000	Newburgh, N.Y. . . .	600,000	Waltham . . .	400,000
Deventer, Holland . . .	150,000	New York . . .	5,200,000	Wandsworth & Putney .	1,800,000
Deventer (2nd) . . .	200,000	Nictheroy, Brazil . . .	250,000	Watford . . .	300,000
Dorking . . .	150,000	North Middlesex . . .	150,000	Watford (2nd) . . .	350,000
Dublin . . .	2,000,000	North Middlesex (2nd) . .	200,000	Wellington, N.Z. . . .	350,000
Dublin (2nd) . . .	2,000,000	North Middlesex (3rd) . .	75,000	West Ham . . .	1,500,000
Dublin (3rd) . . .	650,000	Norwich . . .	1,000,000	West Ham (2nd) . . .	800,000
Dundee . . .	1,500,000	Norwich (2nd) . . .	300,000	Weston-super-Mare . .	350,000
Dunedin, N.Z. . . .	150,000	Norwich (3rd) . . .	500,000	Weston (2nd) . . .	350,000
Dunedin, N.Z. (2nd) . . .	275,000	Nottingham . . .	1,000,000	Wexford, Ireland . . .	100,000
Durham . . .	200,000	Nuneaton . . .	125,000	Wiesbaden, Germany . .	850,000
Düsseldorf, Germany . . .	1,000,000	Oberhausen, Germany . .	175,000	Winchester . . .	225,000
Eastbourne . . .	1,250,000	Oldenburg, Germany . . .	200,000	Winchester (2nd) . . .	125,000
Edinburgh . . .	2,000,000	Ostend, Belgium . . .	100,000	Wolverhampton . . .	1,500,000
Epsom . . .	225,000	Ostend (2nd) . . .	200,000	Zwoile, Holland . . .	200,000
Faimouth . . .	150,000	Perth, W.A. . . .	125,000	Zwoile (2nd) . . .	200,000
Faversham . . .	200,000	Pooie . . .	1,500,000		

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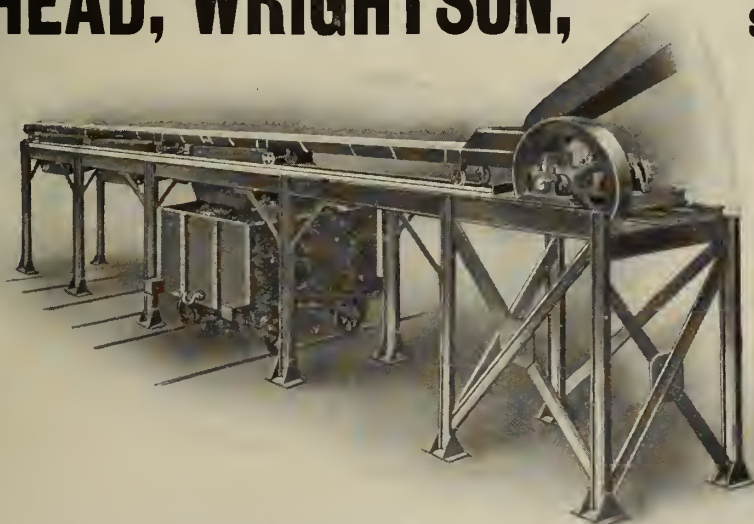
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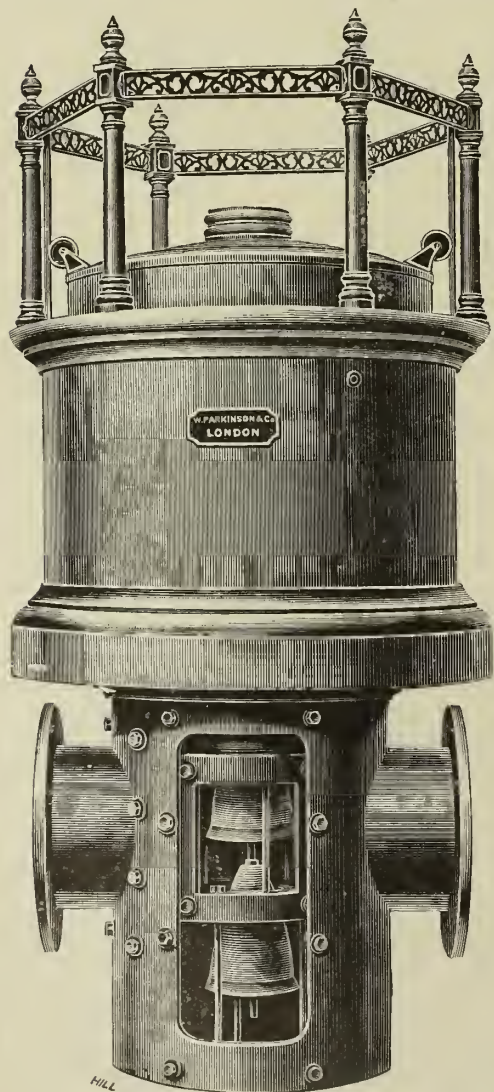
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VOL. CVI., No. 2404.—TUESDAY, JUNE 8, 1909.

EDITORIAL NOTES—GAS, &c.

Glover-West Continuous Carbonization System.

By the publication of a special article in this issue of the "JOURNAL" on the construction and working of a setting of eight vertical retorts on the continuous system of operation devised by Messrs. Glover and West, an important chapter has been added to the already pregnant carbonization history of our times. There has been steady prosecution of work at St. Helens; and from it has issued a practical and successful combination, with several months' run supporting these ascribed attributes. This period of work, as well as the size of the setting—eight retorts 20 feet long, carbonizing 20 tons of coal a day, and producing about one-fifth of the gas required at the present season for St. Helens—cannot be characterized as purely experimental. It is something more than that—it is a fair working example of the system; and as such it has now settled down as an integrant of the producing plant of the works, and is regularly performing its functions in a manner to court and obtain admiration.

The system is a continuous one; and it is one in which simplicity of parts has reduced both manual and mechanical operation to a low point, and has brought both the speed of carbonization and the heating under absolute control. Charging is by gravity; and the rate of the descent of the coal through the retorts is determined by the rate of coke extraction, which is fixed at will, according to the quality of coal and his needs, by the engineer. The heating is by a series of combustion chambers, which also admit of complete regulation. As worked, the highest temperature is at the top of the retorts, and is graduated downwards, chamber by chamber, until the bottom part of the retort is unheated save by the internal charge of coke; and—this part of the retorts being in the secondary-air chamber—the secondary air passing through this to the combustion chambers extracts heat from the coke that is about to leave the retort. Partially in consequence of this, and partially through the removal of the coke from the zones of active external heating, there is little (more often than not no) quenching of the coke to be done. But what is of even greater importance, the economy of fuel resulting from this, and from the method of heating (which forms the subject of a patent), is so very marked in relation to vertical retort working that it will not fail to arrest the attention of gas engineers. The best use is made of the heat; and as a matter of fact there is an extraordinary degree of heat efficiency—if we may be allowed to so describe it—about the setting. Throughout, the conditions of carbonization can be maintained continuously uniform; and through absence of dust, flame, and steam, working is carried on in comparative comfort.

In reading the description, it cannot fail to be a matter of remark that certain distinctive features of the original patents of Messrs. Young and Glover are absent from the completed setting as now presented to us in the joint names of Messrs. Glover and West. The small amount of free space at the top of the retorts has been abandoned. But this does not mean that, under certain circumstances, and other methods of charging and heating, this, and the action of the radiant heat on the evolved gas, would not be an advantage. But if gain there be in the free space, it has been demonstrated by this setting that it is only to be realized by the sacrifice of other advantages and economies. Again, the passage of the gas from the retort is not now through the coal in the feeding-hoppers above. Doubts were raised, from the first, as to the utility of this. That proposal, too, has been abandoned. In short, experience points to the fact that several things that are possible with non-caking coals are impossible with caking coals. Anyway, to Mr. Young we are primarily indebted for the system of continuous carbonization under consideration to-day. For though much of what appeared in the original specifica-

tions has been eliminated from the completed plant, had it not been for Mr. Young's work, it is quite possible that Mr. Glover and the St. Helens Corporation would not have taken up the matter. And if Mr. Glover had not interested himself in it, Mr. John West would not have drifted, as he did by circumstances, into the position of collaborator in respect of this particular plant. However, it will be agreed that the final result is an efficient system of simple construction and working.

Here we are not going to particularly discuss results or any other features of the working. These are set forth for consideration in the special article published elsewhere in this issue. But there is one matter that should be specially impressed; and it is that the time has not arrived for comparison of the results of the working of the Glover and West setting with those of other vertical retort systems—continuous or intermittent. The results can as yet only be compared with the results from the working of the horizontal retorts at St. Helens; and for this reason: At St. Helens in ordinary working the slacks of local coals only are used, and with these particular slacks few gas engineers have working acquaintance, and certainly they have never before been utilized in vertical retorts. But the new settings utilizing these relatively poor slacks have given an excellent account of themselves both in respect of gas and residuals in comparison with horizontal retorts; and if the vertical retorts can do so well under the adverse condition of a poor material to work upon, they should do so much better when carbonizing the recognized and commonly used superior gas-making coals. In giving this introduction to the Glover and West vertical retort plant, it is with confidence that we anticipate it will render a good account of itself among successful carbonizing systems of the future.

Surrender at Birmingham.

It is with regret that we see (unless it be shown that temporary expediency is at the bottom of the act) that the Gas Committee of the Birmingham City Council have surrendered so easily over the question of fixing a maximum for the salaries of the Secretary of the Gas Department and the Engineers-in-Charge of the works, beyond which maximum the Committee should not go without the further consent of the Council. The proposal on the last occasion was only negatived by 29 to 27 votes, so that the Gas Committee had considerable support in the matter. The proposition as originally brought forward was the result of the well-considered judgment of the Committee. It was either right or wrong; and if it was right, it ought to have been given up very reluctantly. From whatever standpoint the position is reviewed, the original proposition commends itself as the correct one. The only objections that could be urged against it by the opposition in the Council were that there was an old and abused principle of the Council still in existence which required all increases of salary over a certain sum to be brought before them, and that the abandonment of the principle would not be consonant with the views of those members whose disposition it is not to lose an opportunity of playing to the gallery.

Subject to the explanation that will be made to the Council a week hence, we repeat the regret felt that the Gas Committee have not held to the position they took up, and done their part to break down an undesirable and demeaning state of things in connection with municipal official service. Of course, if well-deserved immediate increases of salary were placed in jeopardy by the Committee standing firm, then perhaps they are taking the right course in at once recommending a definite advance for Mr. Hampton Barber and the Engineers-in-Charge of the works (Mr. John Foster, Mr. W. Chaney, Mr. F. J. Bywater, and Mr. T. H. Hack). It is hoped, however, and far beyond Birmingham, that the matter will not be allowed to drop there; that, if it is a question of making an amendment in a general rule of

action in connection with the treatment of the officials so as to assure that the officials are not placed in any worse position in regard to publicity of personal means or remuneration than a man in private employ, the matter of amendment will be taken in hand, and not be allowed to subside until it is once and for all accomplished. The fixing of a maximum salary beyond which a Committee should not go without the sanction of the Council appeals to us as a very fair solution of the difficulty.

We have nothing further to say about the scheme of organization the Committee are putting before the Council. It is in effect only a confirmation of what was done a year ago. The report, however, shows us that every precaution has been taken to make the scheme work as smoothly as possible; and, in this connection, we are pleased to see the handsome tribute (though not more than their due) paid to the officials by the Committee. That they are worthy the additional remuneration, and the utmost respectful treatment the Council can accord them, is abundantly clear. It will be seen that it is proposed that the official designation of Mr. Hampton Barber shall henceforth properly represent the responsible duties that he discharges. His official title will for the future be, if the report is passed, Secretary and Manager.

Though not bearing upon the question in hand, another interesting feature of the report under notice is that the Gas Committee are recommending a reduction of 3d. per 1000 cubic feet in the price of gas used for heating (other than cooking) in manufacturing establishments. This will represent a lessened cost for fuel to the industries of Birmingham of no less a sum than £15,000 a year. We have constantly advocated that, so long as it can be done without detriment to other classes of gas consumers, local industries should be encouraged in every way. Their success is of paramount importance to every city or town.

The Victories of Economy.

OUT of the numerous papers read at the International Congress of Applied Chemistry, there has come much matter over which, according to our diverse mental inclinations and capacities, we may with advantage reflect. The reports of the proceedings have no doubt caused many of us to wander into several fields of fresh thought, and to issue from them with respect deepened and broadened for that which is summed up in the words "applied chemistry." One of the victories of applied chemistry to which the recent congress gave pronounced form is that of the great economy in industry which has resulted from the work of the chemist. In industry, economy consists in getting more product out of a given measure of raw material, with a less consumption of energy or fuel for the greater product. "It was not 'so very long since,'" said Professor Witt, in the course of the congress, "that we began to have a conscience 'for fuel. We are now awake to the fact that the quantity of fuel required for an industrial process is very much 'dependent upon the way in which it is made to do its 'work.'" In the gas industry, there is a large amount of indebtedness to the chemist and the physicist for the fuel economies that have been achieved. With a lessened fuel consumption than of old, a greater product is obtained from that which is put into the retorts; and from secondary products, that which was once wasted is now recovered—both refinement and utility being produced from the gross. In the system of regenerative gas heating, there can be perfect regulation of gas and air; and the heat can be under absolute control. The products of coal carbonization which were at one time largely a matter of chance, even of accident, are realized by defined method continued or reproducible hour by hour or day by day. As was shown during the congress, the greater exactness now brought to bear on coal carbonization for gas production is being vigorously applied in the bulk carbonization processes of coke-ovens; and there is progressively less waste of that which is useful through the application of recovery methods.

In this way, chemistry has taught us, and is still teaching us, how to get more advantage from our fuel and raw material; and it all means economy. The achieving of all possible economy is something we owe to our successors. There will be a future in which the fuel that is wasted today will be required. Those who look with confidence to liquid fuel helping substantially to conserve the stores of solid fuel will find, from the congress proceedings, that Sir Boverton Redwood does not give them any great hope of

this. While there must be encouragement to the discovery and utilization of petroleum products, there must be economy; for says Sir Boverton, "I cannot give you hope 'that the quantity of oil that is still in the earth is 'such that it will revolutionize the fuel industry.'" And he goes on to issue a serious warning against "the indulgence 'of extravagant anticipations as to the extent that liquid 'fuel will replace coal." In the economy of fuel, and in giving the world the maximum amount of benefit from the fuel employed, the gas industry, as we have claimed, is doing a large part; and this is being done without adding to the great smoke nuisance about which much was heard during the conference. So deeply impressed were the delegates to the congress as to the waste and deleteriousness represented by smoke from the combustion of fuel, that they passed a resolution, instructing that representations be made to the Governments of the different countries in relation to the formulating of uniform laws regarding the emission of smoke and noxious fumes from chimneys. Few persons realize that smoky chimneys not only carry visible unburned carbon into the atmosphere, but in nine cases out of ten, much invisible carbonic oxide and methane, with all the latent energy they contain. Well-ordered gas-works do not plead guilty to participating in this waste. Regenerative gas heating is not only a sure preventive of smoke, but is also a powerful means of economizing heat; and the gas industry was not slow in recognizing this some years ago. A gas-works is not only a fuel-using but a fuel-producing establishment. It does its work without smoke and nuisance; it produces fuels, gaseous and solid, that help to make life pleasanter and healthier. In several directions, the gas industry demonstrates the victories of economy, through the aid of applied chemistry.

Taxation.

THE publication of the Finance Bill has put all concerned in full possession of the new proposals of the Government for raising the revenue which they require; and only those who are hidebound partizans—in the political sense—will fail to concede the gravity to industry of several of the proposals. The increase in the income-tax payable on behalf of shareholders, and the increase in the duty on contract notes relating to the purchase of stock or other marketable securities, are sufficiently serious; but the new land taxes add immeasurably to the seriousness. The only consolation is that all, whether bodies corporate or incorporate, are brought into the net, in respect of the duty on the increment value of land and the tax on undeveloped land. Gas undertakings, when purchasing land for manufacturing development, naturally, with an eye to the economies of the future in the matter of extension and manufacturing convenience, do so in excess of immediate requirements; and it will be the few rather than the many gas undertakings who will be able to prove to the satisfaction of the Commissioners that the land held in reserve comes within the condition which provides that undeveloped land duty is not to be paid where the site value of the land does not exceed £50 per acre. With regard to the increment site value, there is a little concession in that there is to be a deduction of any part proved to the satisfaction of the Commissioners to be directly attributable to works of a permanent character executed *bona fide* for the purpose of any business, trade, or industry, other than agriculture. In the mineral rights duty, referring to ungotten minerals, gas undertakings will also be in a measure concerned as large consumers of the subterranean wealth of the earth; for these fresh taxes will, to the utmost extent possible, be transferred by the owners to the users of minerals. The same with the increment site value and undeveloped land duties, they will ultimately come largely out of the pockets of people of moderate means and the very poor. The greater part of the patrons of the gas industry come within these categories; and in whatever degree these new land and mineral taxes increase the burdens of the gas industry, to that extent will the consumers be the victims. The methods of valuation are also bound to give rise to much wrangling, between owners and the Commissioners, who are to be vested with very arbitrary powers. In the opinion of Lord Onslow, Chairman of Committees of the House of Lords, "the duties 'imposed on the Commissioners, Special Commissioners, 'and Referees could not be equitably discharged even by 'archangels." It will further be observed that petrol is not the only motor spirit upon which the duty of 3d. per gallon (1½d. for spirit to be used for trade and other specified

vehicles) is to be placed, or, to be more correct, has been placed. "Motor spirit" is to include "any inflammable hydrocarbon (including any mixture of hydrocarbons and any liquid containing hydrocarbon) which is capable of being used for providing reasonably efficient motive power for a motor-car." Benzol is not therefore to be privileged; so that the fillip it was hoped the tax on petrol would give to the use of benzol for driving purposes must be definitely relinquished.

Points from the Factory Report.

To all whose business it is to consider the question of the heating, lighting, and ventilation of factories and workrooms, the annual report of the Chief Inspector of Factories (Dr. Arthur Whitelegge, C.B.), together with the reports of the district inspectors, supply much instruction. The report (which was dealt with last week, pp. 577, 586) has to be considered dispassionately, and with a broad mind, by those affected. It has to be remembered that the inspectors have certain duties to perform, and to see that certain laws are fully complied with. But on carefully reading the reports, the impression is forced upon one that some of the inspectors suffer from a contraction of view, induced and fostered by the very Acts that were framed to give them guidance. This surely should not be the drift of legislation. Legislation is not intended to circumscribe, and keep within hard-and-fast limits, an intelligent survey of conditions; but it still leaves the inspectors free to examine all circumstances, so that there may be a proper determination as to which (if any) of the conditions are faulty, and therefore which (if any) should be improved. There is a disposition to jump at conclusions; and particularly in respect of the requirement of section 6 of the Act of 1901, that adequate measures shall be taken for securing and maintaining a reasonable temperature in each room in which any person is employed, and that the measures so taken must not interfere with the purity of the air in the room. We admire, and favour, all the efforts that can be put forward to induce the most scientific application of all the agents employed for lighting, heating, and power. But there must not be either unjustifiable condemnation or harsh restriction. The section of the Act referred to is no doubt responsible for some of the inspectors, when they find open gas-flames are being used for heating workrooms, and the proportion of carbonic acid is high, attributing the unwholesome condition of the atmosphere exclusively to such use of the burners, without giving sufficient consideration to the large contribution in crowded workrooms of the more noxious carbonic acid derived from the respiration or the perspiration of the workpeople. We are absolutely averse to the old-fashioned open-flame burners being employed in any wrongful manner for warming purposes. It is found in workshops and factories that these burners are often used in the most wasteful fashion, and flaring away in a style that shows at a glance incomplete combustion. But it is the misuse, and not the use, of these burners that is open to censure. If dependence could be placed upon them being regulated in proper manner, and there was simple top ventilation, they would be an aid to maintaining a sanitary condition of the atmosphere. The whole question hinges on adequate ventilation. Without ventilation in crowded workrooms, there is no doubt that the open-flame burners contribute in a measure to the need for it; but with the provision of modest means of ventilation, they contribute materially to efficiency. And that is more than can be said for electric lights, which no one would think of employing for either heating or as an aid to ventilation. What is really wanted in factories and workrooms is a higher standard of ventilation. We are glad to see the favourable remarks in several of the reports regarding the growth of the use of incandescent gas-burners in factories.

Much the same observations apply to the use of flueless gas-stoves for heating workrooms. With an adequate general scheme of ventilation in such rooms, no objection could be raised to these heaters, providing proper selection be made of the stoves. There are flueless gas-stoves on the market in which the most elementary scientific considerations have been set at naught; and we are afraid that these have been the means of giving a bad name to all of the genus. It is a pity; but the fact remains. It will be a still greater pity if neglect should kill the trade in a really useful heating appliance, when used under appropriate conditions. As Dr. Whitelegge says (*ante*, p. 586), section 6 of the Act of

1901 does not limit the choice among the various means of warming; but the criterion established by the section is the avoidance of additional pollution of the air by the products of combustion. We have to squarely face this condition, and to recognize that the inspectors have been busying themselves in explaining to factory occupiers the "objections" to which flueless stoves are open. It would be quite as much to the point, and more valuable, if the inspectors would explain openly in their report their objections, so that they could be as freely discussed by those competent to do so. The inspectors have an advantage over the gas-stove makers in coming into such close contact with the users. There the issue stands. No matter the character of the ventilation, the inspectors want a flue to all means of gas heating. With a flue, all their objection goes. Miss Paterson puts in a nutshell the position taken up by the inspectors, and their attitude towards gas heating, when she says: "As a rule, the provision of a flue is not a difficult matter; and objection to gas as a means of heating cannot be maintained if the fumes are removed. . . . Gas is likely to be the chief means of heating, in small workrooms at least, until the cost of electricity is much less than now." There has been a strong fight between Dr. Whitelegge's department and the stove makers over this question of flueless stoves; and the Chief Inspector remarks: "In some instances, analyses have been produced tending to show that, contrary to the usual experience, the products of combustion of gas contained no sulphur compounds, carbonic oxide, or organic matter." The result, it is clear, is that Dr. Whitelegge and his assistants are not yet reconciled to the use of stoves of any description without flues; and it will be difficult to, in the premises under their supervision, disturb in any effectual manner the influence that they are able to exert in this particular matter. At the same time, the wholesale way the flueless stove as a class is condemned, is totally unmerited.

But of far greater danger than scientifically constructed flueless gas-stoves is the use of producer and suction gas plants in factories; and yet we see no suggestion in the report other than that of ventilation in regard to them. The inspectors of the South-Eastern, South-Western, and Midland divisions, all call attention to the matter; and there is no question that the increasing use of such gases is imposing more and more responsibility upon them. The dangers to health and life from carbon monoxide poisoning, and the additional loopholes for the creation of a perilous condition of things that such plants introduce into factories, keep the inspectors very active. In places where these plants are now employed, although there may be no actual fatality calling special attention to them, it is not at all an uncommon thing to find the workers complaining of acute headache. One thing that is bound to come is this: If manufacturers use such plants, they will have to provide suitable buildings for them, and not lodge them in just any place on a works where accommodation can be conveniently found for them. There is a case recorded where a plant was installed in a basement under a large workroom, the occupants of which suffered severely from the escaping gas and fumes. The care necessary in the housing of producer and suction-gas plants, and the obligation as to thorough ventilation, are considerations to be taken account of by manufacturers in calculating the costs of these forms of providing power and heat.

Social Events in Institution Week.

The technical programme for the annual meeting of the Institution of Gas Engineers has been dealt with in previous issues of the "JOURNAL," and general reference has been made to the other events. The social side contains the usual attraction of the reception and dance by the President and his wife—on this occasion Mr. and Mrs. Thomas Glover—at the Galleries of the Royal Institute of Painters in Water Colours, where the pictures of the Pastel Society will be on view. The arrangements for the excursion on the Friday should produce a big success in numbers and pleasure. Apart from the fact that the old-world city of Norwich is the home of the President, and that there are many places of interest worth inspecting there, the reception that will be accorded the visitors will be of the most generous character. The Chairman and Directors of the British Gaslight Company—among whom are men whose names are prominent in gas administration and engineering—are inviting the visitors to luncheon at the

St. Martin-at-Palace works; and, given fine weather, the trip down the River Bure to Wroxham Broad will be most enjoyable. This trip is by invitation of the members and officers of the Norwich Corporation; and the liberal and kindly act may be taken as not only a recognition of the standing and importance of the Institution as the chief representative organization of the gas industry, but as attesting the excellent relations that exist between the Corporation and their officials and the British Gaslight Company and their officials at this station. About the Norwich Gas-Works, there are novel features—particularly in respect of the big division there is in the manufacturing operations; gas production being conducted in one part of the city, and the subsequent purification processes in another. Those engineers who wish to refresh their knowledge of these matters can do so by re-perusing the special illustrated descriptive articles that appeared in the "JOURNAL" for Sept. 19 and 26, 1905 (pp. 740, 803), and the notes on Mr. Glover's lantern lecture at the Midland Association meeting, as published in our issue for Oct. 31, 1905, p. 299.

The Institution Benevolent Fund.

Taken as a whole, the gas industry is a bad supporter of funds having for their purpose common benefit or the relief of those to whom fate has been hard, and who have had direct dependence upon the industry. If the gas undertakings of the country would unitedly and systematically each subscribe annually some small sum—a five pound note or less, according to position—to in part go to the Special Purposes Fund and in part to the Benevolent Fund of the Institution, those funds would be permanently in a sound condition, and their administrators would be in a position to work free from the restraint which comparative impecuniosity places upon them at the present time. There is the Benevolent Fund. The report issued by the Committee of Management shows that last year's income (less donations) only just enabled them to meet restricted outgoings; and they end the year with the feeling that the means placed at their disposal has only enabled them to deal in an inadequate manner with the applications brought under their notice. If the list of donations is referred to, it will be seen there are several important items that cannot be expected to recur. The suggestion that the Committee of Management should be fortified by representation from the District Associations has been adopted; and it is to be hoped that this will result in a substantial accession of annual subscribers.

Mooted Tax on Automatic Machines in Prussia.

The proposed Imperial tax on gas and electricity supplies having been rejected by the Finance Committee of the Reichstag, it seems that the Prussian Chamber of Deputies has now under consideration the imposition of a licensing fee of 10s. per annum as a minimum on automatic machines. The "Journal für Gasbeleuchtung" of the 5th inst. discusses the question of whether this fee is intended to apply to prepayment gas-meters, which, it points out, differ from ordinary automatic machines in that they are not, like the latter, for use by the public at large. Moreover, as the prepayment meters are commonly used to supply gas to heating and cooking burners, it is argued that the suggested licence fee would be antagonistic to the Prussian communal law which prohibits the taxation of fuel. A fee of 10s. per annum on each prepayment gas-meter would, of course, practically prevent the use of this class of meter.

Position of the Nottingham Gas Undertaking.

Of the truth of the aphorism that "the whirligig of Time brings in his revenges," few more complete exemplifications could be found than that in relation to matters associated with the gas undertaking of the Nottingham Corporation. Those who followed in anything like detail the acrimonious controversy which arose some time ago out of the management of this important branch of Corporation enterprise will be interested, though not surprised, to learn that the responsible official who was held up to public obloquy by a party clique has amply confounded his enemies. Nobody who had any knowledge of technical details could have any doubt as to the ultimate result; but there was always the danger that platform fulminations might obscure an issue in regard to which men with professional training were alone competent to pronounce judgment. Reports presented to the Nottingham Council were employed as the medium for criticism, not

always of the most friendly character, of the work of the Engineer and Manager, Mr. J. H. Brown. All this, happily, has now been changed, and the many complimentary utterances which have been forthcoming during the last few days testify to the appreciation of the admirable results which have followed upon the exercise of sound and unfettered judgment. Up to two years ago, the gas undertaking suffered from being made more or less the toy of municipal politics. There were those who predicted that if the man who was responsible for the technical details was allowed, subject to the ordinary municipal control, to perfect his plans and do his work untrammelled by irresponsible critics, the effect would soon be realized. Experience in the intervening period, which has witnessed some sweeping changes in the *personnel* of the Council, has abundantly justified the anticipation. The report submitted to the Council at their meeting yesterday, the principal portions of which will be found in another part of the "JOURNAL," disclosed the record profit of £106,940 in a year in which the possibilities have been discounted by reason of the circumstance that the receipts from residuals show a diminution of £8713, while the increase in the rate of pay granted to almost every grade of employee largely added to the cost of the department. Mr. Brown's good management has thus been adequately demonstrated.

Semi-Vertical Retorts at Market Harborough.

The report which Mr. A. T. Harris, the Gas Engineer and Manager of the Market Harborough Urban District Council, has just presented on the working of the undertaking in the past financial year was the tenth of a series of favourable statements which the Chairman of the Gas Committee (Mr. G. G. Gardiner) has been able to lay before the Council since he has held this office. The one under notice, some particulars from which are given elsewhere, is of special interest from the fact that Mr. Harris has been working with semi-vertical retorts (45's); and though the productive capacity of the plant has not yet reached anticipations, the Chairman stated that the make of gas with this particular setting had been quite satisfactory, and had undoubtedly been "a contributing factor to the success of the past year's working." As a matter of fact, Mr. Harris obtained 11,567 cubic feet of gas per ton from a cheaper class of coal than he had been previously carbonizing—50 per cent. of Derbyshire coal being employed during the year—while his sales of coke were 10.25 cwt. per ton. As the outcome of the experience gained during last winter, further improvements will shortly be made, which it is expected will increase the efficiency and economy of the new system. The good results obtained at Market Harborough are shared with the consumers, who are to have their price reduced 2d. per 1000 cubic feet, which will make, with the 1d. taken off in the two winter quarters, 3d. for the year—equivalent to a gift of £440. Being thus liberally treated, they are not likely to turn their attention to the electric light, should the Council determine on carrying out a scheme, for which they have powers now nearly lapsing; nor apparently are the inhabitants generally, for out of 466 circulars recently sent out to people in the area covered by the Council's Provisional Order, only 23 replied that they were willing to take a supply, while 342 said they would not have it. The Council, the Gas Committee, and their Manager are to be congratulated on the results so far of the working of the gas undertaking. Let them take care not to jeopardize them.

The Latest Municipal Results.

In addition to Nottingham and Market Harborough, which are referred to in separate paragraphs, there are numerous points of interest to be noted in the results of the working of municipal gas undertakings during the past year which are recorded in the "Miscellaneous News" columns to-day. From Bolton comes the report that during the twelve months the rebuilding of the retort-house at the Lum Street works was completed, and that "in the near future the costly work of altering the retort-benches into the regenerative system of firing, and providing stoking machinery, will be imperative;" while other new plant will also be necessary, "in order to keep pace with the latest improvements and cheapen the cost of gas manufacture." The make of gas shows some falling off as compared with the previous year; and the total amount to be carried to the net revenue account is £50,398, as against £56,595. Out of this, £17,500 has been voted in aid of the district rate. There is also a decreased output shown at Kendal; the remark

being made that two or three former large consumers now have their own suction-gas plants. A reduction in the price of gas is foreshadowed—the experience in the past having been that “every time they have taken a step in this direction and been generous to the consumers, they have improved their results.” A hint is also thrown out that, even if the rents of cookers cannot be altogether abolished, some reduction may be made, especially to those customers “who have had them in their houses for ten years or more.” The net cost of gas sold at Lancaster comes out at the low figure of 10·72d. per 1000 cubic feet; and the return from residual products is 76·40 per cent. on the cost of coal. It will be observed that the public lamps are supplied with gas free of charge; this being equal to a sum (at 1s. 11d. per 1000 cubic feet net—which is practically the average price received for gas sold) of £1594. The make of gas per ton of coal (slack) is 10,451 cubic feet; and the unaccounted-for gas is as low as 2·64 per cent. Of the coke made—13 cwt. per ton of coal—88·14 per cent. was available for sale; 11·86 per cent. being used for fuel. The surplus of £529 at Newbury has been utilized in paying for extended mains and other improvements, rather than borrowing further money for the work—the Committee feeling that “the undertaking has reached its limit in the direction of relieving the rates,” and that in future profits should be devoted to meeting current expenses. There is at St. Helens an increase of just under 1 per cent. in the output; and the unaccounted-for gas is only 3·3 per cent., which, as the Committee point out, is a very low figure, considering that the whole district is much disturbed by mining operations. An outstanding feature is the fact that the income from bye-products is more than the cost of coal and oil for enrichment. The importance assumed at St. Helens by the question of vertical retorts will be gathered from what appears elsewhere. During the six years since 1903, financial improvement to the extent of £3593 has been effected by the Teignmouth gas undertaking—a deficit of £1283 having been turned into a credit balance on revenue account of £2310. Repeated reductions in the price of gas—which total 1s. 1d. per 1000 cubic feet—have not diminished the profit-producing powers of the department, but, on the contrary, have, as one would expect, exercised a beneficial effect by stimulating the consumption of gas, thus reducing the working and capital charges per 1000 cubic feet. The first year's working of their gas undertaking by the Wolstanton Urban District Council has resulted in a gross profit of £5000. The make of gas per ton of coal carbonized is, it will be noted, 11,775 cubic feet.

The Coal Position.

Temporarily, at any rate, the centre of interest in the question of coal miners *v.* colliery owners seems to have been shifted from South Wales to Scotland, where the differences between the parties have assumed a most threatening appearance; and almost anything may happen in the near future. Though the subject of wages is here the chief topic discussed, it would probably not be far wrong to assume that the Eight-Hours Bill has really a good deal to do with the present strained relations. The employers have been urging that the question of wages should be referred to a neutral Arbitrator; but the men decline to accede to this—their contention being that wages must not fall below 6s. per day, which the acceptance of the owners' proposals would cause them to do. From this it may be taken that the point involved is not only the immediate rate of pay, but the more important principle of the minimum wage. Of course, the owners base on the ruling price of coal their claim to a reduction in wages; but the men are apparently of opinion that this price should be raised to such a level as would justify the existing rates of pay. Perhaps this would be a more difficult task than the simple suggesting of it would imply. However that may be, if the employers should decide to issue reduction notices, the men state that they will regard them as a challenge, and leave off work. The Glasgow Correspondent of the “Financial Times” remarks that the trade trouble in Wales is not without important bearing on the Scotch position, as the opinion is voiced that, if the Welsh miners strike, the Scotch colliery owners will not post notices, but take advantage of the higher market values which would assuredly rule. But against this probability must be pitted the powers of the British Federation to call out their own men in every district, and make the stoppage national. He points out that the Scotch miners have £70,000 of funds; but as 80,000 miners and 20,000 others would be involved, this sum would not go far in assisting a strike. Other factors are that trade is dull, and supplies are not

being taken up; while the men cannot hope for moral support from allied trades. These conclusions, if fully justified, render the position more hopeful than would otherwise be the case.

Experiments on the Compression and Transmission of Gas.

In the “JOURNAL” for the 25th ult., we gave portions of the first part of a paper dealing with the effect of compression and transmission on the illuminating and calorific power of gas. In the extracts referred to, the results were recorded of investigations with carburetted water gas carried out by Messrs. H. E. Bates and J. R. Rafferty, both of whom are engaged in the laboratory of the Peoples Gas Company of Chicago. To-day we give, practically in its entirety, the second part of the paper, containing the conclusions arrived at by two other investigators—Messrs. V. A. Houghton and S. L. Cole—who devoted their attention mainly to coal gas. The entire paper was prepared as a research contribution to the American Gas Institute from the Illinois Gas Association, at the last annual meeting of which body it was submitted and discussed. The conclusions arrived at by the authors of the first part of the paper are that carburetted water gas loses both illuminating and heating value on compression up to 100 lbs. per square inch, and that the loss of the former property is greater between 5 lbs. and 60 lbs. than with pressures up to the higher limit named. The loss of calorific value by water gas on compression is greater with high than with low candle gas. Dealing with coal gas, Messrs. Houghton and Cole conducted a series of tests immediately before and after the gas was compressed, and again when it had travelled 22 miles in a 4-inch pipe having a capacity of 11,900 cubic feet at atmospheric pressure. An average of tests carried out in July and August last year showed that in the distance named coal gas lost a candle in illuminating power and 30 B.Th.U. in heating value, and the pressure had dropped by about 6 lbs.

Temperature and Pressure Tests.

A second series of tests was conducted by Messrs. Houghton and Cole, on “straight” water gas transmitted to stations situated at three distances; and the results led to some interesting investigations in regard to the relation of temperature and pressure. It was found that low-pressure gas does not suffer any loss of illuminating power when cooled to the dew-point temperature; but that the reverse is the case with high-pressure gas, which loses to the extent of 3 candles when it is cooled down to the dew-point temperature of uncompressed gas, and drops another candle when subjected to severe pipe-line conditions. The conclusion arrived at is that there is no loss on transmission, but that it results from compression and cooling, and is dependent upon the extent of these operations. The authors submitted the results of their labours without expressing any conclusions thereon, in the hope that the investigation might be carried to the final determination of the important questions raised. For the present they say the advantage of protecting pipe-lines from exposure to low temperatures is clearly apparent from their studies, and that, where the maintenance of illuminating power is important, the advisability of resorting to the compression of gas must be studied in connection with the cost of the enrichment which may to some extent be necessary as a consequence of this operation. The paper of the four joint authors deals with a subject which has of late years attained very considerable importance; and a contribution to its literature of the character of that under notice deserves more than passing attention.

Instruction in Autogenous Soldering.—The extent to which processes of soldering and welding by means of acetylene are now being employed in engineering work is indicated by the fact that, under the auspices of the German Association for the Autogenous Working of Metals, an information bureau and a course of training for fitters have been established in Cologne. Both are in the charge of Herr Theo. Kautny, the Editor of the journal “Acetylen in Wissenschaft und Industrie;” and since the establishment of the bureau, in March last, upwards of 400 inquiries, many of them of great technical importance, have been dealt with. The Ministry of Commerce recently agreed to place at the disposal of the Association a workshop and lecture-room in the Royal Engineering College at Cologne, for use in connection with a course of instruction in autogenous soldering or welding. It is free to members of the Association, and should be valuable in affording the knowledge and training which are essential to the proper use of the acetylene welding process.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 667.)

BUSINESS in the Stock Exchange last week was not abundantly active on the whole; and it would have been quiet indeed had it not been for the lively animation in South Africans and, to an extent, in Americans. It took some little time to get into swing; for upon the reopening on Tuesday, the attendance of members was not numerous. The general tendency, however, was tolerably good. There was a demand for gilt-edged qualities, though Consols remained unchanged. Railways were rather weak; but the Foreign Market evinced strength. Quietude continued on Wednesday, and there was some reaction where strength had been. Consols fell $\frac{3}{16}$. Great dullness prevailed on Thursday—the effect of many causes not within our scope to particularize. Nearly every market was flat; while Consols had another $\frac{1}{16}$ fall. On Friday, after a quiet start, activity was accelerated, and rising prices responded to a more cheerful feeling. Consols recovered partially; and the more speculative lines above mentioned rose gaily. Saturday was a fairly busy day, and Consols had another small rise; but most of the strength was in the South African Department. In the Money Market, there was a good demand, and rates hardened materially, both for short loans and for discount, though the tendency was easier at the close. In the Gas Market business was very moderate, and not very interesting. Changes in quotations were few and slight; and the ups and the downs were pretty evenly balanced. In Gaslight and Coke issues, there was a fair modicum of dealings in the ordinary, without any change of value—transactions ranging from 103 $\frac{3}{8}$ to 104 $\frac{3}{8}$. In the secured issues, the preference was rather more active at from 105 $\frac{1}{2}$ to 106 $\frac{1}{4}$; and the debenture marked 86 $\frac{5}{8}$. South Metropolitan was very little dealt in, and realized from 123 to 123 $\frac{3}{4}$. The debenture made 85 $\frac{3}{4}$ and 85 $\frac{3}{4}$. In Commercials, the 4 per cent. changed hands at 108 $\frac{1}{2}$ and 109 $\frac{1}{2}$, and the debenture at 82 $\frac{1}{2}$. In the Suburban and Provincial group, Alliance and Dublin new was done at 12 $\frac{3}{4}$; Brentford old at 252, ditto new at 189 $\frac{1}{2}$, Brighton original at 213 and 214, North Middlesex new at 13 $\frac{1}{4}$ and 13 $\frac{1}{2}$, South Suburban at 120 $\frac{1}{2}$ and 121, Tottenham "A" at 134, ditto debenture at 103, and West Ham at 121 $\frac{3}{4}$. Southampton had a three-point rise. In the Continental Companies, Imperial was a point weaker at from 180 to 181 $\frac{1}{2}$, ditto debenture made 96 $\frac{1}{2}$ and 96 $\frac{1}{2}$. Union 99 $\frac{1}{4}$ (a fall of 1), European fully-paid 24 $\frac{1}{2}$, and Tuscan 8 $\frac{7}{8}$. Among the undertakings of the remoter world, Bombay changed hands at 51 $\frac{1}{16}$, Buenos Ayres at 132 $\frac{7}{8}$ and 131 $\frac{15}{16}$, Monte Video at 12 $\frac{11}{16}$ and 12 $\frac{1}{2}$, Primitiva at 6 $\frac{1}{16}$, ditto preference at 5 $\frac{3}{8}$ and 5 $\frac{5}{16}$, ditto debenture at 96, River Plate at from 14 $\frac{1}{16}$ to 15 $\frac{1}{8}$, and San Paulo at 13 $\frac{3}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Costs and Illuminating Powers—The Trick of Comparing the Modern with the Ancient—Consumers' Experiences—Abandon Selfish Motives and Use Electricity—Speculation and Humour—Hiring and Wiring Direct or Through Contractors.

EVER and again, people have forced on their attention by electricians the extraordinary cheapness of electricity in comparison with incandescent gas lighting, and still more singular statements as to the increase of illuminating power that accompanies the lower cost of the electrical illuminating agent. We had the case last week (p. 569) of Mr. Pringle, of celebrated Burton-on-Trent, on the lighting of St. Peter's Church, Stapenhill. Peter was not always given to veracity; but we will let bygones be bygones. In this particular church of St. Peter, electricity has displaced gas; and the electricity bill for past two quarters amounted to £3 10s. 8d., against £13 7s. 7d. for gas in the corresponding quarters of the previous year. The electric lamps number 75; and they are only of 25-candle power each. Some of our electrical friends have suppressed the fact that the gas-burners formerly in use in the church were the ancient, wasteful fishtails, and that there were no less than 288 of them. In concealing this fact, there ought to have been a severe pricking of conscience. We fear suppression of some such similar fact accounts for the wide difference that it is asserted there will be in illuminating power by the conversion at Bedford of 58 street gas-lamps to electric lighting, at a capital cost of £630. The illuminating power as a result, so it is said, will be increased, in the aggregate, from 928 to 3840 candles, though the annual cost is to be only £7 15s. more. We suggest to our contemporaries that in future they should specify the kind of gas-burners that are to be displaced; and give a few other details, so as to have some fair basis of comparison.

In last week's issue, there were also some reproductions of photographs of excellent samples of ordinary pressure incandescent gas lighting, as carried out by the Birmingham Corporation Gas Department, in certain public buildings; and actual figures were given as to costs of lighting per hour, illuminating power, &c. The installations included the famous Birmingham Art Gallery, the lecture theatre of the Midland Institute, churches, and chapels. Turning back to the church of St. Peter, about which Mr. Pringle crowded more than thrice in the electrical press, the total possible illuminating power from the 75 25-candle power Osrams is 1875 candles; and if these "candles" should, as we suspect, be Hefner

units, then—having regard to the "memorandum" recently issued from the National Physical Laboratory—we have to bring that 1875 down to 1688 to represent British standard candles. In the Birmingham figures (p. 573), the closest return to this illuminating power is 1750 candles in the School of Art; and the total cost of lighting per hour there only works out to 2'18d. The lighting of Mr. Pringle's St. Peter's Church by 75 Osrams will run away with 2 $\frac{1}{2}$ units of electricity per hour. The 2'18d. per hour would not give much profit on the 2 $\frac{1}{2}$ units of electricity, nor supply much surplus for labour, renewals, &c. Commenting on the Burton-on-Trent comparison between the ancient and the modern, the "Electrical Times" remarks: "Whether fishtail burners be used without maintenance, or mantles with their enormous depreciation—most churches being draughty—electric light scores quite easily in church lighting." Our contemporary might make note of the fact that, in the Birmingham Art Gallery, "the mantles have lasted for a period of fifteen months without renewal; and in the Wesleyan Chapel only six new mantles were needed for 34 burners at the end of fifteen months. As "Meteor" hungers for more examples of church lighting, he might adopt those given in the "JOURNAL" last week from Birmingham.

While on this question, there are a few current matters upon which the electrical press have failed to make editorial comment. According to a South London newspaper, the Lambeth Borough Council, at a recent meeting, found themselves in the uncomfortable position of being on the "horns of a dilemma" with regard to the lighting of the libraries. It appears that in 1907, the Council asked the Libraries Committee to wire four of the libraries, with the view to consuming some £1000 worth of electricity to be supplied by agreement with the South London Electric Supply Corporation, on the understanding that the cost to be charged to the Libraries Committee should not be more than the amount previously paid for gas. The cost has turned out to be about double that of gas; and while the General Purposes Committee of the Council want to charge the full amount to the Libraries Committee, the latter claim adherence to the original agreement. The Council were asked to arbitrate between the two Committees; and 27 members sided with the General Purposes Committee and 20 with the Libraries Committee. Notwithstanding, the Libraries Committee won, as to rescind the 1907 action of the Council a two-thirds majority was required. The members voting against the Libraries Committee did so on the ground that they ought not to have electric lighting at the expense of another Committee. Would that this principle had a much wider application; and that consumers of electricity from municipal undertakings were not allowed to have the supply at the expense of the ratepayers and the consumers of other lighting commodities in the towns concerned. But the main point about this Lambeth incident is that, though the cost of electricity was to be no more than that for gas, it was double. There was a bill for electric lighting before the Marylebone County Court the other day; the defendant disputing it on the ground that it was excessive. The charge made appears to be on the maximum demand system of 8d. and 1d. For three weeks the charge came to £3 12s. 6d.; and in the sixteen weeks during which this aggrieved tenant occupied the house in question, the bill for electricity ran up to £9 5s. 9d. He declared that there was no electric light in the basement, no electricity was used for cooking, and there were no festivities at Christmas. His Honour seemed to think—the thought is common—that the purchase of the electricity undertaking by the Borough Council has not been an unmixed blessing for Marylebone; and while he regarded the charge on the evidence before him as exorbitant for lighting, he could only sympathize, and order defendant to pay the demands made upon him. The other week, too, a consumer at Grantham was disputing his account in Court (*ante*, p. 358); and a fortnight ago the Argus Printing Company were in the City of London Court fighting over an account for £14 os. 9d. for work done. Some flame arcs were put into their premises on approval; and their case was that the trial was unsatisfactory. The decision was in their favour. These samples of litigation do not look well set against the cry of the electrical enthusiast who allows his enthusiasm to carry him past the line of discretion.

It will interest the gas engineers who will be visiting Norwich in the course of the next fortnight to learn from the Chairman of the Corporation Electricity Committee (Mr. Wild) that there are 29,000 houses in Norwich, and that at least 20,000 of these are capable of taking electricity, yet only 4400 of the tenants have seen fit to do so. There must be some sound reason for them declining to have electricity for lighting purposes. Perhaps the President of the Institution of Gas Engineers will explain in his forthcoming Presidential Address. Mr. Wild appeals to the householders of the city to support him and his Committee, by abandoning their present "selfish motives" for not using electricity. This is interesting and—well, entertaining for gas people. "If only," says Mr. Wild, "the 20,000 householders would co-operate with the Committee, what could they not do? They might by their co-operation have the best supply of electricity in the kingdom, and at the same time remove the city from the reproach of being said to be the highest rated city in the kingdom." He therefore urges the ratepayers "to co-operate with the Committee, and not let selfish motives keep them from using electricity for lighting and power." It may have sounded well when Mr. Wild uttered these beautiful words. But in these prosaic days, pounds, shillings, and pence form as powerful a motive as anything Mr. Wild can advance in deciding the direction in which to confer

patronage. We take it that, in his business dealings, Mr. Wild, as a rule—electricity may form the exception—looks to get the best value that he can for his money. We wonder how he would have framed his argument if gas as well as electricity had been under the care of his Committee.

In the opening paragraphs of the "Memoranda" a fortnight since, it was seen how the question of speculative electric wiring by municipalities is being dealt with by Parliament. If municipalities must not speculate in this direction, except through contractors, and unless they make income keep pace with expenditure, the question is raised as to why electrical contractors should not take upon themselves the whole risk. They are not responsible to anyone but themselves. The considerate suggestion comes from the writer of "Installation Topics" in the "Electrical Times." He advises contractors to plunge into the system of wiring houses as they are being built, and take their chance of getting remunerated, by the builder including the cost of the wiring in the price he asks for the house, and then paying the wiring contractor, or by securing a contract from the new tenant to take electrical current, and then getting the electricity suppliers to pay for the wiring. The writer of "Installation Notes" should be put into the manager's chair of an electrical contractor's firm that wants to make a rapid exodus *via* the Bankruptcy Court. The speculation suggested is a bad business proposition. Looking down a respectable collection of tenders for wiring that have emanated from electrical contractors, an idea lurking at the back of one's mind is confirmed that there are not many of the firms who are invited to tread this risky plank that are given to speculation, and especially speculation that has "folly" written big all over it. We like to read some of our electrical contemporaries. Amusement and instruction are rather frequently mixed up in a most delightful manner. The lofty style, the simulated contemptuous attitude towards the money-making rival, the pretence of supremacy—oh! it is all so droll. Harken to this extract from the notes written to encourage wiring contractors to rash speculation: "In some such districts, the local gas company, *recognizing that electric light is usually adopted*, approaches the builder, and obtains his permission to pipe the property throughout in carcase, free of all cost. Many purchasers of house property, however, favourably they may look upon electric light, *will put up with gas* if the pipes are all run, and will hesitate to instal wires after the decorations have been completed. . . . In many cases, no doubt, if the [wiring] contractor got in first, *the gas people would hesitate to pipe houses already wired merely on the chance that anyone would prefer gas to electric light*, when both were equally available." The italicized words are full of unintentional humour. We do not, however, quite follow the argument of the writer in the last part of the quotation. What he seems to suggest that gas people would hesitate to do, is just what they would not hesitate to do. They are such firm believers in their own commodity, that they are persuaded that, in a large majority of cases where both gas and electricity were established before houses became tenanted, gas would be patronized on account of its economy and reliability, and, in the minority of cases in which electricity was patronized at all, the presence of gas would take rather a large part of the gilt off the electrical account. Something more than the presence of electric wires is required to scare away people whose business it is to sell gas.

But the writer of "Installation Notes" had a bad fall shortly afterwards; for, in a subsequent issue of the "Electrical Times," the absurdity of his suggestion was pointed out, in an indirect way, in an article that seems to have come from someone having a closer acquaintance with the editorial chair than the author of the notes in question. "The contractors," it is remarked, "have failed to meet the case of consumers who want hire or hire-purchase installations. They have neither the capital nor the inclination to do this important class of work, neither can they wire new property on the chance of effecting a sale to tenants." This is more rational than the irresponsible advice referred to in the previous paragraph. The line of the argument in the article from which these sentences have been extracted appears to be that, if Parliament is going to deny to municipal electricity undertakings general wiring and fittings powers excepting through contractors, at any rate assisted hiring and hire-purchase installations might be left to a department of the undertaking without outside intervention. "The main function of a municipal wiring department would be to carry out work which would never be done were it left to the wiring contractors; so to that extent the latter would lose nothing, while they might gain a good deal by getting some of the quite new work that would accrue from municipal *financing* of consumers." The blunt truth contained in the last five words might well be used as a cogent argument in opposition to the point of concession that it is desired to secure. But who is to draw the line between what would, and what would never, be done by the contractors? We fear that there would be scope here for illimitable disputation. But the fact that it is proposed by Parliament that the work shall be done through a contractor does not place any prohibition on assisted wiring and hire purchase; the whole point is that the work is not to be done direct by the department's own men. We, however, confess there is a drawback here, though the drawback is not so great with electricity as it would have been with gas, as the expense and restricted applications of electricity limit the field of its use to those who are in a position to do what wiring they require on their own account. That is not, however, the view of the writer of the article. As time goes on, he says, it becomes

increasingly necessary to cultivate new classes of business. "The smaller classes of consumers can only be got on some scheme of free or assisted wiring; and unless the work be done in the most economical way, there is no chance of making a profit on the supply. The great drawback of wiring is its high cost compared with gas fitting; and, in many cases, the wiring of small property would be commercially impracticable if it had to yield two profits—one to the contractor, and the other to the department. Even if the department sought no profit, there would still be establishment and other charges to go on top of the contractor's price." It is clear that the metallic filament lamp has not done all that is necessary to make electricity for lighting really popular.

GERMAN GAS AND WATER ASSOCIATION.

Programme of the Annual General Meeting.

THE Annual General Meeting of the Association is to be held, as already announced in the "JOURNAL," from the 21st to the 25th inst., at Frankfort-on-the-Maine. The provisional programme of the technical proceedings, to which the three days—the 22nd to the 24th inst.—will be devoted, has now been issued. The first day—viz., Tuesday, the 22nd inst.—will be restricted to technical communications relating to gas supply. The chair will be taken by Mr. E. Körting, the General Manager of the Imperial Continental Gas Association's works at Berlin, who will deliver his Presidential Address inaugurating the meeting. The following papers will then be read:—

- "A Historical Retrospect," by Mr. E. Körting, of Berlin.
- "A Review of the Position of the Water and Gas Supplies of Frankfort," by Herr Kölle, of Frankfort.
- "The Storage of Coal," by Herr H. Prenger, of Cologne.
- "Quality of Gas in Relation to Requirements," by Dr. H. Bunte, of Carlsruhe.
- "Gas Supply to Distant Places, and the Coupling-up of Several Places in a Large Area of Supply," by Herr Kuckuk, of Heidelberg.

On Wednesday, June 23, the following papers dealing with water supply, and the reports of some of the Technical Committees appointed by the Association, will be presented:—

- "The Development of Water Supply in the Last Fifty Years," by Herr F. Reese, Manager of the Dortmund Water-Works.
- "The Origin of Underground Water, with Special Reference to the Hessian Plain," by Dr. Steuer, of Darmstadt.
- "Removing the Acidity of the Underground Water of the Frankfort District," by Herr Scheelhaase, of Frankfort.
- The Report of the Committee on the Working of Water-Works, presented by the Chairman of the Committee, Herr F. Reese, of Dortmund.
- The Report of the Electrolysis Committee, and
- The Report of the Standards Committee, both of which will be presented by Mr. W. H. Lindley, the Chairman.

Friday, June 24, will be devoted to the presentation of the reports of the remaining Technical Committees, to private business, including the election of officers for the ensuing year, and to the reading of two papers dealing with gas supply—viz.:

- "The Development of Gas-Engines," by Herr J. Körting, of Düsseldorf.
- "Advances in Inverted and High-Power Incandescent Gas-lighting," by Herr Lebeis, of the Welsbach Company of Berlin.

The reports of Committees will be presented by their Chairmen as follows:

- On the Constructional and Experimental Gas-Works of the Association, by Dr. K. Bunte, jun., of Carlsruhe.
- On Photometry, by Dr. Leybold, of Hamburg.
- On Heating, by Dr. E. Schilling, of Munich.
- On Technical Training, by Dr. W. von Oechelhaeuser, of Dessau.
- On Gas-Meters, by Herr C. Kohn, of Frankfort.

The arrangements for the meeting are in the hands of a Local Committee of which Herr C. Kohn, of Frankfort, is acting as Secretary. The Information Bureau will be established at the offices of the Imperial Continental Gas Association in the Rosmarkt; and the technical meetings will take place in the hall at the Zoological Gardens. There will be a reception by the Chief Magistrate of the City on the evening of Monday, the 21st inst., and for the afternoon of the following day a number of visits to works in the town have been arranged, including an inspection of the vertical retort settings at the Solmsstrasse works of the Imperial Continental Gas Association; the works of the Frankfort Gas Company in the Gutleutstrasse; a new Municipal Gas-Works at Offenbach-on-the-Maine, where there is an installation of vertical retorts; and the new water-works of Frankfort at Hattersheim. For the evening of the Tuesday, arrangements have been made to see performances at two of the theatres. For the afternoon of Wednesday, the 23rd inst., visits to various works and exhibitions have been arranged; and in the evening there will be an assembly and concert in the Palm Garden. On the Thursday evening, there will be a banquet and concert in the Zoological Gardens; and on Friday, the 25th inst., an excursion will be made to Saalburg and Homburg.

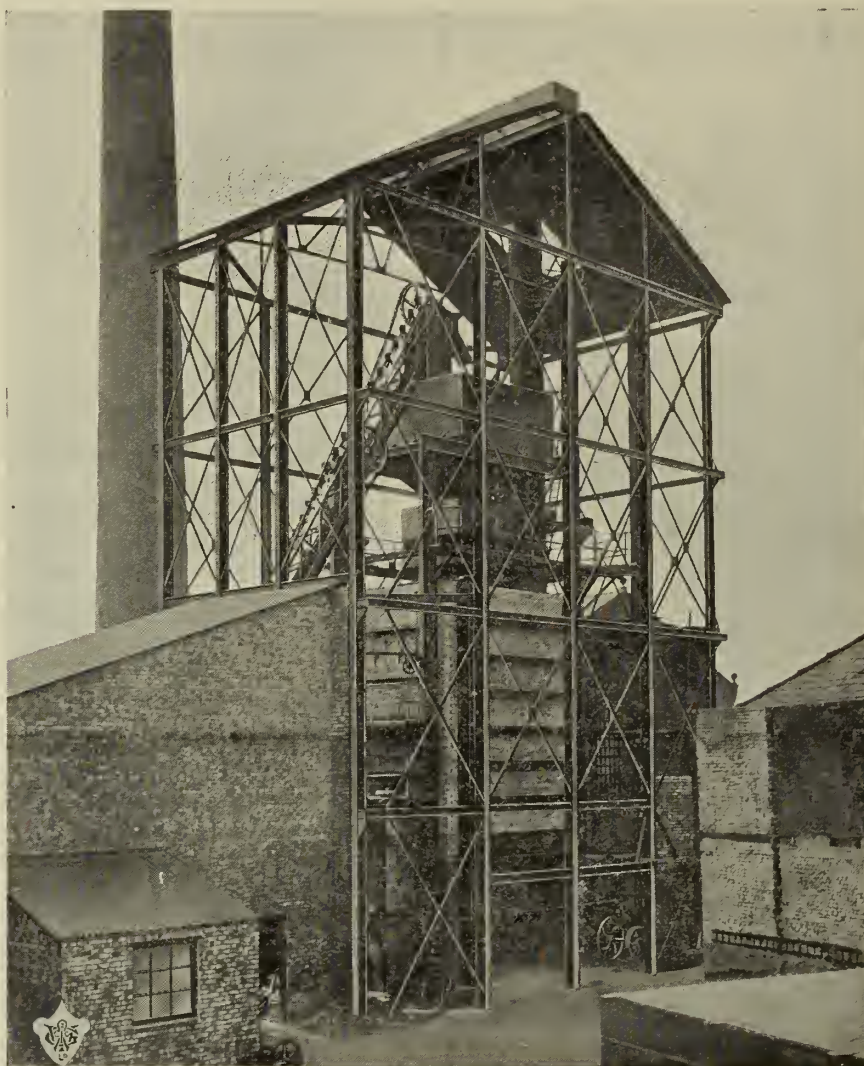
Unusual importance attaches to this year's meeting, because it coincides with the celebration of the Jubilee of the Association.

THE GLOVER AND WEST VERTICAL RETORTS AT ST. HELENS.

Continuous Working with Gravity Charging.

GAS engineers, not only in this country but abroad, have been patiently waiting to learn of the practical development of the vertical retort system at the St. Helens Corporation Gas-Works, together with the results of the working. But they have lost nothing by delay, as now it is our pleasure to present to them a system complete, and at work on a practical scale, taking its part—with seven months' record at its back—in the ordinary daily

producing operations, and with routine precision. As a matter of fact, when we remember the period that has been absorbed in the development of other carbonization systems with vertical retorts—every day of which period could be justified—the development of the Glover and West system, including involuntary delays through various uncontrollable causes, has, it must be admitted, been somewhat rapid.



The Setting of Eight Vertical Retorts on the Glover and West System.

The system is a continuous, and not an intermittent, one; and it had its origin in the patents—known in detail to all who have made a study of vertical retort carbonization—granted to Messrs. Young and Glover. The work of the late Mr. William Young—the former co-patentee—as a pioneer in the successful application of vertical retorts for the purpose of distilling shale is well within the knowledge of, and is highly esteemed by, our readers. The system, however, that has been developed to a practical success at St. Helens, as we are about to describe it, is covered by patents and inventions, in which Mr. John West, of Manchester, is associated with Mr. Samuel Glover. But it must not be thought that features which it was expected would find a place in the St. Helens setting have not been tried. In designing the plant as now erected, Mr. West wisely arranged it with a series of valves and bye-pass connections, so that the theories advanced by Messrs. Young and Glover in their original patent could be tested, as well as working with or without the hydraulic main. It was finally proved, after many experiments, that the most satisfactory method was to work with a full retort, and dispense with the hydraulic main—having separate valves to each retort, and automatically feeding in the coal. Everything was so thoroughly thought-out, that all the changes contemplated have been made without letting-down the setting since it was started; and the whole plant, we can bear witness, is working regularly and in an excellent manner.

THE NEW VERTICAL RETORT-SETTING.

In a light steel-framed structure—partly filled in with 9-inch brickwork at the lower part, then with 4½-inch brickwork above, the upper panels partially rough boarded-in for protective pur-

poses, and with a light galvanized iron roof over the whole—was found the setting of eight vertical retorts whose operations were soon to be admired, for it was at once obvious that, in the installation, continuous working had been reduced to a matter of fine simplicity. But we pause a moment to remark upon the lightness of the structure that has sufficed to protect the setting during the rigour of the winter through which we and it have but lately passed; for it was in October last that the plant was first set to work. It will be a matter for congratulation if, with the coming of the vertical retort system, a cheaper method of building the structure sheltering carbonizing plant becomes the vogue; and there is no reason—as instanced here—why it should not, and capital expense be saved. Some vertical retort constructors go so far as to say that anything more than a light top covering is unnecessary; but Messrs. Glover and West are not of that way of thinking.

The building, however, does not in itself possess the interest of that which it encloses; but we cannot proceed without at once complimenting the Chairman and the members of the St. Helens Corporation Gas Committee upon the completeness given to the installation, and the thoroughness of the test that this has allowed, not only in their own interests, but to the satisfaction of the gas industry at large, the professional men of which have for some time had their eyes turned to St. Helens for definite information as to the working of the new process. With the thoroughness of Mr. Samuel Glover, with manufacturers on the large scale as members of his Committee (men who are aware that the value of processes must, to be of use, be tested in a practical way, and on a reliable scale), and with the same life-long principles animating Mr. John West, it has been anticipated that, with the publication of description of structure, there would be something positive at

hand. We have that "something" in the finished process and the dependable results.

Running the eye generally over the installation at St. Helens before going into particulars, we see a working combination of eight 20 feet through verticals, complete with coal-breaker, elevator, coal hoppers, and shoots to the retorts, coke-extractors and coke-receiving chambers, with patented outlet-doors, and all the necessary retort-bench bracing, staging, staircases, valves, gas and tar mains, governors, and other plant. Following the foul main across a short distance of the yard, we see the condenser connections, exhauster, tar and ammoniacal liquor extractor, scrubber, and purifiers, tar and liquor tanks. Then, in an adjoining building, is a station meter, a jet photometer, a photometer room, fitted with a 10-candle pentane lamp, standard burners, calorimeters, and so forth; and outside there is a 1000 cubic feet test holder, to which, through the twenty-four hours a continuous stream of gas can be passed from the vertical retorts, so as to store for testing purposes a representative average of a day's make, instead of taking samples at different periods of the day. We have here, in fact, a miniature gas-works with the carbonizing plant, in point of dimensions, on the ordinary working scale. Never indeed has a new carbonizing plant been better equipped to carry practical experiments to a successful and conclusive issue, and to independently test against the working results of the existing system. The vertical retorts and the auxiliary machinery were erected by West's Gas Improvement Company, Limited, of Manchester, who are the sole makers for the Glover and West system.

SOME DETAILS OF THE SETTING.

With this hasty glance at the constituent parts of the installation, we may profitably devote a little time to a closer examination of the central feature—the setting—the principles involved in it, together with the methods of operation. The ground space occupied by the eight retorts in the one setting is 17 feet by 13 feet. From ground level to the top of the brickwork of the stack, the height is 33 feet; and the height above this to the top of the coal-storage hopper into which the elevator delivers, is 18 feet. There is 9 feet of headroom below the retorts; but depending from them are the coke-hoppers. So there is no unnecessary space here, other than that essential for the comfortable discharge of the operations associated with the system. The eight retorts in the setting are of special oval section, 24 in. by 12 in. at the top, expanding to 30 in. by 18 in. at the outlet end. The retorts are 20 feet long. Presently there will be something of interest to say about their heating; for upon the heating of the setting (as, in fact, has been the case in all the details) a good deal of thought has been expended.

Before ascending to the top of the setting, it is observed that the waggons bringing the coal supply to the vertical retorts come from the old coal-store; and the coal goes through the usual cycle of operations. It is delivered by the waggons into the coal-breaker at the foot of the elevator, which then raises it—once a day is sufficient for the present installation—to the storage coal-hopper at the top of the setting. The capacity of the elevator and coal-breaker is roughly 20 tons an hour.

AT THE TOP OF THE SETTING—NOISELESS, SMOKELESS, AND DUSTLESS CHARGING.

Reaching the top of the setting, one can hardly tell that it is at work. There is no mechanical movement of any kind. It is only when the elevator is delivering, for about two hours a day, into the coal-storage hopper that there is any noise whatever at the top of the bench; and only about once in four hours has the man in charge to ascend to the top to open the valves between the storage and the feeding hoppers; and gas making is then a silent, automatic operation until the exit of the coke at the bottom of the retorts. On top, the brickwork of the setting is only just warm; and the gas-outlet pipes are not much hotter. There is, in fact, an infinitesimal loss of heat by radiation here; and the same may be said of all other parts of the setting. It will be seen, as the description proceeds, that the original idea of a moderate free space in the top of the retorts has been sacrificed to simplicity, and that the gas is taken off at the top of the retorts without passing through the coal-hopper above.

The coal hopper is capable of holding 20 tons; and as each of the retorts has, under its present conditions of working, been carbonizing about 2½ tons a day, the 20 tons is just sufficient for a day's work. The hopper has four conical-shaped extensions from the bottom, which deliver through a hand-worked gas-tight valve, into the feeding chambers (seen in the photograph of the setting taken before the external framing was bricked in), which are partitioned so that each one feeds into two retorts. The feeding chambers are in direct communication with the retorts; and when they are periodically replenished from the storage hopper (which is the work of only a few minutes), there is really in them a head of coal that will last for four hours' feeding. It will be seen from this, that the retorts are charged entirely by gravity, and without mechanical aid. The coal storing and feeding hoppers, it should be mentioned, are suspended by girders supported on the buckstays, so that the retort-stack is entirely relieved of the weight of the hoppers and their contents. At the junction of the ironwork of the feeding hoppers and the top of the brickwork of the setting, provision is made for the upward expansion of the latter in manner somewhat similar to a purifier lute, with a filling of lime or other soft material after

expansion has taken place. All this top work is easily examined by the platform running round the setting.

The next thing that arrests notice is the gas outlet-pipe that runs laterally from the top of each retort. This outlet is a short bent pipe, upon which there is a rectangular sealed faced door 9 in. by 6 in., so that if any cleaning out is necessary it can be easily and instantly accomplished. Through the centre of the door is a small turned plug, about 1¼ inches in diameter, through the opening occupied by which a bar can be inserted to ascertain the relative position of the carbonized and uncarbonized portions of the charges. This short length of outlet-pipe (which has a valve attached to it) drops almost immediately—so acting as a descension-pipe, and not an ascension-pipe—into the foul main, which has a good fall to the condensers. There is no ascension-pipe, nor any hydraulic main. By the side of each gas outlet-pipe there is another hole, covered by a ball, and perforated by a hole through the centre. By turning this ball so that the hole is in a downward direction, a rod can also be used here, if required, to ascertain the positions of the carbonized and uncarbonized portions of the charge. For scurfing purposes, the ball is removed entirely; but this is an operation that has been rarely required during the seven months' working.

SOLIDITY OF STRUCTURE A NECESSITY.

With such vertical retort-settings as this, one essential to success is that the structure shall be of a substantial character, to withstand the variations of temperature to which it is exposed in its different sections. The joint designers of the setting attach the greatest importance to the best of material and workmanship being employed in connection with the system; and, under the supervision of Mr. West, West's Gas Improvement Company have put into the setting work of a very strong and substantial character. It is seven months now since the setting started; and the brickwork and ironwork so far as they are capable of examination are in as perfect order to-day as when the plant began work. Every brick in it is made of fire-clay; the buckstays, uprights, and cross-bracings are all substantial; and they look as though they were fitted in position but yesterday. The old mode of solid construction has been adapted to the most modern mode of carbonization. It pays; for it means longevity.

THE HEATING OF THE SETTING—RAISING THE TEMPERATURE OF THE SECONDARY AIR BY THE SPENT COKE.

The producer for the heating of this setting of eight verticals is at one side; and on a platform, about 15 feet from ground level, is seen the charging mouthpiece, covered with a hermetically sealed lid. The charging of the furnace is performed once every four hours with cold coke, and measured so that the consumption is known to a nicety. The fuel account is not more than 12 to 13 per cent. of the coal carbonized, which is notably low. The furnace was seen to be working admirably, and everything visible was in excellent condition. The setting, be it remembered, has been at work for seven months; and the bars of the furnace were in the condition that one looks for in bars of more recent introduction. Clinkering is performed at intervals varying from 24 to 48 hours, according to the quality of the coke.

Regarding the heating of the retorts—the system is fully protected under the patents of Messrs. Glover and West—temperature regulation is absolutely at will; and any part can be heated precisely as may be required. This is accomplished by a series of combustion chambers from the top to within 3 feet of the bottom of the retorts; and this 3 feet of the bottom section is not subjected to the heating gases—being run into the chambers in which the secondary air passes on its way to the regenerators and combustion chambers. Here the secondary air extracts heat from the hot coke that is nearing its point of discharge, so that the air assists in cooling the coke; and the coke performs the useful function of heating the secondary air. Judging of the condition in which the coke passes from the setting, and the small amount of radiated heat found at any part, we do not know that we have ever come across a setting in which the heat is so completely confined and utilized as in this one. This has a very appreciable effect in producing the low fuel account.

The method of heating the setting is to have it at a higher heat at the top than at the bottom; and this is readily accomplished through the distinct combustion chambers provided. There is a division wall between the two rows of retorts. From a common channel at the side of the setting, there is a port-hole giving entrance to the producer gases in each pair of combustion chambers. On either side of this gas-inlet is a port-hole for the admission of the heated secondary air. Combustion takes place on each side of the division wall, and there is free travel round the retorts—the waste gases passing out into a common flue, and on to the next pair of chambers. With the accretion of the waste gases, and the supplementing of the secondary air in the successive chambers, the graduated heating of the retorts from top to bottom is secured by this patented arrangement. An inspection through the sight-holes provided at the side of the setting, shows a gradual rise of temperature upwards, chamber by chamber, until in the top chamber heating is seen that has been the admiration of all who have so far had an opportunity of making an inspection.

THE EXTRACTION OF THE COKE.

The patentees of this new system of carbonizing in vertical retorts have more than one system of extracting the spent charges

from the retorts. But on the present occasion it will be sufficient to refer to the one witnessed in successful operation at St. Helens. Beneath the retorts is the coke-receiving hopper, partitioned into four separate chambers, so that two retorts deliver into a single chamber. Each chamber has a curved swing cover over the bottom outlets; and this serves as a container for a shallow water seal, which is replenished by a water-tap on the side of the hopper after every discharge of the coke. At the bottom of each pair of retorts is a plate, which practically forms a base for the charges. On the top of this plate is a "wiper," or rotary arm, which slowly revolves—making only one revolution in from fifteen to twenty minutes—and pushes the coke off the plate into the receiving-hopper below. At each of the four corners of the hopper is a spindle by which the "wiper" is revolved. Each pair of spindles is operated by arms connected with a reciprocating bar, which, in turn, is operated through reducing gear—the motive power being provided by one of West's Gas Improvement Company's engines in an adjoining engine-room. The speed can be varied at will, according to the coal being carbonized. Hence it follows that the speed of carbonization and the quantity of coal passed through the retorts in twenty-four hours are completely governed by the rate at which the mechanical discharge is effected. If the coal is wet, or, from any other cause, wants more burning off, the means of extraction can be regulated to meet the conditions. At the present time, as previously stated, 20 tons of coal are being passed through the eight retorts per day; so that each retort is carbonizing $2\frac{1}{2}$ tons. Thus the travel of the coal from top to bottom takes about $12\frac{1}{2}$ hours. The coke is removed from the receiving chambers about every half hour at present; and it is carefully weighed each time—one discharge from four retorts that was personally examined weighing 6·1 cwt.

The operation of discharging the retorts is interesting to watch. From this small installation the coke is barrowed; but for the larger installation in prospect coke-conveyors will be used. The water-sealed covers of the coke-receiving hoppers are operated by a lever worked by hand. At the first short pull at the lever, the water in the curved lid escapes, and as the lever is fully pulled out, the coke discharges into the barrows in excellent condition—solid, large, dry, and bright, and practically without breeze. The local manufacturers are already learning the value of this coke as compared with the ordinary; and they willingly pay 2s. 6d. per ton more for it. Practically no quenching at all is required. Such indeed have been the advantages of the Glover and West system of heating the secondary air by the outgoing coke, that the coke only occasionally requires the addition of a little water for the purpose of quenching it; and consequently the absorption of the heat of the coke by the secondary air results in considerable economy in fuel. Therefore, this forms a very valuable part of the installation.

THE QUESTION OF STEAM ADMISSION.

There is one question that may be raised in the minds of readers; and that is as to whether, with the water seal at the bottom of the coke-receiving hopper, there is any appreciable amount of steam admitted to the retort. There is not; and a moment's consideration will prove it. When the first droppings from the retort have made a bed at the lower part of the coke-receiving hopper, the water is completely insulated, as it were, from the subsequent discharges. As a matter of fact, the patentees have, after mature consideration, abandoned all idea of the admission of steam, for several reasons, which, summed up, have convinced them that from it there is no material advantage to be gained, but rather harm.

WEAR AND TEAR.

As to the question of wear and tear, after only seven months' working it is impossible to speak with any amount of positiveness. But the length of time is sufficient to enable the patentees to say that the item of wear and tear will be on a low scale. Just consider the conditions with this process of continuous working. The charging is in small quantities by gravity. There is nothing to cause trouble. The retort is not subject to any violence or rapid fluctuations of condition through the admission of heavy cold charges, and the withdrawal of highly heated ones. The travel of the charge into and out of the retort is as gentle as it possibly can be. Mechanical operation is limited to the 20-minute revolution of the "wiper" extracting the coke at the bottom of the retort. The retorts have only required scurfing twice since they were started. These are all points in favour of a low wear and tear account.

LABOUR.

At the present time, it is impossible to say much about the question of labour. On this setting of eight retorts, there is one stoker per shift, at 5s. 6d. per shift, whose duty is to look after the driving-engine, exhaustor, and the whole of the plant, the feeding of the coals to the retorts and coke to the furnaces, and the removal, weighing, and tipping of the coke in the coke yard. There are also two labourers during one shift, at 3s. 9d. each per shift, to unload the railway waggons, elevate the coal into the top hoppers, and attend to the weighing and elevating of the coke for the furnaces. The cost of the three stokers and two labourers amounts to £1 4s. per day, or 1s. 2d. per ton of coal carbonized; and this shows a considerable reduction as compared with the cost of working in the horizontal retort-house. These men are only partially occupied, and could attend to at least two settings of retorts per shift, which would reduce the cost by one-half.

During the whole of the experiments, the coke produced and that required for the furnaces has been carefully weighed, so that, in the ordinary way of working, the operations in vogue at present would be considerably reduced. Mr. West estimates that, with a moderate sized installation, the labour costs would be from 6d. to 9d. per ton according to locality.

ALL TESTS ON AN INDEPENDENT PLANT.

Before referring to the results from tests made on the plant in the course of ordinary working, both by the contractors' engineers and chemists, and independently by Dr. Harold G. Colman, over a period of some days with great comprehensiveness, we will just take a glance at the auxiliary plant which gives to this setting the advantage, in the trials and tests, of being a complete gas-manufacturing unit. When treating of the plant at the top of the setting, we traced the course of the gas from the head of the retorts through the short descension-pipe into the 10-inch foul main. The plan shows the disposition of the auxiliary plant. All the connections it will be seen are 10-inch. The 10-inch foul main runs across the yard—connecting up first with a retort-house governor (fitted with a bye-pass), on to the 10-inch vertical condensers, only part of which, however, are in use. At the bottom of these condensers beautiful thin tar—that is to say, beautiful as tar goes—of a brownish appearance, is seen escaping; and then we come to the exhaustor. In passing, it is noticed that there are gauges situated at different parts all through the plant—at the top of the retorts and at the bottom, and interspersed among this external condensing and purifying plant; and, making allowance for friction, it is remarkable how level the pressures are maintained. Then the gas passes through a tar extractor, and ammoniacal liquor scrubber. All the condensed tar and liquor from all parts of the plant run into a common 8-foot diameter tank above ground, where it is measured before being run off into the ordinary works' tar and liquor well. From the scrubber, the gas passes to the purifier, where it is treated by oxide of iron, and not by lime as is that from the horizontal retorts. The gas is registered by a separate station meter (which has been certified by the makers), before passing to the common storage of the works. As already stated, a special photometer and testing room has been fitted up, and a 1000 cubic feet test holder is available for the tests, into which a continuous sample of the gas can be drawn throughout the twenty-four hours. Thus, it will be remarked, everything is distinct from the ordinary working; everything can be got at; everything can be completely measured and tested at will. And there can be no question about anything.

SOME MISCELLANEOUS NOTES—UNIFORM PRESSURE AND OTHER CONDITIONS.

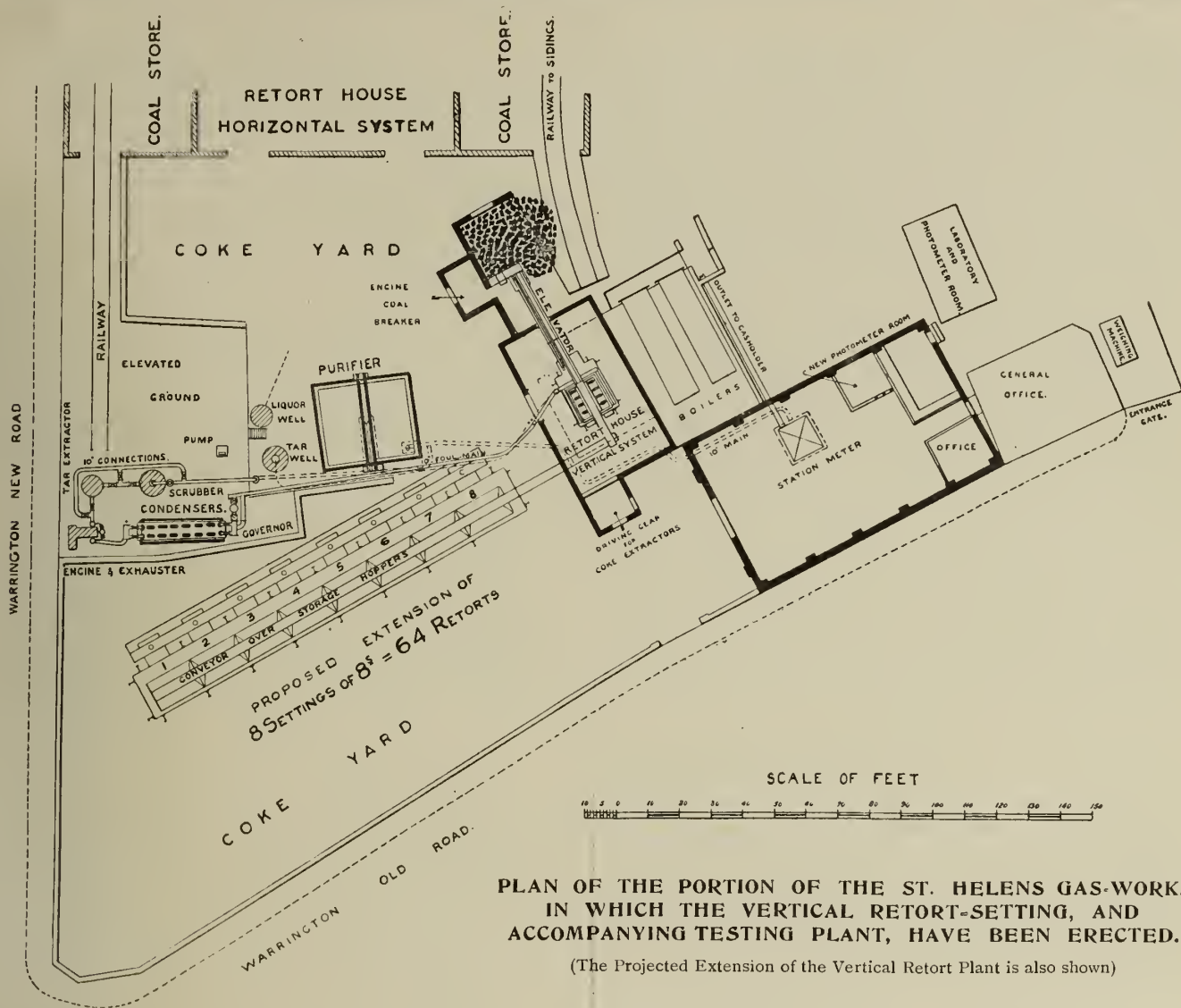
There is another noticeable feature about the working of these continuous retorts; and it is that in them the conditions may be said to go on from hour to hour and day to day with methodical consistency. The pressure-gauges connected at the top and bottom of each retort indicate the uniformity of pressures as between the top and bottom of the retort and as between retort and retort. There is a little oscillation when the coke is removed from the hoppers below; but then it is observable that the pressures settle down again to normal almost instantly. Remember that such material as slack or washed nuts is being used in these retorts; and it will be admitted that, with such close lying material, to have level pressures at the top and only one-tenth difference at the bottom is an excellent condition of working. With such a small variation between top and bottom, there cannot be much difference in the pressure at the middle of the retorts. With loose material, the pressure, there is no question, would be about the same throughout the length of the retort.

There is an interesting point as to the condition of the charges in the retorts. Reference has been made to the facilities provided at the top of the retorts for testing by a rod the characteristics of the charges. Testing in this way, the formation of the charge appears to be composed of 2 to 3 feet of coke at the bottom of the retort, and then the uncarbonized portion seems to take a V-shape, with the spent portion of the charge on the outside. This being so, the travel of the gas must be through the colder or uncarbonized portion of the charge; and this is proved by the low temperature of the gas passing into the descension-pipe at the head—viz., 160° C.

Another instructive feature is that in these eight 20 feet length retorts, 20 tons of material are carbonized per day. In the eight retorts, there are 160 feet length; so that, given a production of 11,500 cubic feet per ton of local slack (in the use of which for gas making St. Helens appears to stand almost alone), the production is upwards of 1400 cubic feet per foot-run of retort per day. If a Durham, or some other high-class, coal were used, the make per ton and per foot of retort would, of course, be considerably higher. It is understood, however, that arrangements will soon be made for carrying out tests in the vertical retorts on coals commonly used in other parts of the country, under the same exact conditions that the tests with the local slacks have been made. The results of these tests can be incorporated in a subsequent article.

A THOROUGH TESTING, AND A FULFILLED STRINGENT STIPULATION.

As has been said, the contract for the setting was entrusted to West's Gas Improvement Company, Limited, of Manchester; but it was upon certain fixed conditions—the Corporation Gas



PLAN OF THE PORTION OF THE ST. HELENS GAS-WORKS IN WHICH THE VERTICAL RETORT-SETTING, AND ACCOMPANYING TESTING PLANT, HAVE BEEN ERECTED.

(The Projected Extension of the Vertical Retort Plant is also shown)

Committee stipulating that the contractors should guarantee to improve upon the carbonizing results and labour costs of their existing retort-house, and, failing this, that the whole of the plant was to be removed from the site without any payment whatever. When completed, the apparatus was for some time thoroughly tested by the contractors' engineers and chemists. They also obtained the services of independent operators to test the plant; and the results, which were very satisfactory, were reported to the Gas Committee as follows.

Independent Experiments made by Mr. J. E. BLUNDELL, Chemist and Analyst, Southport, with Eight Vertical Retorts, 25 feet long, continuously for three days, commencing March 10, finishing

March 13, 1909.

Coal carbonized, washed Orrell nuts.	61 tons.
(containing 5.35 per cent. of moisture, for which no allowance has been made.)	
Total gas made (N. T. P.)	718,552 cub. ft.
Gas made per ton	11,779 "
Illuminating power	15.74 candles
Calorific value, gross	600.25 B.Th.U.
Calorific value, net	541.94 "
Tar per ton of coal	16 gallons
Ammoniacal liquor per ton of coal	40.76 " 10 oz.
Sulphate of ammonia	34.33 lbs.
Coke per ton of coal	14.34 cwt.
Fuel, coke per 100 lbs. coal carbonized.	12.02 lbs.
Coal carbonized per retort (three days' test) per 24 hours	2 t. 10 c. 3 q.
Gas made per retort (three days' test) per 24 hours	29,939 cub. ft.
Yield of gas per foot length of retort per 24 hours	1496 "
Coal carbonized per retort (eight days following above experiment) per 24 hrs.	2 t. 11 c. 1 q.
Gas made per retort (eight days following above experiment) per 24 hours	30,710 cub. ft.
Yield of gas per foot length of retort per 24 hours	1535 "

Composition of Gas.

	Per Cent.
Carbon dioxide	2.0
Unsaturated hydrocarbons	2.8
Oxygen	nil.
Carbon monoxide	7.2
Methane	33.57
Hydrogen	50.94
Nitrogen	3.49

Horizontal Retort-House.

April 13, 1909.—A test was made with washed Orrell nuts of the same kind as used in the above experiment with the vertical retorts, with a view of ascertaining the difference in volume of gas obtained between each system of working. 140 retorts 10 feet long were in use, with excellent heats; and these were charged with coal very evenly with West's manual machinery, and most thoroughly burnt off—the results being as follows:

Coal carbonized (washed Orrell nuts)	86 t. 2 c. 2 q.
Total gas made (N. T. P.)	905,215 cub. ft.
Gas made per ton	10,510 "

Advantage of volume obtained in the verticals over the horizontals, per ton of coal carbonized, 1269 cubic feet.

The bulk of the coals used at the St. Helens works are cheap washed and other slacks of the neighbourhood; and these produce on the average about 10,000 cubic feet per ton; the gas being enriched with oil gas made by the Peebles process.

To make a comparison in the verticals, as against the above results obtained (upon the average) in the horizontals charged by machinery on April 19 to 22, 1909, two kinds of these cheap slacks, of which about 70 per cent. is used throughout the year, were tested—viz., three trucks of washed slack, three trucks of fine Arley slack mixed together; the results being as follows:—

Total weight of coal carbonized	49 tons 6 cwt.
Total gas made	569,500 cub. ft.
Make of gas per ton of coal carbonized	11,551 "
Average illuminating power	16.73 candles.
Average calorific value, gross	592.67 B.Th.U.
" " " net.	542.50 "

The coke produced in the verticals was of excellent quality, having a higher heating power; and the breeze from the coke is less than from the ordinary retorts.

The illuminating power for the horizontals could not be obtained, as the gas was enriched in transit to the station meter.

The illuminating power tests were made on the No. 2 "Metropolitan" burner.

The calorific value was taken with Junkers apparatus.

The whole of the plant and machinery worked in a most satisfactory manner without a hitch during the whole experiment.

(Signed) J. E. BLUNDELL,
Chemist and Analyst.

The Corporation Gas Engineer (Mr. S. Glover) also reported that the working of the plant had been very satisfactory, and that

excellent results had been achieved; and in the annual report of the Gas Committee, the following paragraph appears:—

During the period under review, the new method of carbonizing coal in vertical retorts (which our Engineer, in conjunction with West's Gas Improvement Company, has introduced by arrangement with the Committee) has been worked for a considerable time; and the Committee have taken great interest in the development of the new system, and have had it officially tested on behalf of the Corporation by a competent London expert, who has reported very favourably of the system, and the way in which it is worked. This new system of setting retorts is likely to prove of particular value to the Gas Estate, as it is the only hope we have of being able to increase the production of gas at the old works; and our Engineer is to be congratulated upon having taken another important step in advance.

It will be observed from this that the Gas Committee attached very considerable importance to the fulfilment of the guarantee, as the system was so great a departure from that in operation at their works. Hence the arrangement for an independent expert to thoroughly test the plant, in order to arrive at the full and complete measure of the value and advantages in every detail to be obtained by the adoption of the system. Their choice fell upon Mr. A. E. Broadberry, the Engineer of the Tottenham and Edmonton Gas Company (with a chemist), to make complete experiments with the plant. These experiments have been carried out; and Mr. Broadberry has reported that the whole of the guarantees imposed upon the contractors by the Corporation have been fulfilled, and that the results are superior to the working of the old system—the make of gas per ton of coal carbonized being increased considerably, more tar being produced of better quality, the coke also being of enhanced quality, while the cost for labour is materially reduced. The tests were made against the retort-house, containing 24 beds of through retorts, operated by West's manual stoking machinery, so that the standard set (using the same class of coal) may be said to be a good one.

RESULTS OF DR. COLMAN'S TESTS.

The patentees acted wisely in also placing the plant under the entire control of Dr. Colman for making independent measurements and tests over several days' ordinary operation; and his results will be taken as unimpeachable in the matter of care and veracity. The coals used in these tests were washed nuts—similar to those tested in March by Mr. Blundell; the difference being that in Dr. Colman's test the heats of the retorts were at a somewhat lower temperature. After witnessing the working and the results, it is not by any means to be admitted that the returns secured by Dr. Colman exhaust the possibilities of the system—even using the class of coal that he employed.

Chemical Laboratory, 1, Arundel Street,
Strand, W.C., May 29, 1909.

Dear Sirs,—I beg herewith to present my report upon the test made with the installation of continuous vertical retorts at the St. Helens Corporation Gas-Works, during a period extending over four days from May 20 to May 24.

Disposition of Plant.—The installation in question consists of a setting containing eight vertical retorts, 20 feet in length, heated by gaseous firing from a generator combined with the plant. The gas produced is condensed and purified in plant which is entirely separate from that dealing with the gas from the horizontal retorts; the gas passing through a dry main to the foul main, thence through a set of vertical atmospheric condensers to the exhauster, after which it traverses successively a washer, scrubber, and oxide purifier, passing thence to the meter, after which it mixes with the gas from the horizontal retort-house.

Method of Carrying out the Test.—The coal used was weighed in the railway waggons over the Corporation machines, and elevated into the large overhead bunker common to all retorts. Between the latter and each retort a smaller bunker is fixed; each pair of small bunkers being separated from the large bunker by means of a slide-valve. At the commencement of the test, at 10 a.m. on May 20, matters were so arranged that the small bunkers were all full up to the level of the slide-valve, the large bunker being empty; and the same conditions were fulfilled at the close of the test at 10 a.m. on May 24, so that the ascertained weight of coal from the machine represented the actual quantity carbonized. In the same way, the generator was completely filled at the commencement of the test, and again at the end—the coke added in the interval being all weighed in. The clinker from the furnace was picked, and the unburnt coke returned to the generator unweighed.

The coke was dropped from the discharging devices into barrows at half-hourly intervals, and weighed after standing for a short time.

Two tanks are provided for the tar and liquor. In the first, the tar and virgin liquor from the foul main and condenser collect; while the second contains liquor which is constantly circulated through the washer by means of a pump, and into which the scrubber liquor also runs. The first tank was emptied at the commencement of the test; and the volume and strength of the liquor in the circulating tank ascertained. The tar and virgin liquor obtained in the first tank during the test were measured and sampled; and the increase of volume and strength of circulating liquor at the end of the test determined and included in the ammonia production—account being also taken of the tar deposited in the second tank; this having been separated by the action of the washer. In addition, the amount of ammonia in the gas leaving the scrubbers was determined and allowed for.

The dry purification was effected by oxide of iron only; and no air was admitted for revivification during the test.

RESULTS OBTAINED DURING TEST, MAY 20-24, 1909.

Coal Carbonized.—The coal carbonized consisted of washed Orrell nuts, containing the following quantities of moisture and ash, as determined from an average sample collected from the various trucks used as they were unloaded:—

Moisture 3.95 per cent.
Ash 6.94 „

The total weight carbonized during the 96 hours of the test amounted to 74 tons 14 cwt.

Gas Made.—The total quantity of gas produced during the period amounted to 855,236 cubic feet, corrected to 60° Fahr., 30 inches barometer.

Yield of gas per ton 11,448 cubic feet.
„ „ „ diem 213,800 „ „
„ „ „ retort per diem 26,725 „ „
„ „ „ foot length of retort
per diem 1,336 „ „

Quality of Gas.—As the gas made from the vertical retorts mixed with the gas from the horizontal retorts before the holders, separate arrangements were necessary to obtain an average sample of the gas; and the existence of a holder of some 1000 cubic feet capacity, in connection with the test plant of the Corporation, enabled this to be done in a satisfactory manner—a stream of the gas as made being led into this holder over considerable periods, and the collected gas then used for the determination of the illuminating and the calorific power.

The illuminating power was ascertained on the bar photometer, using the Harcourt 10-candle pentane standard and the "Metropolitan" No. 2 burner. The calorific power was determined by means of the Junkers calorimeter. Eight samples in all were collected; the period of collection being eleven hours, except in the first instance—the gas being sampled therefore for 85 out of the 96 hours the test was in progress. The results obtained were as follows:—

No.	Sample Collected.	Ill. Power. Candles.	Calorific Power. B.Th.U. Gross.	B.Th.U. Net.
(1)	May 20, 12.30 p.m. to May 20, 8.30 p.m. .	16.85 ..	592.0 ..	534.7
(2)	May 20, 9.30 p.m. to May 21, 8.30 a.m. .	15.83 ..	591.0 ..	526.4
(3)	May 21, 9.30 a.m. to May 21, 8.30 p.m. .	16.86 ..	594.0 ..	542.9
(4)	May 21, 9.30 p.m. to May 22, 8.30 a.m. .	16.06 ..	580.4 ..	525.8
(5)	May 22, 9.30 a.m. to May 22, 8.30 p.m. .	16.02 ..	580.4 ..	520.0
(6)	May 22, 9.30 p.m. to May 23, 8.30 a.m. .	16.19 ..	589.4 ..	527.2
(7)	May 23, 9.30 a.m. to May 23, 8.30 p.m. .	16.46 ..	584.0 ..	524.5
(8)	May 23, 9.30 p.m. to May 24, 8.30 a.m. .	15.94 ..	593.5 ..	534.9
Average . . .		16.28 ..	588.8 ..	529.6

Composition of Gas.—Samples of Nos. 3, 4, and 6 were taken, and subjected to complete analysis, with the following results:—

	No. 3.	No. 4.	No. 6.	Average. Per Cent.
Carbonic acid . .	2.1 ..	1.8 ..	2.0 ..	1.97
Unsaturated hydrocarbons . .	2.7 ..	2.8 ..	2.6 ..	2.70
Oxygen	Nil ..	Nil ..	Nil ..	Nil
Carbonic oxide . .	9.9 ..	10.0 ..	9.8 ..	9.90
Methane	32.4 ..	31.2 ..	32.3 ..	31.97
Hydrogen	49.7 ..	51.3 ..	51.0 ..	50.67
Nitrogen	3.0 ..	3.1 ..	2.1 ..	2.73
99.8 ..		100.2 ..	99.8 ..	99.94

Production of Coke.—The total weight of coke produced during the test was 55.34 tons, weighed moist. An analysis of an average sample collected from each barrow as weighed gave the following results:

Moisture 4.0 per cent.
Ash 10.8 „

Therefore the yield of coke moist as weighed equalled 14.8 cwt. per ton; yield of dry coke equalled 14.2 cwt. per ton.

Generator Fuel.—The total weight of moist coke used in the generator was 9 tons 8 cwt.; and therefore:

Fuel used equalled 12.56 per cent. of moist coke.
„ „ „ 12.06 „ dry „

Yield of Tar.—The total yield of tar, free from liquor, was 1302 gallons, equalling 17.2 gallons per ton.

Quality of Tar.—The tar produced was thin and uniform in consistency, and contained 5 per cent. of water as sampled. Much of this water readily separates on standing; and under ordinary works' conditions of the tar remaining for some time in the wells, this amount would doubtless be decidedly lower.

The analysis of the tar (free from liquor) gave the following figures (specific gravity at 60° = 1.076):

Composition of Tar by Distillation, &c.

	Per Cent. By Volume.	Per Cent. By Weight.
Light oils up to 170° C. . .	3.8 ..	3.0
Middle oils, 170° to 270° C. .	29.6 ..	27.0
Heavy oils, 270° to 350° C. .	24.7 ..	23.8
Pitch, above 350° C. . . .	— ..	45.9
Naphthalene	— ..	4.5
Free carbon	— ..	2.5

Yield of Ammonia.—The total yield of ammonia, calculated as 10-oz. liquor, amounted to 2960 gallons:

Equalling 39·6 gallons of 10-oz. liquor per ton
 „ 33·4 lbs. of sulphate of ammonia per ton.

Yield of Cyanide.—A test of the gas made at the inlet to the washer showed the following:

Cry. sod. ferrocyanide. . . . 4·8 lbs. per 10,000 cub. ft.
 Na_4FeCy_6 to H_2O 5·5 lbs. per ton.

The quantity of cyanide is therefore quite equal to, or better than, the average obtained from the horizontal retorts.

Sulphur in Gas after Purification with Oxide Only.—A test of the total quantity of sulphur in the gas after purification showed 37·5 grains per 100 cubic feet.

During the whole period of the test, matters proceeded with the utmost regularity, the continuous introduction of the coal into the top of the retorts, and the removal of the coke from the bottom, taking place with great smoothness.

(Signed) HAROLD G. COLMAN.

THE ADVANTAGES SUMMARIZED.

To sum up, the experience derived from the working of the system has so far indicated that the following advantages are obtained by its use:—

- (1) Increased make of gas per ton of coal carbonized.
- (2) Increased yield of tar per ton of coal carbonized.
- (3) Increased production of ammonia per ton of coal carbonized.
- (4) Coke improved and of more value.
- (5) No stopped ascension or descension pipes.
- (6) Increased make of gas per retort.
- (7) Largely increased make of gas on same ground space.
- (8) Improved labour conditions, and at considerably reduced cost.
- (9) Great economy and saving in first cost of land and buildings.
- (10) Reduced wear and tear on retorts.

FUTURE EXTENSIONS.

Owing to the saving in space that can be effected with vertical retorts, the system will enable a large extension of the carbonizing plant to be made within the boundary of the land now belonging to the Gas Estate. An additional machine-charged horizontal retort-house would be out of the question; and the present retort-house, with horizontal retorts charged and discharged by West's manual machinery, cannot be extended. If the plan is referred to, a projected extension on the vertical system will be seen. The site represents the little remaining property, within the public roads surrounding the works, belonging to the Gas Department. This is now occupied by the old plunge baths of the town and other buildings. But it will be sufficient to enable an extension of the carbonizing plant to be made on the vertical system; and thus the necessity of going to another site (already secured) will be deferred, as well as the consequent large expenditure. The extension of the verticals contemplates eight settings of eights; and, as the present setting is regularly dealing with 20 tons a day of local slack, the new bench would represent an additional carbonizing capacity of 160 tons of the same class of coal.

It only remains to congratulate Messrs. Glover and West on the success that has attended their efforts at producing a simple combination for the continuous carbonization of coals in vertical retorts, and West's Gas Improvement Company on the manner in which they have carried out this first installation of eight retorts on the system. Needless to say there has been a great amount of anxiety on their part as to the success of the venture, in view of the conditions attaching to the contract. Had failure to come up to the guarantees been the result of their enterprise, the financial loss would, of course, have been very considerable. Fortunately, the end has been the one desired; and there is no doubt that the personal interest Mr. West, sen., has, in conjunction with Mr. Glover, taken in the development of each detail has had much to do with the success of the complete system, of which it has been our privilege to make such minute examination.

A FEW NOTES ON THE ST. HELENS GAS-WORKS.

While on the St. Helens Gas-Works investigating the new continuous setting of verticals, a few notes were made as to the conditions of working there which (while not attempting to describe the plant as a whole) will certainly form a useful supplement to the foregoing.

The works as they now stand are the results of reconstructions and enlargements on an extension of the original site. They have been reconstructed three times since they were purchased from the St. Helens Gas Company in 1875. The existing arrangement of the plant is such as leads to an orderly succession of operations. The coal is received on sidings connected with the London and North-Western Railway, and is brought in from the main line by the Corporation's own locomotives. The coals used (as mentioned in the foregoing) are the cheapest forms of slacks from the local coals, thereby setting up a cheap base to the whole operations. Enrichment is by oil gas; the Peebles process having been

continuously at work since its introduction, with the exception of the summer months, during which enrichment is by crude naphtha obtained at the works' own tar distillery. Seeing that coke and the other products are here so successfully worked-up—the resultant coke being especially an important feature—the highest production of gas per ton of coal is not so essential as it is in some works. Last financial year the total quantity of gas made was 465,252,000 cubic feet; and the total amount of material used in the manufacture of gas, including coal, cannel, and oil, was 46,452 tons, of which 438 tons were cannel nuts. The oil used was 89 tons 14½ cwt.; but of the total gas made, only 2,084,030 cubic feet represented oil gas, or 0·04 per cent. The illuminating power of the gas supplied was equal to 17·79 candles. The make per ton of total material used (including enrichment) was as the figures show, 9971 cubic feet. But of the character of the bulk of the material used, sight must not be lost; nor must this point be overlooked, that in the last financial year the total income from the bye-products was £21,639 net, which is believed to be the highest percentage of income recovered from bye-products in the country—at any rate it is more than the cost of the coal and the oil for enrichment put together. As a matter of fact, the cost of coal, &c., equalled last year 10·46d. per 1000 cubic feet of gas sold; while the income from residuals was equivalent to 11·08d. per 1000 cubic feet of gas sold. The total received from residuals deducted from the total cost of manufacture leaves the cost of gas into the holders at 6·8d. per 1000 cubic feet. In other words, the cost of gas into the holder (including maintenance of works and salaries) was equal to £13,191; and as the gas made was 465,252,000 cubic feet, this equals 6·80d. per 1000 cubic feet. The cost of distribution was £2823, or equal to 1·45d. per 1000 cubic feet of gas made. The quantity of coke for sale was 26,347 tons, which was equal to 11·34 cwt. per ton of coal carbonized. The tar made was 2270 tons, or 8·7 gallons per ton of coal. The sulphate of ammonia made was 578 tons 2 cwt., or 27·87 lbs. per ton of coal. It may be added that the gross income from gas last financial year was £49,648; or, deducting discounts (£2546), the net income from gas was £47,102.

Passing into the old retort-house, it is seen to contain 24 beds of seven retorts, 22 in. by 15½ in. by 20 ft., operated by West's manual machinery. Upon inspecting the charges and heats, the latter are found to be good, and the former even, and thoroughly well carbonized. Another thing was observed—that Mr. Glover aims at having moist mouthpieces. To this end, he has extended the ascension-pipes to the middle and upper retorts, so as to have the ascensions of uniform length, and give on the mouthpiece side a uniform condensing area, which is very useful in preventing stopped ascension-pipes. The settings are heated by the gaseous firing system so successfully introduced by Mr. Charles Carpenter, by means of producers heating more than one bed apiece—three beds being the maximum at St. Helens. The combustion chambers are thoroughly under control, and an evenly heated retort—the heat being that which Mr. Glover's experience shows him is the best for the kind of coal carbonized—throughout, with a reduction just at the mouthpiece, is obtained. In each of the small arches permissible in this retort-house, seven retorts are set; and so even is the heating and working, that records of from 1200 to 1300 working days for the retorts are obtained in general practice, which is considered good for retorts worked by manual machines. Figures as to gas production have already been quoted; and in the latter portion of the section of this article dealing with the vertical retorts, the line of future carbonizing plant extension and working has been predicted.

In the coal-store, at the time of the visit, a delivery of washed slack and dry slack was being dealt with. The two classes are separately delivered, and are mixed together close to the elevator boot, thus enabling a good coke to be obtained, for which there is an excellent market all the year round. In buying coal, Mr. Glover always remembers that he is a coke manufacturer as well as a gas maker; and therefore the coal is not bought specially to get a high production of gas per ton. The purification of the gas from the horizontal retorts is by lime, which when fouled finds a free sale among the farmers of the district. By some inexplicable means, St. Helens has got a name for being away from all agricultural interests; but, as a matter of fact, the town is closely surrounded by an agricultural area, and to this the waste lime goes, with profit to buyer and seller. It should be stated that the Gas Committee are under no compulsion in the matter of eliminating sulphur compounds. Having carefully purified the gas, it is enriched up to from 17 to 18 candle power, which is a little lower than the department has been supplying during previous years; and this is done, notwithstanding that the standard illuminating power is 14 candles, tested by the "London" No. 1 argand burner. Nor, in fact, are the Committee restricted as to impurities; nevertheless their operations are all conducted as if the restrictions were in existence—the Metropolitan Gas Referees' tests being used to check all operations. During the year 24 tests were made for impurities, with the following results: Sulphur, average maximum 12·6 grains per 100 cubic feet, average minimum 10·9 grains, average mean 11·7 grains. The maximum (17·2 grains) was in December, 1908, and the minimum (8·9 grains) in April. As to ammonia, the average maximum was 0·6 grain per 100 cubic feet, minimum 0·4 grain, and mean 0·5 grain. The maximum (0·8 grain) was in June, 1908; and the minimum in January, 1909, 0·3 grain. The average illuminating power (237 tests) was 17·79 candles.

The naphthalene process introduced by Messrs. Young and

Glover has been in continuous use since the year 1897. The crude gas is washed before the scrubbers in suitable oils for the removal of the larger portion of the naphthalene; while to prevent the formation of any crystals at all in the distributing system, a small quantity of suitable oil is vaporized into the trunk mains by a simple piece of apparatus, through which a continuous stream of gas travels (bye-passing the district governor) on its way to the town. The distribution system has been entirely cleared of the naphthalene trouble, which was very bad in St. Helens before the process was invented. Difficulty, it may be said, is now unknown in any part of the distribution system or in consumers' services. It is extraordinary, however, what an amount of naphthalene comes from the cheap coals now used at St. Helens, carbonized at high heats, which is fully revealed upon examining the distillates at the tar-works.

No one would think of visiting the St. Helens Gas-Works in search of information without inspecting the tar-distilling plant, and the methods pursued in recovering the products from the residuals of gas manufacture. On this head, full particulars can be obtained from the paper read by Mr. Glover at the autumn meeting of the Midland Association of Gas Managers in 1906. Among the many interesting features is the one that the enrichment of the gas in the summer time is entirely by the benzol from the crude naphtha obtained from the distillation of the tar. Inasmuch as this enrichment is from one of the products of gas manufacture, it is the cheapest form obtainable.

These few supplementary notes, as intimated earlier, will assist in explaining the character of the operations now carried on at St. Helens, together with the objects Mr. Glover has in view in following the particular lines of practice that he has adopted.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
May 24	Previously acknowledged (subject to correction made in letter, p. 590)	9793	1	7
" 25	Cooke, A., Oldbury	1	1	0
" 27	Dixon, Harold B., F.R.S., Manchester	1	1	0
" 28	Simmanx and Abady, Westminster	5	5	0
	Warrington Corporation Gas Committee	5	5	0
June 1	Gibson, James, Leigh	1	1	0
" 2	Belton, J. C., Chester	0	10	6
	Hoyte, P. S., Plymouth	2	2	0
	Musselburgh Gaslight Company	5	5	0
	Tetley, C. F., Chairman of the Leeds Corporation Gas Committee	50	0	0
" 4	James Dougall and Sons, Bonnybridge	5	0	0
" 5	S. Penny, London	1	0	0
" 7	Barton, John, Peterborough	1	1	0
	Chard Corporation Gas Committee	1	1	0
	Onslow, A. W., Woolwich	0	10	6
	Richmond, F. D., Heckmondwike	0	10	6
	Trewby, L., Mill Hill	1	1	0
	Total	£9874	16	1

PERSONAL.

Mr. W. FRED VERNON, the Manager of the Coupar Angus Gas Company, has been appointed Manager of the Stonehaven Gas Company, in succession to Mr. W. McLean Ross, resigned. Mr. Vernon was Assistant Gas Manager at Kelso, his native town. In 1902, he was appointed Manager at Coupar Angus, and while there he has effected considerable improvements in the works.

It will be remembered that early last year Mr. CLEMENT HOVEY, who was then the Assistant Engineer and Manager of the Tyne-side Gas Company, North Shields, was selected by the Directors of the Union des Gaz for the appointment of Engineer-in-Chief of the Milan Gas-Works, which position carried with it the superintendence of the whole of the technical service there. Mr. Hovey has, we learn, resigned the appointment, and intends returning to England to once more take up a position in home gas engineering, in which he had, before his departure for Italy, secured for himself by his abilities a large measure of recognition. The Directors of the Union des Gaz have expressed their very sincere regret at the coming severance of Mr. Hovey with the Milan works.

At the request of the Directors of the Toronto Gas Company, Mr. Thomas Newbigging will shortly leave England for Canada, to advise them on important extensions of their works.

In the "JOURNAL" for the 25th ult., it was announced that Mr. J. R. H. Jacobs, the Assistant-Secretary and Accountant of the Reading Gas Company, had obtained the appointment of Secretary of the Southampton Gas Company. Mr. Jacobs entered upon his new duties yesterday. He had been with the Reading Gas Company for nearly twenty years; and at the last meeting of the Directors a resolution was passed expressing their high appreciation of his services, and a substantial honorarium was awarded him.

OBITUARY.

CHARLES ALFRED CRAVEN.

AN old and respected ex-servant of the Dewsbury Corporation, and one of the few remaining representatives of the past times of the gas industry, was removed last Tuesday by the death, at his residence in Altrincham, in his 69th year, of Mr. Charles Alfred Craven. Deceased was born at Keighley, and at the age of eighteen became a member of the staff of the Dewsbury and Batley Gas Company. While with them, he qualified himself for more responsible duties; and in 1862 he obtained the position of Manager of the Keighley Gas-Works. Not long afterwards, the Manager at Dewsbury (Mr. Williamson Metcalf) retired; and Mr. Craven was invited to become his successor. In view of the extensive improvement scheme he had in hand at Keighley, he at first declined to move; but about four years later he returned to Dewsbury. When in 1873, the undertaking was transferred by agreement to the Corporations of Dewsbury and Batley, Mr. Craven elected to remain with the former, as the necessity for the erection of new works to replace those at Batley Carr would, he thought, afford scope for the exercise of his engineering abilities. He became Engineer and Manager to the Corporation; and to his designs, and under his supervision, the present works at Savile Town were constructed. After holding this position for ten years, he accepted an offer to manage the gas-works at Pernambuco; and he proceeded to Brazil in 1877, accompanied by his wife and children. Two years previously, the management of these works was relinquished by Mr. Thomas Newbigging, who was succeeded by two engineers who were both cut off by yellow fever. This, however, did not deter Mr. Craven from taking up their work; but while he, fortunately, escaped, he sustained a painful bereavement by the death of his eldest son, Mr. Arthur Craven (who he had hoped would succeed him as Manager), who was attacked by the malady and succumbed to it. While abroad he had varied experiences; and for a time things were made exceedingly uncomfortable for him—his life being at times in danger. But he finally won his way to the hearts of his workpeople, who, when he returned to England in 1885, made him a handsome presentation, consisting of a marble timepiece and two large bronze ewers.

On reaching England, Mr. Craven settled for a time at Todmorden, where his brother is in practice as a solicitor. In 1890, however, he was again appointed Manager of the Dewsbury Gas-Works; and continued to serve the Corporation in this capacity up to 1906, when he resigned on account of ill-health, and was succeeded by Mr. G. W. Fligg. A few months after his retirement, he was presented with an illuminated address and a framed photograph by the employees at the works. He was unable to be present on the occasion; but the gifts were conveyed to him by Mr. Fligg on behalf of the donors.

Mr. Craven was one of the first members of the British Association of Gas Managers; and though he could not personally attend the preliminary meeting held in December, 1863, to consider the advisability of forming the Association, he was one of a number of gas managers who sent letters expressing their approval of its objects. He was for some years a member of the Council of the Gas Institute, and in the past took a very active part in its work. He was largely instrumental in bringing about those personal reconciliations which resulted in the amalgamation of the two gas organizations, and the formation of the present Institution, of which he was a member. He was not a paper reader; but at the meeting of the Institute in 1898, he offered some interesting remarks on the inclined retorts he had installed at Dewsbury. His name was one of the earliest on the roll of the Manchester District Institution of Gas Engineers; but it was removed in 1906. He was a Freemason; his Lodge being that of the Three Grand Principles. As a man he was genial and good-hearted, and was highly esteemed by a large number of private and professional friends. He leaves a widow, three daughters, and one son, Mr. Harry Craven, who is Town Clerk of York.

The funeral took place last Friday afternoon, at Sale Cemetery; floral tributes being sent by Alderman Oldroyd (the Chairman of the Gas Committee of the Dewsbury Corporation), Mr. Fligg (the Manager), and Mr. Fred Schofield (the Assistant-Manager). The two latter attended the funeral, with Alderman Pearson and other members of the Gas Committee.

SIR EDWARD LAWRENCE.

ON Monday last week, a noted local political leader, and one of the foremost figures in the mercantile and social life of Liverpool, was removed by the death of Sir Edward Lawrence, LL.D., which occurred at his residence, The Grange, St. Michael's-in-the-Hamlet, after a somewhat protracted illness, complicated by weakness of the heart. Deceased, who, our readers may remember, was for many years Chairman of the Liverpool Gas Company, was born in the city on Oct. 4, 1825, and was therefore in his 84th year. His father, who was Mayor of Liverpool in 1845, brought him up to commercial pursuits, for which he displayed great aptitude. He commenced business for himself as an East India merchant, and his firm is still identified with it. He entered public life in 1841, at the time of a great parliamentary contest. His municipal career began in 1860, when he represented the North Toxteth Ward on the City Council. He was Mayor in 1864, and during his year of office had the honour of entertaining the then Prince and Princess of Wales (the present King and

Queen) on their first visit to the city. Deceased joined the Board of the Liverpool Gas Company in 1876, at which time it was the custom to elect the members in rotation to fill the office of Chairman for a period of two years. His turn came in 1881; but at the end of the usual period he was asked by his colleagues to consent to re-nomination. He complied with the request, and was re-elected every year till the annual meeting in August, 1904, when he expressed his desire to relinquish the position. His resignation was accepted regretfully; and he was succeeded by Mr. Wade Deacon. He was a Director of the Bank of British West Africa, of the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, of the Liverpool Overhead Railway Company, and of other undertakings. He was elected an Alderman in 1892, and held many positions of trust in the city. His father was one of the founders of Liverpool College; and Sir Edward was appointed Pro-Chancellor of the University of Liverpool—the degree of LL.D. being conferred upon him two years ago in further acknowledgment of his services. In 1899, he received the honour of knighthood in recognition of his public activity and his labours on behalf of the Conservative party. Deceased leaves two sons and a daughter. The funeral service took place at St. Paul's, Prince's Park, on Thursday, after which the body was cremated. The Gas Company were represented by Mr. H. Wade Deacon (Chairman) and several Directors, Messrs. William King and Edward Allen (late and present Engineers), Mr. Theodore Garnett (representing Mr. P. F. Garnett, the Secretary), Mr. J. H. Fisher (Audit Department), and others.

JOHN SPENCER PHILLIPS.

WE regret to record the death, on Monday last week, in his sixty-second year, of Mr. John Spencer Phillips, The Mount, Shrewsbury, Chairman of Lloyds Bank and of the Shrewsbury Gaslight Company, and one of the best known bankers in the kingdom. Deceased was apparently hale and vigorous only about a fortnight before his death; but it was recognized that the illness with which he was seized would terminate fatally. Mr. Spencer Phillips was the eldest son of the late Rev. John Phillips, the Rector of Ludlow. He was educated at the Shrewsbury School, from which he went to Trinity College, Cambridge, where he took his degree in the Law Tripos. On leaving the University, he became a partner in the private bank of Messrs. Beck and Co., of Shrewsbury and Welshpool. In 1880, he arranged the sale of the concern to Lloyds Bank, and thereafter was connected with the negotiations for the purchase of private banking businesses in various parts of the country. He was elected a Director of Lloyds, afterwards became Deputy-Chairman, and later (in 1897) Chairman. For his eminent services to the bank, the Directors recently presented him with his portrait in oils; and it is among the pictures shown at the Royal Academy this year. Mr. Spencer Phillips was appointed a Director of the Shrewsbury Gas Company towards the end of 1880, and was made Deputy-Chairman on Oct. 28, 1891, and Chairman about two years later. This position he held at the time of his death. He took great interest in the affairs of the Company, and he will be difficult to replace, on account of his high standing and abilities. He was associated with other undertakings; being a Director of the Alliance Assurance Company (Chairman of the local Board) and Deputy-Chairman of the North Staffordshire Railway Company. He was a Justice of the Peace for Shrewsbury, but never took his seat; and beyond his commercial activities, he took no part in the public life of the borough. Referring to his death, "The Times," in their Money Article on Wednesday testified to the general regret expressed in banking circles concerning the death of Mr. Spencer Phillips, whose influence was, he said, strongly on the side of harmonious working and good feeling among bankers; and from this point of view he would be missed by the whole banking community. The funeral took place at Shrewsbury last Wednesday, and was very largely attended. Among the mourners were the following representatives of the Gas Company: Mr. T. Frank Poole (Deputy-Chairman), Messrs. J. B. Lloyd and Henry Wade (Directors), and Mr. W. Belton (Engineer and Secretary).

Mr. HENRY OLDFIELD, the Chairman of the Hyde Gas Company, died recently at the age of 65. He had been ailing for a considerable period.

The death occurred recently of Mr. FREDERICK BRIDGES, a Director of the Ascot, Hungerford, and Whitchurch Gas Companies. Deceased was in his 68th year.

The death occurred on Friday, the 28th ult., in his 41st year, of Mr. THOMAS RILEY, the Chief Clerk in the Town Clerk's department of the Bolton Corporation. Deceased was not only a well-known public official in Bolton, but was highly esteemed in local social circles for his genial qualities. The funeral took place at Tonge Cemetery last Tuesday.

We much regret to record the sudden death, last Friday, of Mr. GEORGE CUTLER, the Engineer and Manager of the Stroud Gas Company. He joined the British Association of Gas Managers in 1872, when he was Manager of the Whitehaven Gas Works; and he obtained the appointment at Stroud about ten years later. He passed into the Gas Institute, and was a member of the present Institution. He was a gentleman of the old school—his bearing being such as to endear him to all with whom he was associated; and he will be greatly missed by a large number of friends.

A CHANGE OF ADDRESS AND OF DIRECTORS.

HAS 99, Cannon Street dropped into disfavour? And have the names of Eaton and some of his satellites lost the moderate power of attraction they at one time possessed; or are they suffering from ill-health, and cannot attend to company promoting, or what is the matter? We should not like them to slip from sight, in view of the publicity they have had in the past, without knowing whether it is our duty to commiserate with, or to congratulate, them. Our interest in these matters is aroused by the issue of a fresh prospectus of the Water and Gas Debenture and Share Investment Trust, Limited, inviting further applications for capital, and which invitation we cannot strain our consciences to support. There was a prospectus issued dated March 9, 1908; while the present one is dated June 5 this year. The Directors were:

MARCH 9, 1908.

Dr. Allan Maclean (Barrister-at-Law), *Chairman*.
H. W. L. Way, *Vice-Chairman*.
Percy Davies.
A. Schofield.
E. Eaton.
Capt. F. Jenkins, D.S.O.

JUNE 5, 1909.

Sir W. W. Bruce, Bart.
H. W. L. Way, J.P.
Sir C. B. H. Soame, Bart.,
Solicitor (Chairman).
Capt. F. Jenkins, D.S.O.

The new Chairman will be recognized as having had some connection with two recent Welsh gas promotions—Gowerton and Beaufort. The other "Bart."—Sir W. W. Bruce—is a fresh importation. It is wondered whether his name will prove more magnetic than that of the other Baronet. Apparently, it is hoped so, or it would not appear in the prospectus before the name of the Chairman. In March, 1908, Mr. J. Kennard was the General Manager of the Trust. His name does not appear on the face of the fresh prospectus. Percy Williams was the Secretary in March, 1908; he is so now. The office at the former date was 99, Cannon Street; it is now a few doors off—viz., 2, Budge Row, Cannon Street. Now, why has the "Trust" shifted from the notorious 99, Cannon Street? Has the office accommodation there got too limited for the amount of the work to be done?

In March, 1908, the invitation graciously issued to the public was to subscribe for 10,000 6 per cent. preference shares of £1 each at par, and 10,000 10 per cent. ordinary shares of £1 each at par. Up to that time the total original share capital amounted to £2000! The public then showed the measure of their "trust" by declining to subscribe for anything more than a few hundreds of either class of shares, the big dividends foreshadowed notwithstanding. Prior to that issue, the capital stood at 1000 preference shares, 800 ordinary shares, and 200 founders' shares. Subsequent to the invitation of March last year, only a further 835 ordinary and 865 preference shares were added (although 20,000 shares in all were offered); and of those 835 and 865, 272 of each kind were allotted otherwise than for cash to creditors for accounts owing. This does not look very flourishing. Less than £300 per annum (we make out) would cover the full dividends on the total capital so far issued; so that, when these figures are considered, there is not much to boast about that the "Trust" have been able to pay the "full dividends" for two-and-a-half years. We see that the founders' shares are to take anything left after paying 6 per cent. on the preference shares and 10 per cent. on the ordinary shares (non-cumulative). At the top of the green (suitable colour) application form issued with the prospectus in March, 1908, it was stated: "The Directors will make the next issue of shares at a premium, and allottees of the present issue will be entitled to allotment thereof at par." The Directors are keeping faith with the public in respect of the ordinary shares. The preferences now offered (4000) are at par; the ordinaries (also 4000) at 2s. premium—if the Directors can get it.

There are certain things in the prospectus with which we agree, but which have a very remote application to the promotions which the founders of the Water and Gas Debenture and Share Investment Trust, Limited, have had anything to do with at the old address at 99, Cannon Street. If we omit the words "and electric light" from this paragraph, there is no objection to it:

As a channel of investment, combining security with reasonable return, there is probably no branch of joint-stock enterprise which commands more favourable attention than the shares of well-managed gas, water, and electric light companies.

But we demur to the succeeding half-a-dozen words of the paragraph, when applied to the undertakings that have had birth at 99, Cannon Street:

Especially those in the progressive stage, in which case the shares thereof have not generally reached a premium.

The last clause of the paragraph is quite true of the 99, Cannon Street promotions. Then the prospectus proceeds to point out with beautiful *naïveté*:

There are numerous cases of the purchase of water and gas undertakings by local authorities, for which high premiums have been obtained by the shareholders.

And we have an instance:

In the case of the London Water Companies on their transfers to the Metropolitan Water Board, the difference between the nominal value of the shares and the sum paid as purchase money amounted to nearly twenty millions sterling.

On the outside of the prospectus, examples of companies that

have "already" arrived at the premium stage are given. Among the water companies are Brompton and Chatham, Lewes, and Portsmouth; and among the gas companies Bath, Bromley, and Cardiff. It may be suggested to the "Trust," that they expunge from this list all the companies that had existence, and had "already" arrived at a premium stage, before Mr. Eaton entered upon his gas and water promoting campaign, and confine the list to the promotions of 99, Cannon Street, that have (if any can be found) actually reached the premium stage. One other point from the prospectus. We see the Directors have protected themselves against the applications for shares being of a small order. That is wise. "The minimum subscription upon which the Directors may proceed to allotment of shares on this issue has been fixed at £20!" The prospectus is signed by W. W. Bruce, Bart., and H. W. L. Way (Directors). Why did not the Chairman, Sir C. B. H. Soame, Bart., sign it?

If the prospectus does not attract applications for shares, perhaps the covering letter signed by "P. Williams, Secretary," will do so. When a Water and Gas Debenture and Share Investment Trust, Limited, have to descend to the offer of inducements of this sort, they must be in a bad way indeed. P. Williams in his letter says:

I would mention that the shareholders are entitled to the following privileges:

- (1) To have their investments purchased and sold without charge by us.
- (2) To an allowance of 3s. in the pound off the usual annual premiums payable on fire policies on house property, furniture, &c. Such allowance to be made every year.
- (3) To have investments insured against reduction in dividend and depreciation in capital by payment of a premium to be agreed.

The temptations offered by Nos. 1 and 2 are beautiful and cheap-jack like in their simplicity; and as to No. 3, we shall be pleased to publish a list of the premiums that would be charged in respect of the various companies promoted by 99, Cannon Street, not omitting Gowerton and Beaufort, in which Sir C. B. H. Soame, Bart., Chairman of the Trust, was concerned.

INSPECTION OF GAS AND METERS.*

THE work before us does not aim at giving a description of the manufacture and distribution of gas, but merely at supplying information on the methods, apparatus, and chemicals used in America in the testing of gas—rather from the inspector's or examiner's standpoint than from that of the gas-works' manager or chemist.

The first part (comprising 80 pages) deals with photometry. Incidentally, the author observes that the table-photometer as now prescribed by the Gas Referees is not generally considered in the United States to be equal to the bar-photometer in accuracy and ease of manipulation. The bar-photometers in common use are either of the closed bar or improved Letheby type. A form of portable photometer is described; and apparently the author considers it a valuable item in the equipment of the State Inspector of Gas, notwithstanding the evidence of the American Gas Institute to the contrary.

In regard to the loss of illuminating power which results from the passage of gas through rubber tubing, it is remarked that "such loss is by no means confined to old samples of tubing, for several lengths of new and expensive rubber hose showed a similar loss." The common belief is rather that the loss decreases, up to a point, with the time during which the tubing is kept in use for gas, and that fresh tubing has a most disastrous depreciating effect on the illuminating power of gas. This view is supported by reason as well as the results of observation; and we wonder whether the author has any real evidence against it. The point, however, is of minor importance, as flexible metallic tubing has now superseded rubber tubing even for portable photometer connections. The author prefers the Leeson contrast-disc to the Bunsen disc; and he rightly says that the Lummer-Brodhun device is fatiguing to the eye.

Six standards of light are referred to—viz., the Harcourt, Carcel, Hefner, and Elliott lamps, the Edgerton slit (an improved screen of the Methven type), and candles. The Elliott lamp and Edgerton slit, which are both of American origin and practically unknown in this country, are spoken of as suitable for works' use in cases where the more accurate standards are not essential and would be less convenient on account of the special fuels which they consume and the more precise and tedious adjustments which they require. The Harcourt lamp of the standard English type is now made, with a few modifications, by an American firm. Curiously, the price of it, as quoted by Mr. Stone, is almost precisely double that of the English-made lamp; but probably an import duty is imposed on the latter to equalize the price to the user in the United States. On the other hand, pentane is naturally somewhat cheaper in the country of origin of its raw material.

In regard to the standard gas-burner, the author appears to

favour the general adoption of the No. 2 "Metropolitan" argand for coal-gas supplies; but he points out that in Massachusetts this burner has been ruled to be impracticable for use by consumers, on the ground that, on account of its high cost, it is not within the reach of everyone.

Part II. of the book occupies about 110 pages, and refers to chemical tests. Most of the methods of testing described are familiar to English gas chemists. There is a somewhat inconclusive discussion of the question of the statutory limitation of the amount of sulphur which may be permitted in the gas supplied to consumers. Part III. treats of calorimetry, specific gravity, and pressure. It comprises about 70 pages. The relative merits of the Junkers and Boys calorimeters are discussed on the basis of the recent report on calorimetry of the Committee of the American Gas Institute; and to this report the author appears to have little to add of his own knowledge. The fourth part of the work, covering 30 pages, refers to the testing of meters, and contains no matter of special interest. There is an appendix of some 20 pages of useful tables.

We think the work under review should be useful to the gas-testing enthusiast of every nationality, and in particular to the gas inspector of any of the several States of the Union in the North American continent. Indirectly it may be of value also to the gas-works chemist there, while it will provide the gas examining fraternity in European countries with an incentive to study more closely the conditions with which their *confrères* on the staffs of gas undertakings are expected to comply in their daily routine of gas supply for the benefit of the community at large.

THE ILLUMINATING ENGINEERING SOCIETY.

FROM an account of the proceedings which appears in the current number of the "Illuminating Engineer," we learn that on the 25th ult. a meeting was held at St. Bride Institute, E.C., of those interested in the formation of an Illuminating Engineering Society. At an inaugural dinner held in February last, it was decided to form such a Society; and an Executive Committee was then appointed to consider the drafting of the rules, &c. The Committee reported at the meeting on the 25th ult., when the constitution and bye-laws drafted by them were ratified by those present; and the Committee (forming the nucleus of the first Council of the Society) were re-appointed with the power of adding to their number as might be expedient, in order that they might proceed with the affairs of the Society during the summer vacation. It was decided that the Committee should approach a number of gentlemen whose names were approved by the meeting, with a view to their being invited to act as officers or on the Council; and it was also agreed that the Council should be free to elect as members any who intimated their desire to become members of the Society, and were duly proposed and seconded in the prescribed manner, without the formality of ballot—up to the beginning of the first session of the Society.

Mr. Leon Gaster, the Hon. Secretary, on being called upon to present his report, said that, though the members of the Committee represented different interests and various aspects of illumination, they had worked together in perfect harmony; and the keen discussions which had taken place at the meetings had invariably been of an amicable nature. This, he thought, only illustrated what he had always maintained—that people with a common interest in illumination, though connected with different branches of the subject, could work together perfectly satisfactorily for the common good. A large number of gentlemen had expressed regret at being unable to attend; and he had received many expressions of good-will to the Society. In no single case had he met with any expression of disapproval.

Further particulars, and forms of application for membership, may, on application, by letter, be obtained from Mr. Gaster, at No. 32, Victoria Street, S.W.

In view of the increasing use of reinforced concrete in building construction, the attention of our readers may be called to a pamphlet, entitled "Simplified Methods of Calculating Reinforced Concrete Beams," by Mr. W. Noble Twelvetrees, which has just been published by Messrs. Whittaker and Co., of White Hart Street, Paternoster Square, E.C., at the price of 6d. net. The author is an authority on the special kind of construction dealt with; and his object in writing the book is to remove an existing difficulty arising from the differing notation and algebraical forms in which various authorities have been in the habit of expressing their equations.

We have received the first number of the "Canadian Heating and Lighting Journal," which will be devoted to the industries indicated in the title as well as that of metalware. It is being conducted by Messrs. John A. Fullerton and George H. Honsberger, both of whom were connected with one of the largest trade journal houses in Canada; and in their introductory article they say they have secured the co-operation of experts who will contribute practical articles which will have a "dollar and cents" value to their readers in their every-day work. The sections devoted to the lighting trade, electric lighting, and gas and acetylene are anything but extensive—consisting of only two pages each. The price of the publication, which will be issued monthly in Toronto, is \$1 per annum.

* "Practical Testing of Gas and Gas-Meters." By C. H. Stone, B.S., M.S., Chief Inspector of Gas Public Service Commission, Second District, New York, Member American Chemical Society. New York: John Wiley and Sons. London: Chapman and Hall. 1909.

PARKINSON STOVE COMPANY'S SHOW-ROOMS.

A DESCRIPTION which appeared in the "JOURNAL" for Dec. 8 last (p. 684) of the new London offices and show-rooms of the Parkinson Stove Company, Limited, was prefaced by the remark that both the rooms and their contents were deserving of favourable notice. Such notice was then accorded to them; but it was not at the time possible to include an illustration of the premises. We are now in a position to supply this omission; and in doing so, would remark that the Company have lately appointed Mr. Sydney A. Scrivener to act as Representative and Manager for the London area. This step has been necessitated by the fact that Mr. T. E. Barralet, the present London Manager, who was formerly Managing-Director of Maughan's Patent Geyser Company (which Company is now incorporated with the Parkinson Stove Company), is, owing to the growth of the water-heating section of the business, going to Birmingham, where the manufacture of the articles is carried on.



The Parkinson Stove Company's London Show-Rooms.

The show-rooms are at No. 129, High Holborn, W.C.; and for the convenience of intending visitors during Gas Institution week, it may be pointed out that they are situated near Kingsway, and adjoining the British Museum Station of the Central London Railway. They consist of lofty ground floor and lower ground floor accommodation, and are, of course, replete with up-to-date apparatus for warming and cooking by gas, as well as for the supply of hot water. In addition, the firm have, in their capacity as agents for the Gaslight and Coke Company, a representative display of attractive gas-fittings. These are to be seen on both floors; but a special feature on the lower ground floor is the controlling of all the lights by means of pneumatic switches.

The firm's specialities on view were fully noticed in the earlier description of the show-rooms already alluded to. Passing reference may, however, be made here to the new "Holborn" intermediate grade cooker, which a number of gas companies are now putting out on the hire system; it being a good and substantial article, and at the same time moderate in cost. It is made in three sizes, with all parts interchangeable and the burners removable for cleaning; and the oven is fitted with self-locking grids, and sliding meat-hook operated from the outside. The oven is packed and lined with green enamelled steel sheets, which are entirely free from screws. In the way of water-heaters, two new and cheap patterns may be mentioned—the "Jewel" geyser and the "Treasure" geyser. Both are made of strong copper, with the exterior polished and lacquered. The former is of the direct heating type, and is intended to supply hot water for bath use only; while the latter is of the chamber-heating pattern, and delivers water suitable for drinking purposes at any temperature up to boiling. They can be had with interlocking taps, to prevent the gas being on when the cold water tap is turned off.

The show-rooms contain samples of practically everything in which the Company deal; but the large amount of space at disposal obviates anything like an unduly crowded appearance of the goods.

A DISPLAY OF MODERN GAS-FITTINGS.

Messrs. G. Hands and Co.'s New Show-Room.

THE motto of "Artistic Fittings at a Moderate Price" must be acknowledged to be a good one to adopt—and to live up to. Most people are more exacting in their requirements than used to be the case; and the gas consumer is, generally speaking, no exception to this rule. In regard to lighting, a great deal more is now expected in the way of attractiveness of the fittings; and enterprising firms have set themselves to meet this growing demand—nay, more, to still further stimulate it, by the designing of goods of ever-increasing beauty. Among the foremost of the firms who have done so much to deserve the thanks of the gas industry in connection with this transformation of the utilitarian fitting into a thing of beauty which is a joy for ever, must be mentioned Messrs. G. Hands and Co., of No. 71, Farringdon Road, E.C. The wares of Messrs. Hands and Co., both in general and in particular, have been referred to at length in previous volumes of the "JOURNAL;" but a recent extension of their show-room accommodation afforded a welcome excuse for a further inspection by a representative a few days ago, and mention must be made of what was seen there.

Instead of both offices and show-room being situated on the ground floor of the premises, as was previously the case, the offices have now been removed to the first floor; and this, of course, has rendered available much additional space for display purposes. Immediately on entering this enlarged room, one is struck by the complete manner in which the decoration harmonizes with the fittings. The several shades of light green of which the colour scheme consists (with a large amount of white enamel) show off to the greatest advantage the many hundreds of lovely fittings of all kinds, shapes, and sizes which cover the walls and hang in thick clusters from the ceiling. The choice is naturally bewildering, when a glance is cast over the contents of the whole room; but on closer inspection, it is noticed that the fittings are conveniently grouped for selection of any particular kind. The whole of the lights in the place are controlled on the well-known "Norwich" system, the smooth and reliable working of which—as well as its simplicity—can be demonstrated by the operation of one switch after another right round the room. It may be remarked that the valve in connection with the "Norwich" distance lighting arrangement has been reconstructed, with the object of rendering any complications whatever a matter of impossibility. The position of the bye-pass tube has been altered, so that the jet burns upright just underneath the burner. It used to be at the side; but it was found that there was then apt to be rather too much of an explosion on lighting up, with the result that the bye-pass light was occasionally blown out. Now it can be seen that there is no explosion at all.



Three-Light "Ipswich" Oxidized Copper Bracket.

Turning to the fittings which adorn the walls, attention will probably in the first place be attracted by the beautiful shades of colouring to be seen in the oxidized copper goods. The explanation of this is that they are hand-wrought; it not being possible to obtain such effects with cast work. Messrs. Hands and Co. claim to have been really the first people to introduce the use of oxidized copper for gas-fittings. But whether this is so or not, anyone can see for himself that they have brought to a very high state of perfection indeed the adaptation of this metal for the purposes of what they so justly name their "Modern Art Gas-Fittings." After a visit to these show-rooms, no unbiassed person would deny that an installation of gas lighting can (with the facilities that are already available) be carried out in at least as artistic a manner as could be accomplished by the best efforts of any other system of illumination. In another direction, mention may be made of a handsome panel of Louis XVI. brackets, designed specially for use in large houses. These, of course, are brass heavily gilt.

Suspended from the ceiling are a number of shaded dining-room pendants finished in polished brass or oxidized copper. They

are arranged for one or two lights, and have silk flounces of different colours, but all lined with white. A large demand is being experienced from gas companies for fittings in this style; and they are certainly deserving of popularity—both on account of their artistic merit and of their moderate price. And this latter clause brings one to the second part of the motto with which this notice opened, and which Messrs. Hands and Co. place before themselves in the conduct of their business—"Artistic Fittings at a Moderate Price." Enough has been said (in conjunction with the illustrations) as to the artistic nature of the goods; but a word or two should be added on the matter of price. For a very few shillings, it is possible to get a single bracket that would not look out of place on the wall of any small house; while for a three or four light modern-antique pendant, in oxidized copper, with insertions of enamels, one may give more than as many pounds. Both the cottage and the mansion are catered for; but however simple, and consequently small priced, a fitting may be, inspection shows that it is just as well made as its more expensive brother. "Cheap and nasty" is a term that does not apply to any of the things to be seen in these show-rooms—low priced as a great many of them are. Before leaving this attractive display of fittings, reference may be briefly made to a very inexpensive, and at the same time extremely elegant, type of hall or lobby light, in which the decoration is attached to the shade holder of the Hands "Cool" burner. The object in designing this style of pendant has been to meet the want of a fitting of the kind that can be purchased, with burner complete, at a moderate figure, and at the same time be worthy of being placed in the prominent position



The Hands "Cool" Burner.

accessible. This type of outside lamp is forcing its way to the front, though perhaps it is not yet so much in the public mind as its namesakes in the Navy. At the present time a section of an arcade in one of our large cities is being illuminated by these lamps in place of arc lights. Six arc lamps are being removed, and replaced by five-light "Dreadnoughts," which will, it is calculated, give the same amount of light at a very much smaller cost. If this trial should prove successful—and there is no reason to anticipate that it will not do so—we shall hear of further demands for "Dreadnoughts" from the town referred to. Installations are also anticipated in some of the skating-rinks which are springing up with mushroom-like rapidity all over the country.

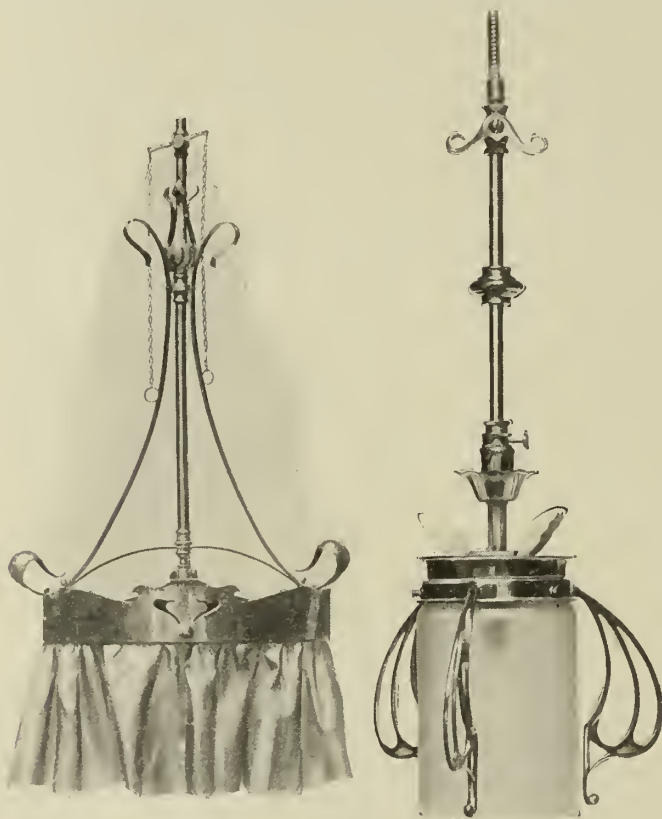
The business of Messrs. Hands and Co. is still a young one, having been started only some six years ago; but it has already, in its short career, achieved solid and growing success, the reason for which is ascribed by the head of the firm to the motto quoted in the first line of this article. It is safe to prophesy that, so long as the aim of supplying artistic fittings at a moderate price is pursued, the firm will continue to find themselves treading the path of success.

Precautions in Laying Pipes in Earthquake Districts.

The March "Bulletin" of the Société des Ingénieurs Civils of France is almost entirely devoted to the consideration of questions relating to earthquakes. M. Bergeron has a theoretical paper on vibrations of the ground and their consequences; M. Espitallier considers the constructional aspect of the matter; and M. Flament-Hennebique contributes an article on reinforced concrete (*béton armé*) and earthquakes, giving a score of interesting photographs of the recent disasters at San Francisco and Messina, which show how well reinforced concrete building stood unmoved in the centre of districts entirely destroyed. A system of architecture suitable for volcanic countries is described and illustrated by M. Pillet; and there is a further paper on a similar subject by M. Pesce. The last-named paper has a note about the precautions to be taken in such countries with regard to mains and inside pipes. The author recommends, as a precaution against fires and floodings resulting from shocks, that interior pipes should have supplementary lengths, so as to give to them a flexibility and an elasticity that would enable them to be stretched or displaced without inconvenience. Under the effect of shocks, special flange rings would allow the piping to be extended without breaking. As regards large outdoor mains, it is suggested that they should be fitted at certain distances with an arrangement permitting of a telescopic lengthening of the pipes and with some kind of spherical knee-cap joint.

Increases in Salary.—The Briton Ferry Urban District Council have increased the salary of Mr. John Mogford, the Gas Manager, by £50 per annum, on the understanding that he is to attend to the electric lighting undertaking. The Stoke-on-Trent Town Council have decided to increase the salary of the Gas Engineer and Manager (Mr. W. Prince) by £50 per annum.

Painting Cement.—The painting of cement has always proved troublesome to builders. Hitherto the best results have been obtained by the judicious use of acids. Two coats of hydrochloric acid and water should be applied to the cement, with an interval of two days between each application. Before painting, care must be taken to wipe off the frothy efflorescences and the globules remaining on the surface. After each operation, when the cement is quite dry, oil paint can be applied. An old process was, after the cement had been cleaned as described, to apply one or two coats of yellow wax dissolved in spirits of turpentine. When this is dry, oil paint may be put on; care being taken to make the first coat very thin, so that it will sink into the cement.



The "Hastings" Brass or Oxidized Copper Corona Pendant.

An Inexpensive Hall Pendant, with Hands "Cool" Burner.

which a hall light is necessarily called upon to occupy. These pendants are, of course, also suitable for placing in rooms over which an equal distribution of light is specially desired. They can be had in a number of different patterns.

The Hands patent "Cool" inverted burner, just referred to, has already been described in the "JOURNAL" for Nov. 24, 1908 (p. 554); and it is only necessary to say here that two distinct advantages are claimed for it. The first of these is that it is always cool for adjustment of either air or gas; and the second is that it will not cause discoloration of the fittings on which it is used. In fact, the makers go so far as to undertake to re-oxidize or re-lacquer any fitting which can be genuinely urged to have been discoloured by the Hands burner. This is a guarantee which says a good deal for their faith in the invention. In the show-room the burners are to be seen in action fitted to polished brackets, so that visitors may receive optical proof of the absence of discoloration. These burners are being largely taken up by some of the big gas companies. Tests, it may be mentioned, have shown a lighting efficiency of 81 candles for a consumption of 3 cubic feet of gas. The burner is entirely British made; and a neat appearance is given to it by the fact that the wings which act as deflectors are made of china.

Any gas engineers who should call and inspect the show-rooms during the Institution week will find fitted up outside one of the Hands "Dreadnought" three-burner lamps, operated by a switch, and giving a light of 125 candles per burner with a consumption of 3 cubic feet of gas per burner per hour. The lamp is detachable in such a way as to make the working parts very easily

BROOKE AND DEMPSTER'S VERTICAL RETORTS.

AMONG the patent specifications issued last week, was one relating to application No. 16,405 (dated Aug. 4, 1908), for "Improvements in Connection with Vertical Retorts," taken out in the names of Reuben Mitchell Brooke, of West Vale, near Halifax, and Robert Dempster and Sons, Limited, of Elland. The invention consists mainly in an adaptation to vertical retorts of the principle underlying the prior invention of Mr. Brooke (No. 14,637

of 1906). This principle was "that the heat applied to each of the heating chambers or compartments into which the setting is usually divided, and the draught upon each of such compartments, should be capable of separate regulation." A full illustrated description of the earlier patent appeared in the "JOURNAL" for July 16, 1907, p. 172; and the modification will now be dealt with.

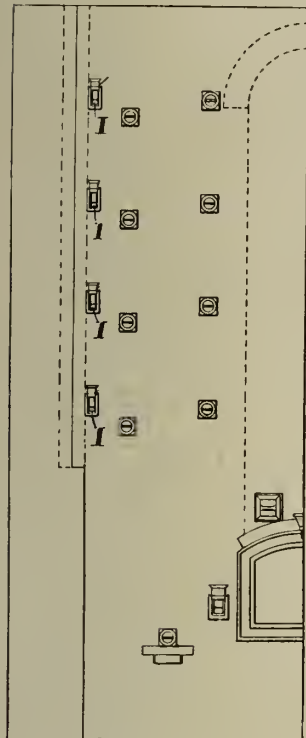


Fig. 1.

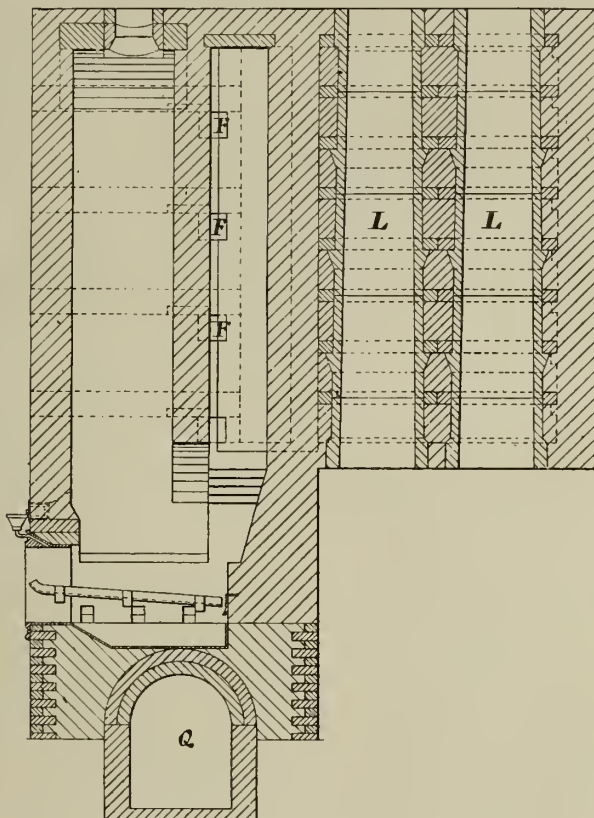


Fig. 2.

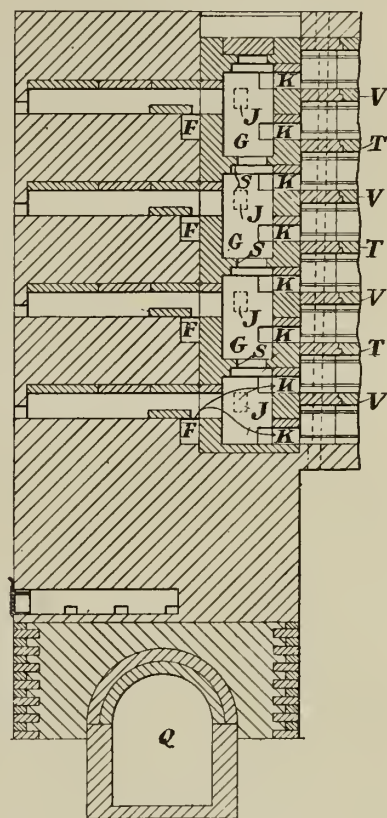


Fig. 3.

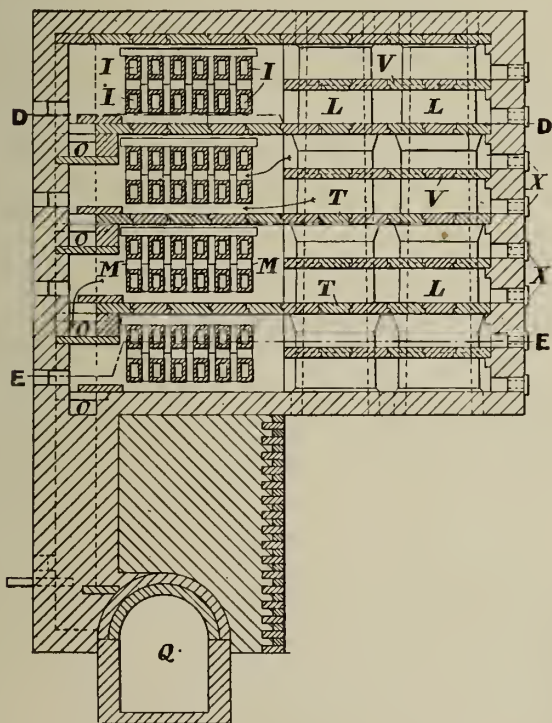


Fig. 4.

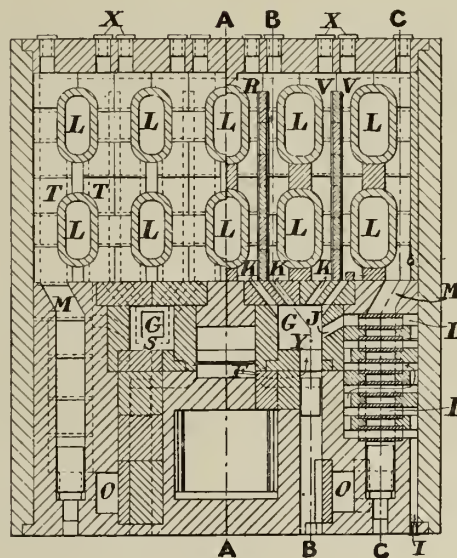


Fig. 5.

The patentees point out that, as dampers close to the different compartments—that is, between the compartments and the regenerator—would be liable to become immovable in consequence of the heat to which they would be exposed, they prefer to regulate the draught by dividing the regenerator into separate units—one for each compartment; and to regulate by suitable dampers at the outlets of each of the regenerators the proportionate draught upon each compartment. The general draught upon the setting would be regulated by a main damper controlling the

common outlet from all the regenerators to the chimney. These dampers are, therefore, only exposed to the waste gases after a portion of the heat has been imparted to the secondary air in passing through the regenerators.

In a vertical combustion chamber, they point out, it is conceivable that the tendency of the hot gases to rise might cause the upper compartments of the setting to receive an undue proportion of such gases; but the regulated draught upon each compartment is designed to prevent this. Otherwise, any of the following arrangements might be employed: (1) The supplies of producer gas and secondary air opposite the upper compartment or compartments might be reduced in order to compensate for the surplus rising from lower levels. (2) The supplies might be reduced at the lower compartments, giving a reduced pressure or partial vacuum, inducing a down-draught which would oppose such upward tendency; or the equivalent might be adopted of increasing the chimney draught on the lower compartments. (3) The openings from the combustion chamber into the several

compartments of the setting might be of different sizes, as, for instance, they could be smaller for the upper compartment or compartments, relatively to those leading into the lower compartments. (4) The combustion chamber might be divided into a number of separate combustion chambers, one opposite each compartment of the setting (an arrangement previously known in connection with horizontal retorts), or the combustion chamber might be divided into two or more parts, each part being common to several heating compartments. (5) The chamber could be provided with baffles forming any desired number of sub-chambers having communication with each other; the baffles, however, preventing the formation of a definite upward current. This latter arrangement they at present consider preferable, and have illustrated.

Figs. 1 to 5 illustrate, by way of example, the application of the invention to a bed of ten retorts; fig. 6 relates to a bed of six retorts; and fig. 7 to a bed of two retorts. Fig. 1 is a half front elevation. Figs. 2, 3, and 4 are vertical sections on the lines A—A, B—B, and C—C, fig. 5. Fig. 5 is a sectional plan; the left side being taken on the line D—D, and the right side on the line E—E, fig. 4.

Referring first to figs. 1 to 5, it will be seen that the setting is divided vertically into two portions by a wall K, into which the two central retorts are built. Each portion has a separate vertical combustion chamber G; so that, if desired, only four or six retorts might be worked while the rest were not in use. This arrangement applies to settings of eight or more retorts, except that in the case of eight or twelve retorts, for example, none of the retorts need be common to both halves of the setting. Settings of fewer than eight retorts would not be thus divided; and a single combustion chamber—centrally situated and common to all the compartments—would, therefore, suffice, as in fig. 6.

The secondary air may be admitted at each side of the furnace; the amount required for various parts of the combustion chamber being separately controlled by adjustable slides or in other suitable manner. The air enters the regenerator passages I and passes through the openings J into the combustion chamber, which is provided with baffles S as already mentioned. The ports are so arranged that the gases are ignited at Y (fig. 5) in the back part of the combustion chamber; the object being that each port K shall better receive its share of the products of combustion.

The hot gases from the combustion chambers pass through the openings K into the setting, travelling horizontally between the retorts L in single streams. Then the combined streams, having given up part of their heat, pass between the outer retorts and the pier walls to the waste-gas passages M of the regenerators; and thence through openings controlled by dampers to the vertical flues O. In the lower portion of these flues are dampers, to regulate the flow of waste gases from each portion of the setting to the main flue Q.

The setting is shown as being divided by horizontal partitions T into four compartments at each side—each compartment having a separate regenerator. And each compartment may be further subdivided by any number of partitions V, which act as supports to the retort, but do not extend to the regenerator. The number of such compartments and subdivisions, however, is immaterial to the invention, and will in practice be adapted to the requirements of each particular case.

Referring to fig. 5, it will be observed that each compartment is heated by four streams of hot gases direct from the combustion chamber through ports K. Each stream is kept separate until it has passed over an equal amount of the exposed surface of the retorts—that is, each stream is at first confined to heating the exposed surface portions of two retorts; so that each side of each retort, except the outer ones in that division of the compartment, has a separate supply of heat. The streams then, having each given up an approximately equal portion of its heat, unite; and the combined stream, in consequence of its increased volume, suffices to heat to the required temperature the remainder of the exposed portions of the retorts on its way to the outlet M. Consequently, the greatest uniformity of heating is said to be obtained in each compartment; and this uniformity of heating, combined with the short travel of the heating gases in practice, "assists greatly in economizing fuel and in increasing the efficiency of the setting."

It is well known (the patentees here point out) that, in the practice of heating retorts, the heating gases must leave the setting at a temperature somewhat above the required heat for carbonizing (some of the heat being regained from the gases in the regenerator beyond the setting). Therefore, it follows that the shorter the paths of the streams of heating gases, the lower the temperature of the combustion chamber needs to be in order

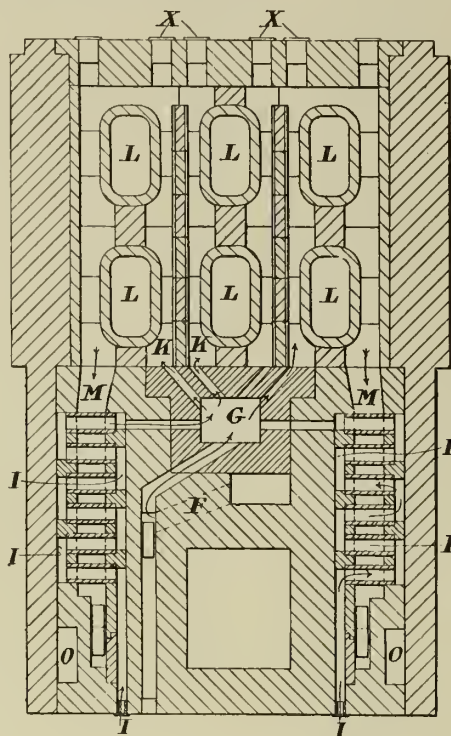


Fig. 6.

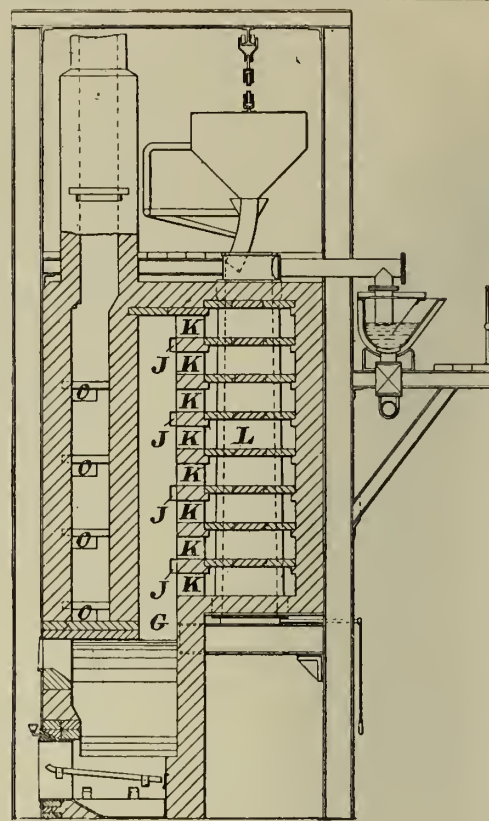


Fig. 7.

to maintain the carbonizing heat at the outlet; and thus less coke will be consumed in keeping the combustion chamber up to the relatively lower temperature.

Owing to the slight difference in length of travel of the streams of gas to the outlet M from each of the inlet ports K of any one compartment, it is desirable that the port which is furthest away from M should be slightly larger than the next, and so on; the one nearest to the outlet M being the smallest. However, the inventors find this difference to be so small that they prefer, in the first instance, to make all the ports of the same size; and then, after the bench is heated, to apply some fire-clay or other material to the ports so as to adjust their areas. For this purpose, the sight-boxes X are arranged exactly opposite the ports K, and the divisions T and V are made on the same level, so that the fire-clay may be easily placed into position by a rod introduced through the box at any time during working. If desired, fire-resisting blocks may be placed opposite the port, to prevent the gases entering the setting impinging directly upon the retorts.

Referring to fig. 7, the furnace is charged with coke from the ground level, instead of from the top of the bench. The separate producer-gas chamber may be dispensed with; the producer gas going directly to the combustion chamber G, and the waste gases from all the regenerators are collected in one flue immediately over the furnace—passing upwards to the chimney. The heat-regulating arrangements, enabling even or uneven heating to be obtained at will, are, however, the same in principle in this as in the benches previously described.

Concluding their specification, the patentees remark: "In the process of gas manufacture in vertical retorts having our improvements applied thereto, the heat applied to each part of the retort can be regulated as desired, so that the carbonization may proceed simultaneously throughout the length of the retort; and, owing to the short travel of the streams of heated gases coming from the combustion chamber into the setting, such streams need only have an ordinary carbonizing heat—that is, a lower initial temperature than in the present known forms of settings for vertical retorts. In the case of combustion chambers built at the top or bottom of the setting only, with consequent long travel of heating gases, when a retort is newly charged with a large volume of cold coal, the initial temperature of the streams of heating gases must of necessity be exceedingly high, in order to be able to impart carbonizing heats to retorts throughout their length of travel, and then leave the setting at the required carbonizing heat. Moreover, in practice with long travels of heating gases, the temperature of such a stream of gases, when first coming in contact with a newly-charged retort, would probably drop below the carbonizing heat; and, in consequence, the carbonization of the coal, instead of proceeding simultaneously throughout the length of the retort, would begin at one end and gradually extend over the length of the retort, with consequent waste of time and inefficient results. Our retorts, not being exposed to such excessive ranges of temperature, will also be found more durable than in the latter case, or in the case of the compartments of the setting being converted into combustion chambers, as has previously been proposed in relation to vertical retorts."

The two claims for the invention are: (1) For heating vertical retorts in a setting divided into compartments by horizontal

partitions, the combination of a combustion chamber communicating with several compartments, means for delivering and separately controlling supplies of secondary air and producer gas to the various parts of the combustion chamber in proximity to the passages leading from the combustion chamber to the compartments, separate regenerators for the exit of the waste gases from each of the compartments, and means for separately controlling the draught through such regenerators from each compartment. (2) For heating vertical retorts in a setting divided into compartments by horizontal partitions, the combination with each of such compartments of a separate combustion chamber, means for delivering and separately controlling supplies of secondary air and producer gas to such combustion chamber, separate regenerators for the exit of the waste gases from such compartments, and means for controlling the outlets of such regenerators.

A HANDBOOK FOR GERMAN GAS-FITTERS.*

ABOUT four-and-a-half years have passed since we had the pleasure of reviewing† the first edition of Herr Kuckuk's handy little manual on gas-fitting, of which a copy of the second, and considerably enlarged, edition is now before us. We then expressed regret that the work would not be generally of service to English gas-fitters, owing to its being written in a foreign tongue, and to the dimensions and weights being given almost throughout solely on the metric system. The same expression of regret must be extended to the present volume, which should, however, prove a very useful, handy book of reference for the distributing and fitting staffs of gas undertakings in German-speaking countries.

Since 1904, there have been many advances, especially in the direction of the better utilization of gas for lighting purposes. For instance, inverted gas-burners were practically unknown in that year, whereas now Herr Kuckuk devotes several pages to them. Similarly, the immense development of high-pressure gas lighting has called for much fuller treatment of this branch of the gas-fitters' work. Flat-flame and argand burners are mentioned only as having historical interest, and no space is wasted on detailed description of them in what is essentially a practical manual.

We regret to see that the author, however, has not deemed the English types of gas-fires worthy of extended notice, and has practically confined his treatment of gas fires and stoves to the luminous-flame type with or without the regenerative passages introduced by Frederick Siemens. Speaking from careful and extended use of several gas-fires of this type of German manufacture, the writer of these lines has no hesitation in saying that they are far behind the better patterns of English gas-fires in respect of economy, efficiency, appearance, and durability. He believes that in some parts of Germany there have been restrictions imposed by local authorities, acting on academical advice, on the employment of gas-fires in which bunsen flames are used; but even so it is difficult to understand why such restrictions have been tolerated, and why consumers have been content to forego the manifold advantages of the English type of gas-fire.

In regard to apparatus in general, Herr Kuckuk has, we think, kept himself all too exclusively to the purely German types and designs, even bearing in mind that his book will circulate mainly within the confines of the German Empire. This is the hardest criticism we feel called upon to pass on it; for within that limitation it should prove a good and practical aid to the foreman and fitter. The new edition comprises about 320 pages, and has 388 illustrations. Since writing the first edition, Herr Kuckuk has advanced from the position of Manager of the Gas and Water Undertaking of the relatively unimportant town of Stolp to the same position at Heidelberg, where, moreover, the electricity works are also under his charge.

* "Der Gasrohrleger und Gaseinrichter." Ein Handbuch für Rohrleger, Gasrichter, Monteure, Gas- und Installationsmeister sowie Gastechner, von Friedrich Kuckuk, Direktor der Städtischen Gas- Wasser- und Elektrizitätswerke Heidelberg, Zweite, vermehrte und verbesserte Auflage. Munich and Berlin, R. Oldenbourg, 1909.

† See "JOURNAL," Vol. LXXXVIII., p. 168.

Air-Lift Pumping Plant.—Air-lift pumping plant operating two 8-inch wells forms part of the water supply of Palmerton (Ont.). The wells are 300 feet deep, drawing from a limestone stratum; and when the air-lifts are not working, the water rises to within 16 feet of the surface. A 5-inch discharge-pipe is placed inside the casing, and within this pipe is a 1½-inch air-pipe. The air discharge outlets are placed 100 feet below the ground. It has been found, according to an article in the "Canadian Engineer," that a 60 per cent. submergence figured for a water level 38 feet below the surface gives satisfactory results. The compressor is a duplex machine with 12 in. by 16 in. steam and 12-inch square air ends, running condensing. In a ten-hour test, each pump delivered 250 gallons per minute, lowering the water from 16 to 40 feet, at which depth the level remained constant. When separately operated, the level in the spare well, 200 feet distant, was 10 feet above the level of the one being pumped. When discharging 450 gallons per minute, with an average lift of 39 feet, 0.38 cubic foot of free air is required per gallon.

ASSOCIATION OF GAS AND WATER ENGINEERS OF AUSTRIA-HUNGARY.

Annual Meeting at Graetz.

THE Twenty-Eighth Annual General Meeting of the Association took place on the 20th to the 23rd ult., at Graetz, which, for the third time in the history of the Association, had been chosen as the *venue* of the annual meeting. About 125 persons attended. The following particulars of the meeting are taken from the official report in the "Zeitschrift des Vereines der Gas und Wasserfachmänner in Oesterreich-Ungarn."

The visitors were welcomed to the town at a reception given by the Polytechnic Club of Graetz, on the evening of May 20. Addresses of welcome were delivered by various members of the Municipality; and an appropriate reply was made by the President of the Association, Herr Anzböck, the Chief Inspector at Vienna of the Imperial Continental Gas Association. The technical proceedings opened on the following day in the theatre on the Frazensplatz. An annexe was devoted to an exhibition of apparatus. After an opening address by the President, the annual report of the Association was presented, and the following papers were read: By Dr. Strache, of Vienna, on "Modern Photometry;" by Herr Franz Bössner, of Vienna, on the "Inclined Carbonizing Chambers at the Municipal Gas-Works of Vienna;" and by Herr Peischer, of Innsbruck, on the "Rental System of the Innsbruck Gas-Works."

Herr Anzböck, in his opening speech, thanked the various representatives of the Municipality for their reception of the Association, and congratulated the members of the latter on the fact that so pleasant and instructive a town as Graetz had been chosen for the meeting place. Herr Lauda then welcomed the Association on behalf of the Minister of Public Works, who, he said, took a lively interest in the progress of gas and water supply. He was followed by the Burgomaster of Graetz, Dr. Graf, who said that he hoped the members of the Association would find the gas and electricity works, as well as the water-works of the town, well worth inspection. In presenting the annual report of the Association, the President remarked on the satisfactory progress which had been made in the past year. The Minister of Public Works had asked their co-operation in regard to the establishment of a Central Bureau of Water Supply and Purification. The Association had been represented at the Salzburg Water Congress. Reference was made also in the report to the question of the establishment of an official experimental works for gas and fuel apparatus. The progress of the Official Journal of the Association (formerly known as "Der Gas Techniker") had been most satisfactory. Herr Exner deserved thanks for establishing a technical museum for Technology and Industry at Vienna. The raising of the annual membership subscription from 15 to 20 kronen (1 krone = 10d.) had greatly benefited the finances of the Association. The publication of the statistics of water supply compiled by the Association had been delayed, owing to some questions not yet having been answered. There were 4 honorary and 253 ordinary members of the Association. Four members had died during the past year.

A visit was paid on the afternoon of the 21st ult. to the local gas and electricity works, which belong to the Vienna Gas Industry Company. The visitors were received by the Vice-President of the Company, Major a. D. Grünebaum, and were afterwards taken over the works by Herr Böhm, the Manager, and two of his assistants. In the evening, the Vienna Gas Industry Company entertained the members of the Association at a banquet. The proceedings next day opened with the private business of the Association, including the presentation of the accounts, the choice of officers for the ensuing year, and the selection of the place of the next annual meeting. Through the retirement of Herr Anzböck from the presidency, it became necessary to elect a successor; and Professor Adolf Friedrich, of the Agricultural College at Vienna, who is an authority on water supply, was chosen for the ensuing two years. After considerable discussion, owing to invitations having been also received from other towns, Innsbruck was selected for the place of the next year's meeting. The following papers were then presented: By Herr J. Häusler, of Vienna, on the "Use of Gas for Cooking, Heating, and Industrial Purposes;" by Herr Friedrich Lux, of Ludwigshafen, on a "New Electric Distance Lighter for Gas-Lamps;" by Herr H. Adolf, of Vienna, on "Preliminary Studies on the Quality of Underground Water;" by Herr Scholz, of Berlin, on "Advances in Inverted Lighting, with Special Reference to High-Pressure Gas and High-Pressure Air Intensifying Lamps;" and by Herr A. Achterberg, of Vienna, on "A Fast-Running Type of Gas-Engine, known as the 'Fafnir.'" These, as also two of the papers presented the preceding day, were read in an abbreviated form only, and will later be published in full in the official organ of the Association.

A visit was paid on the afternoon of May 22 to the new water-works at Andritz for the supply of the town of Graetz. A bacteriologically sound water is being obtained from a number of deep borings, which will be ready in July or August next to furnish the supply to the town. The new works are being carried out under the supervision of Herr Schnittler, the Manager of the works, and Herr Philipp, the Engineer of the Water Company. In the evening, the members of the Association were entertained at a banquet;

and on the following day they participated in an excursion to Peggau, where the electrical works of the firm of A. Buss and Co. were inspected. The party then visited the Lur grotto, which was illuminated for the occasion by means of acetylene and bengal lights; and after dining together at Semriach, the members returned to Graetz greatly pleased with the success of the meeting, which had been favoured with fine weather throughout.

Abstract-translations of the more important of the papers presented at the meeting will be given in the pages of the "JOURNAL" at an early date.

EFFECTS OF COMPRESSION AND TRANSMISSION ON COAL AND WATER GAS.

In the "JOURNAL" for the 25th ult. (p. 526), we published some extracts from the first portion of a paper on "The Effects of Compression and Transmission on the Candle Power and Heat Units of Manufactured Gas," submitted by Messrs. Bates and Rafferty at the annual meeting of the Illinois Gas Association. We now give the second part of the communication, which contains the results of investigations carried out by Messrs. V. A. Houghton and S. L. Cole.

The first series of tests were conducted on coal gas; tests being made on the gas immediately before and after compression, and also at a point 22 miles distant, *via* the pipe-line. The size of the high-pressure main between these two points is almost entirely 4 inches; and its volume is approximately 11,900 cubic feet at atmospheric pressure. Great care was exercised in purging the line and in timing the rate of flow to make sure that the same gas was tested at both points of observation. The compressors draw their supply from the town holder, thereby assuring a more uniform quality of gas. The results obtained are shown in Table I. A record was kept of the high-pressure drippage for three days, which is shown in Table II.

TABLE I.—Coal Gas.

Works.									Testing-Station 22 Miles Distant.		
Holder Gas.			High-Pressure Gas.					C.P.	B.Th.U.	Aver. Diff. in Pres- sure.	
Date 1908.	C.P.	B.Th.U.	C.P.	B.Th.U.	Pres- sure.	Temp. Ground. Deg. F.	Temp. Air. Deg. F.				
July 27	17.8	686	17.8	705	34	59	85	16.1	635	4.0	
" 28	17.9	673	17.9	683	28	59	85	16.2	656	4.5	
" 29	17.4	669	17.8	677	25	59	83	16.6	660	6.2	
" 30	17.7	669	17.4	663	30	60	80	16.3	653	4.0	
" 31	17.3	663	17.7	665	26	59	78	16.4	643	5.9	
Aug. 3	17.8	665	17.4	675	32	59	84	16.2	634	3.8	
" 4	16.6	660	17.4	679	23	60	87	16.1	641	9.5	
" 5	15.5	648	16.7	665	28	59	85	15.8	637	8.0	
" 6	15.1	639	14.5	639	30	60	82	14.2	631	6.1	
" 7	15.9	647	15.1	648	29	60	79	15.2	633	6.3	
Aver.	16.9	661	16.9	669	28.5	59	82	15.9	642	5.8	

TABLE II.—High-Pressure Drippage from Coal Gas.

Works.					Line.			
Date, 1908.	Comp. Hours.	Gals. Drip.	Gals. per Comp. Hours.	Gals. per 1000 Ft. Pumped.	1467 Ft. from Works.	3604 Ft. from Works.	4190 Ft. from Works.	5200 Ft. from Works.
Aug. 6	23.00	32.25	1.40	0.116	6 gals.	1 qt.	1½ qts.	6 gals.
" 7	20.00	30.75	1.53	0.127	3 qts.	1 pt.	1 qt.	3 "
" 8	20.75	30.25	1.45	0.120	3 gals.	½ pt.	½ pt.	1 pint.

From the data obtained, it was evident that there was a difference in the quality of the gas before and after compression and transmission; but the proportions of each deteriorating factor were not satisfactorily apparent. The reason for the contradictory results obtained at the works testing-station—viz., the compressed gas having an equal or higher illuminating and calorific value than before compression in some cases and not in others—may be accounted for in the following manner: Since the outside temperature was about 80° to 85° Fahr. when these tests were conducted, it is possible that the compressed gas may, upon subsequent expansion in the photometer-room, have at times picked up hydrocarbon vapours from the condensate in the photometer and calorimeter leads. On the other hand, the compressed gas may not have lost its vapours on the high-pressure side of the regulator, due to the comparatively high temperatures. The compressed gas at some point not far distant from the works was reduced to the ground temperature, with a consequent loss; but the testing leads came from a point close to the compressor. Hence the compression loss was not obtained in some cases, but quite the reverse.

A second series of tests was conducted on straight water gas; three testing-stations being established at 3, 8, and 18 miles from the works. These stations may be designated as A, B, and C

respectively. The line connecting them consists of 3-inch, 4-inch, and 6-inch pipe. The first part of this series of tests was conducted between the works and station B, the second part between the works and station C, the third part between the works and station A. Between the second and third parts several weeks had elapsed, and the weather had changed from moderately warm to cold. Circumstances had also compelled a change in the position of the apparatus at the works; the leads to the testing-room being made longer in consequence. However, the usual care was taken to thoroughly purge them before testing. The results are shown in Tables III., IV., and V.

TABLE III.—Water Gas, between Works and Station B.
[Transmission 8 Miles.]

Date, 1908.	Candle Power.		B.Th.U.		Pressures.		
	Works.		Station B.	Works.	Station B.	Works.	Station B.
	Holder.	Line.		Holder.	Line.		
Sept. 16	18.3	19.2	17.2	628.3	599.5	588.9	30
" 17	21.0	21.0	17.4	617.4	603.3	586.7	30
" 17	23.3	19.8	18.4	..	..	598.1	35
" 17	19.8	19.3	17.7	640.6	626.5	583.0	30
" 18	20.9	20.3	18.5	626.8	624.1	583.9	35
" 18	19.9	21.3	19.0	624.5	612.4	584.0	30
" 19	21.9	21.2	18.1	645.4	628.6	588.2	40
" 21	18.4	19.8	17.7	638.3	628.9	598.8	35
" 21	18.8	18.7	19.6	646.7	628.8	597.6	35
" 21	18.9	18.7	19.8	639.0	641.0	602.6	30
" 22	20.7	20.5	19.0	644.7	633.7	589.1	40
" 22	20.1	19.8	18.9	642.2	634.5	600.8	40
" 22	21.3	21.0	19.4	643.6	640.3	610.0	30
" 23	21.0	20.3	18.8	643.3	631.3	589.0	30
" 23	21.3	20.6	19.9	644.4	636.5	614.5	35
" 24	20.6	20.3	19.4	644.5	640.1	605.9	30
" 24	..	20.7	19.8	..	648.3	619.9	35
" 24	20.5	20.2	19.8	654.3	654.0	610.3	30
" 25	20.6	20.1	19.4	643.3	648.9	610.3	30
" 25	20.8	20.2	19.7	652.0	651.7	616.7	35
" 25	19.9	19.8	19.4	644.8	650.8	604.5	30
" 26	19.8	19.7	17.1	636.1	628.3	600.1	40
" 26	20.1	19.7	17.9	636.6	632.4	602.7	40
Aver.	20.4	20.1	18.8	639.8	632.9	599.4	34

TABLE IV.—Water Gas, between Works and Station C.
[Transmission 18 Miles.]

Date, 1908.	Candle Power.		B.Th.U.		Pressures.		
	Works.		Station C.	Works.	Station C.	Works.	Station C.
	Holder.	Line.		Holder.	Line.		
Sept. 30	20.2	19.3	17.5	612.4	609.2	613.5	30
" 30	19.9	19.2	16.7	609.1	603.8	600.6	38
" 30	19.9	19.7	16.0	609.4	615.9	597.0	30
Oct. 2	18.8	17.3	17.2	618.1	600.6	558.3	35
" 2	18.4	17.4	17.3	614.4	603.0	551.5	35
" 2	19.0	18.6	17.2	615.9	610.0	560.7	30
" 3	18.9	18.1	16.8	609.3	608.1	595.7	39
" 3	18.8	18.1	17.4	626.4	617.2	585.6	39
" 5	..	19.5	17.9	615.9	626.1	612.3	30
" 5	20.0	10.1	17.7	625.2	620.3	580.5	35
" 5	19.8	20.1	18.2	624.8	626.3	581.7	30
" 5	20.0	19.1	17.7	625.2	620.3	580.5	35
" 6	20.8	20.3	18.3	625.4	629.6	594.1	40
" 6	..	20.5	18.4	627.8	630.4	599.5	30
Aver.	19.6	19.1	17.5	618.9	616.0	587.1	34

TABLE V.—Water Gas, between Works and Station A.
[Transmission 3 miles.]

Date, 1908.	Candle Power.			B.Th.U.		
	Works.		Station A.	Works.		Station A.
	Holder.	Line.		Holder.	Line.	
Nov. 12 . . .	17' 1	15' 8	..	584 1	576' 0	..
" 12 . . .	17' 0	15' 9	15' 4	571' 3	569' 5	549' 9
" 12 . . .	17' 9	14' 7	15' 5	559' 1	560' 7	548' 9
" 13 . . .	16' 7	14' 8	14' 4	568' 7	568' 0	549' 7
" 13 . . .	17' 6	15' 6	15' 0	574' 3	580' 1	563' 7
" 13 . . .	17' 6	15' 9	14' 9	573' 0	592' 0	561' 7
" 14 . . .	17' 2	15' 1	13' 9	581' 7	569' 1	554' 1
" 14 . . .	17' 2	15' 3	14' 1	585' 3	580' 3	556' 0
" 14 . . .	17' 7	16' 5	..	593' 8	589' 4	564' 5
" 16 . . .	18' 1	15' 3	14' 7	597' 8	585' 8	551' 9
" 16 . . .	18' 8	16' 4	14' 9	602' 2	584' 8	566' 9
" 16 . . .	19' 3	16' 0	15' 3	617' 4	588' 6	572' 3
Aver.	17' 7	15' 6	14' 8	584' 1	578' 7	558' 1

It had been observed that there was little difference in the drop of candle power between the 8 and 18 mile transmission; and it was determined to ascertain if the gas had dropped the greater part of its illuminants at a point nearer the works. This was the purpose of the third part of the series of experiments. At this

stage of the investigation, it was felt, as will be more fully explained later, that the data as obtained were not fully comparable, due to lack of knowledge as to the degree of saturation with vapours of the low-pressure gas being examined; and a final series of tests was therefore undertaken, in which an endeavour was made to obtain conditions as nearly as possible comparable throughout.

In these final tests, after operating the compressor for a sufficient length of time to make sure that a uniform sample of gas was present at both intake and outlet sides, a candle-power determination was made of the low-pressure gas, and at the same time a dew-point determination was also made of the same gas, using the hygrometer described in the paper read by Mr. W. H. Gartley before the American Gas Institute in 1906,* to ascertain at what minimum temperature the gas was saturated with vapours. It is understood that if gas is saturated at a certain temperature, subsequent heating will not increase the amount of vapour present, if the heating is conducted without the presence of any condensed vapours.

The compressed gas was then cooled to this so-called dew-point temperature in a cooling coil, and its candle power ascertained. In this manner it was possible to determine the compression effect alone. The data obtained, which are the averages of two to four tests each day, are shown in Table VI.

TABLE VI.—Coal Gas.

Date, 1908.	Low Pressure C.P.	Combined Dew-Point Temperature.	High- Pressure C.P.	Pressure in Pounds.	Temp. Photo- meter Room.	Temp. Outside Air.
Dec. 12 . . .	16.3	41°	15.3	20	66°	36°
„ 14 . . .	16.8	44°	15.1	27	67°	40°
„ 15 . . .	16.4	50°	14.7	30	66°	44°

The question arose as to whether the gas should be cooled in the coil under pressure or expanded and then cooled. It was found that when the reducing regulator was placed immediately at the outlet of the compressor and before the coil (thus receiving the gas at the high temperature at which it left the compressor), there was no loss in candle power, even though the gas was subsequently cooled to the dew-point temperature of the uncompressed gas. This seems logical, because this treatment practically amounts to compression and immediate expansion; restoring the gas to its original condition as to volume and temperature. In view of this fact, the gas was cooled under pressure and then expanded before being led to the photometer. Table VII. shows the results (the figures being the averages of two to four tests) corroborating these statements.

TABLE VII.—Coal Gas.

Date, 1908.	Low Pressure, C. P.	High Pressure, C. P.	Pressure in Pounds.
Dec. 10 . . .	16.9	16.9	30
„ 11 . . .	14.9	14.9	26
„ 11 . . .	15.0	15.2	26

Another question also arose as to the effect of the low-pressure gas being cooled to this dew-point temperature. It was found, as expected, that cooling produced no effect, as shown in Table VIII.

TABLE VIII.—Coal Gas.

Date, 1908.	Candle Power.		Combined Dew-Point Temperature.	Outside Tempera- ture.	Photometer. Room Temperature.
	Without Coil.	With Coil.			
Dec. 12 . . .	16.3	16.0	41	36	66
„ 14 . . .	16.8	16.9	44	40	67
„ 15 . . .	16.4	16.4	50	44	67

It was ascertained, in connection with this work, that the dew-point temperature, as indicated by the hygrometer, was much lower for the high-pressure gas cooled in the coil than for the low-pressure gas. This fact agrees with the loss in candle power.

A testing-station equipped with photometer, calorimeter, hygrometer, and cooling-coil was now established three miles distant from the works; and all possible precautions were taken to make sure that the same gas was tested at both points. Severe weather conditions had now set in; and it was found that the dew-point temperatures at the testing-station were always lower than those of the compressed and cooled gas at the works—indicating that the pipe-line was subjecting the compressed gas to a lower temperature in transmission than the comparable temperature which the cooling-coils were designed to effect. In other words, the compressed gas arrived at the pipe-line testing-station having been subjected to a lower temperature than that to which it was being cooled for comparative purposes by the coil at the works. Had the dew-point temperature at the pipe-line station been higher than that of the compressed gas issuing from the coil at the works, it would have been necessary to cool to the comparable temperature at the pipe-line station in order to determine the transmission effect, if any.

As a matter of useful information, the hydrocarbon dew-point was determined in most of these later tests in addition to the combined dew-point—that is to say, the gas was passed through calcium chloride, thereby extracting water vapour, before being passed to the hygrometer. As will be shown subsequently, the hydrocarbon dew-point was found to be lower than the combined dew-point in all cases, whether the gas examined was compressed or uncompressed. Table IX. shows the compression loss alone and the loss due to further cooling in the pipe-line for varying conditions. Different dew-point temperatures are also recorded.

* See "JOURNAL," Vol. XCVI., p. 449.

TABLE IX.—Coal Gas.

[Col. A.—Combined dew-point temperature. Col. B.—Hydrocarbon dew-point temperature.]

Date, 1908.	Works.							Testing-Station Three Miles Distant.		
	Low Pressure.			High Pressure.				C.P.	A.	B.
	C.P.	A.	B.	C.P.	A	B.	Pres			
Jan. 18 .	17.1	35	..	13.7	22	..	42	12.7	*	..
"	17.4	35	..	14.1	22	..	35	12.1	..	..
"	17.3	35	..	13.7	22	..	36	12.1	..	..
"	16.5	37	..	13.8	22	..	36	..	..	..
"	16.5	37	..	13.9	23	..	37	..	..	..
"				13.9	23	..	38	..	..	..
Aver. .	16.9	36—	..	13.9	22+	..	37.3	12.3	..	..
Jan. 20 .	15.0	37	24	10.9	24	18	41	10.0	9	..
"	14.9	37	24	10.9	24	18	40	9.9	9†	..
"	15.0	32	25	10.8	24	18	40	10.0	9	..
"	15.1	32	25	10.9	24	18	41	9.1	9	..
"								9.1	9	..
"								9.2	9	..
Aver. .	15.0	34+	24+	10.9	24	18	40.5	9.6	9	..
One test	B.Th.U. 607.0	32	25	B.Th.U. 597.3				B.Th.U. 591.3		
Jan. 21 .	15.3	42	32	11.4	31	25	45	10.1	8‡	..
"	15.3	42	32	11.4	31	25	45	9.9	8	..
"	15.8	48	36	11.6	35	27	37	10.2	8	..
"	15.9	48	36	11.6	35	27	36	10.2	8	..
"				11.7	35	27	35	11.1	11	..
"				11.7	35	27	35	11.4	11	..
Aver. .	15.6	45	34	11.6	34—	27—	39	10.5	9	..
One test	B.Th.U. 623.9			B.Th.U. 614.0				B.Th.U. 600.4		
Jan. 22 .	16.4	50	35	15.5	40	33	21	14.8	17.0	6
"	16.4	50	35	15.6	40	33	21	14.8	17.0	6
"	15.9	47	37	15.3	40	33	23	14.1	17.5	8
"	16.0	47	37	15.4	40	33	23	14.1	17.5	8
"				15.4	40	33	24	14.1	17.5	8
Aver. .	16.2	48	36	15.4	40	33	22.4	14.4	17.3	7
One test	B.Th.U. 619.2							B.Th.U. 581.6		

* 15° obtainable, and no dew-points observable. † 3° obtained, and no hydrocarbon dew-points reached. ‡ No hydrocarbon dew-point obtainable.

Lastly, a set of tests was made for candle power and dew-point on (1) uncompressed gas, (2) compressed gas cooled to the dew-point temperature of the uncompressed gas, and (3) compressed gas cooled as much as possible with salt and ice, thereby duplicating severe pipe-line conditions. The results obtained are given in Table X.

TABLE X.—Showing Effect of Compression and Cooling on Coal Gas.

[Col. A.—Combined dew-point temperature. Col. B.—Hydrocarbon dew-point temperature.]

Date, 1909.	(1) Low Pressure.			(2) High Pressure.				(3) High Pressure.			
	C.P.	A.	B.	C.P.	A.	B.	Pres.	C.P.	A.	B.	Pres.
Jan. 26. .	14.6	47	32	12.7	26	17	31	9.6	19	11	32
„ „ .	14.6	47	32	12.7	26	17	31	9.6	19	11	32
Aver. . .	14.6	47	32	12.7	26	17	31	9.6	19	11	32
Jan. 28. .	17.2	47	34	14.9	31	25	35	12.3	28	23	30
„ „ .	17.4	47	34	15.0	31	25	35	12.3	28	23	30
„ „ .	17.7	46	37	15.3	34	28	31	12.5	29	24	30
„ „ .	17.7	46	37	15.2	34	28	31	12.5	29	24	29
Aver. . .	17.5	46+	35+	15.1	32+	26+	33	12.4	28+	23+	30—
Jan. 29. .	15.3	42	30	12.4	31	26	39	11.7	29	25	35
„ „ .	15.4	42	30	12.5	31	26	39	11.7	29	25	35
„ „ .	15.8	43	31	12.6	31	26	39	11.8	29	25	35
Aver. . .	15.5	42+	30+	12.5	31	26	39	11.7	29	25	35

Analyses of some of the condensate collected during the last series of tests are appended, showing the conditions under which it was collected and various boiling-points. The condensate was obtained from 1000 cubic feet of high-pressure gas passed through the cooling coil; the temperature of the coil being maintained at the combined dew-point temperature of the uncompressed gas.

Samples of High-Pressure Condensate.

Sample No. 1.	Sample No. 2.
106 c.c. water, or 0.028 gal.	141 c.c. water, or 0.0373 gal.
159 c.c. oil, or 0.042 gal.	124 c.c. water, or 0.0327 gal.
265 c.c. total, or 0.070 gal.	265 c.c. total, or 0.0700 gal.
Pressure limits, 30 to 35 lbs.	Pressure limits, 26.5 to 32 lbs.
Dew-point temperature of low-pressure gas, 43° to 49°.	Dew-point temperature of low-pressure gas, 39° to 52.5°.

Fractional Distillation.

Sample No. 1.			Sample No. 2.		
Per Cent.		Temperatures, Deg. C.	Per Cent.		
21	..	10.5 c.c. { 28 to 80	4 c.c.	8	No. 1
		80 " 90	11 "	22	" 2
		90 " 110	16 "	32	" 3
76	..	38.0 " { 110 " 116	7 "	14	" 4
		116 " 150	10 "	20	" 5
3	..	1.5 " Residue above 150°	2 "	4	" 6
100	..	50.0 c.c.	50 c.c.	100	

The specific gravity of fraction No. 3 was found to be 0.874, and that of the total, without the residue fraction No. 6, 0.879.

The preceding experiments have been recorded in their order as made, without much attempt to draw conclusions or afford explanations, which it should now be advantageous to summarize as well as possible. As the work proceeded, the difficulty of obtaining exactly comparable data became more evident, with the constant necessity of changing the method of testing and introducing more apparatus. Errors in this, or the necessity for some greater refinement of practice developed by its use, partially invalidated some of the work, causing much necessary duplication of tests and many delays. In this connection, it may be stated that too much stress should not be laid on the results of the heat unit determinations, especially the first series, which were undertaken before the report of the Committee of the American Gas Institute had laid down necessary rules of practice to avoid certain errors. The calorimetric work of the later tests, however, is deemed to be fairly trustworthy.

For the photometric work, both stationary and portable bar photometers were used; the portable instrument being established in the later tests close to the compressor. Great care was taken to avoid the errors ordinarily accompanying the use of portable photometers. In the early tests, both pentane and the Elliott kerosene standards were used; the latter being checked with sufficient frequency against the pentane. In the later tests, only pentane standards were employed; and they were carefully checked against each other.

Turning to the tests themselves, it is clear that in the early ones there was no exact knowledge of the condition of the low-pressure gas as to degree of saturation with vapours; and the comparison between the low-pressure and the high-pressure gas at the works is of no particular value. The comparison between the low-pressure and the high-pressure gas at distant points on the pipe-line gives the total loss resulting from compression and subsequent cooling to the ground temperature, but is deficient in that the relation of this temperature to that to which the low-pressure gas had been previously exposed, is lacking. For such of these tests, however, as were made in the summer months, there was probably no great difference between the low-pressure saturation temperature and the ground temperature to which the high-pressure gas was cooled in the pipe-line; and, therefore, the results of the tests are not without value.

In the later tests, the extent to which the hygrometric determination of the combined dew-point may be accepted as reliable in respect of the temperature the low-pressure gas had been exposed to—that is, its temperature of saturation—was first established; and this hygrometric determination was checked by cooling the low-pressure gas to this temperature, and determining that by such cooling it suffered no loss in illuminating power. The gas was then compressed and cooled under pressure to this same temperature; and the loss shown is that due to compression alone. When a gas exactly saturated with a vapour is compressed from zero to 15-lb. gauge pressure, its volume is cut in two, and it will necessarily drop one-half of the vapour, provided there be no change in temperature. This condition of no change in temperature is the one which it was endeavoured to set up in the later series of tests.

When it came to making pipe-line determinations, it was found that the ground temperature was so low (due to the weather conditions then existing) that additional cooling of compressed gas took place, with a consequent further drop in illuminating power; and this could be doubled by duplicating the temperature conditions in the cooling-coil at the works. It is evident that there is no so-called transmission loss, but that there is a loss resulting from compression and subsequent cooling, which is dependent upon the pressure to which the gas is compressed and the temperature to which it is afterwards cooled. There are further conditions, the effect of which is still indefinite, as shown by the peculiar variations in the results—viz., previous treatment of the gas and rate of loss due to varying combinations of hydrocarbon vapours present, and the effect of these vapours and of the water vapour on one another in the total process of condensation.

With regard to the last, the question has arisen as to whether the water vapour present has any precipitating effect on the hydrocarbon vapour. It would seem that if, for example, we have a gas saturated with both hydrocarbon and water vapours (say, at 60° Fahr.) and this gas is cooled to 40° Fahr., if either water or hydrocarbon vapour be artificially removed, the one remaining should precipitate at 40° Fahr. But it was found that at all temperatures the hydrocarbon vapours precipitated at a lower temperature than the combined vapours; and also that the water vapour dew-point (the hydrocarbons being extracted by finely divided rubber) was much lower than either the combined or the hydrocarbon dew-point (see Table X.). This indicates the

need and possible value of careful study into the condensation of compressed gas, with the view of conserving as far as possible the hydrocarbon vapours.

PRODUCING NITRATES FROM THE ATMOSPHERE.

The subject of the production of nitrates from the atmosphere has been in rather unusual prominence in the course of the past fortnight. Attention was first called to it by a paper read at the meeting of the Royal Society of Arts, on the 26th ult., by Herr Sam Eyde, of Christiania, who described the Birkeland-Eyde process, which he is working at the Notodden factory in Norway; and a few days later it was brought under the notice of the delegates at the International Congress of Applied Chemistry.

Taking the earlier paper first, Herr Eyde began by pointing out that more than a hundred years ago Priestley and Cavendish observed that the oxidation of atmospheric nitrogen took place on heating in an electric flame; and that men like Sir William Crookes and Lord Rayleigh had, with others in recent years, made some valuable contributions to the subject. Shortly describing the difference between previous methods and that in which he was specially interested, it was sufficient to say that he and his colleague had applied large quantities of energy in the electric arc, and had found out the best method of doing this; while it was previously believed that it was small quantities of energy that gave relatively the best results. It was on this assumption that the apparatus employed by them was constructed; and, consequently, their invention completely revolutionized the theory of the process of atmospheric combustion. By bringing quantities of energy into the electric arc, and finding the most suitable electric conditions and most serviceable types of furnace, the author claimed that they had created the synthetical nitrate industry.

After this introduction, Herr Eyde gave a description (illustrated by lantern slides) of the Notodden works, and explained the process carried on there, of which the following is an outline. The flame chamber of the furnace is formed of fire-clay brick, through the walls of which the air is conveyed to the flame. The nitrous gases formed escape through a channel made along the casing of the furnace, which, like the flame chamber, is furnished with fireproof lining. The temperature in the flames exceeds 3000° C. or perhaps 3500° C. The temperature of the escaping gases may vary between 800° C. and 1000° C. during ordinary working. The furnaces are made of cast steel and iron; the middle of the furnace being built out to a circular flame chamber, into which the electrodes are led radially. By the aid of centrifugal fans, the air is brought into each furnace through tubes from the basement. When the air in the flame chamber has been treated by the electric flames, the nitrous gases formed pass out through a channel built along the casing of the furnace, and thence through the lower part of the furnace to two fireproof-lined gas-collecting pipes, about 6 ft. 6 in. diameter, which convey them through the basement to the boiler-house, where they pass through four steam-boilers, in which their temperature is lowered. From the boilers the gases pass on through an iron pipe into the cooling-house, where the temperature is further considerably reduced. From the cooling chambers they go on to the oxidation-tanks, whence they are led into the absorption-towers, filled with broken quartz, which is not affected either by nitrous gases or by nitric acid. Of the entire quantity of nitrous gases passed through the absorption system, about 97 per cent. is absorbed. The finished nitric acid coming from the towers, which has a strength of about 30 per cent. by volume, is collected in granite cisterns, from which it is drawn to what are called the "dissolution works." These consist of granite vats filled with limestone, over which the acid is poured. This drives off, with violent effervescence, the carbonic acid contained in the limestone, while the nitric acid takes its place and forms a watery solution of nitrate of lime, or calcium nitrate. This is pumped into vacuum evaporating apparatus, and its concentration continued until the specific weight of the liquid at a given temperature shows a content of 13 per cent. of nitrogen. The solution is then sufficiently evaporated, and can be pumped up into the solidification chambers, fitted with shallow iron pans, under which cold air is pumped to accelerate cooling. After some time, the nitrate stiffens into a brittle crystalline mass, hard as stone. This is broken up into lumps, and is taken into the crushing-machines, which reduce the mass to a granular state. The resulting coarse powder is raised by an elevator to a vat, from the bottom of which it is tapped into casks holding 100 kilos. net.

Nitrate of lime, produced in the way described, is used in various chemical works as well as for manure. It is its value for the latter purpose, in competition with nitrate of soda and sulphate of ammonia, that concerns our readers. In recent years, a number of well-known men and institutes connected with agriculture have undertaken experiments for the purpose of testing its effect under various climatic and other conditions and on different kinds of soil; and according to Herr Eyde, all the experiments have fully confirmed the expectation of men of science when the new manure first appeared—viz., "that 1 lb. of nitrogen in the form of nitrate of lime has the same effect, both in quality and quantity, as a similar amount of nitrogen in the shape of nitrate of soda; in other words, that nitrate of lime is equal to nitrate of soda as a manure." Three trials with oats were made

by Mr. James Hendrick, the Chemist to the Highland and Agricultural Society of Scotland, with the following average results:—

	Yield per Acre.	
	Grain. Pounds.	Straw. Cwt. Qrs. Lbs.
1.—No manure	2348	33 0 21
2.—Phosphate and potash only	2532	37 1 6
3.—Same as No. 2 with nitrate of soda	2774	41 3 1
4.—Same as No. 2 with sulphate of ammonia	2774	41 3 24
5.—Same as No. 2 with nitrate of lime	3121	43 1 13

The following are the results of experiments made on roots at University College, Reading, by Professor John Percival:—

	Yield.
1.—Nitrate of lime, 1½ cwt. per acre	37'00 tons.
2.—Nitrate of soda	36'00 "
3.—Sulphate of ammonia, 1½ cwt. per acre	32'50 "
4.—No manure	27'75 "

Herr Eyde pointed out that the largest crops had been obtained with the use of nitrate of lime, even when the same gross quantities had been employed, notwithstanding that the nitrate only contained 13 per cent. of nitrogen, against 15 per cent. in nitrate of soda and 20 per cent. in sulphate of ammonia.

At the International Congress of Applied Chemistry, the subject was introduced by Professor Bernthsen, who referred to the process described by Herr Eyde, and said that the chief difference between it and its predecessors was that it utilized a large quantity of energy in a single discharge. He remarked that the great importance attaching to the possibility of the fixation of atmospheric nitrogen had several years ago been recognized in the Badische Anilin-und Soda-Fabrik; and after the task of manufacturing indigo on a commercial scale had been brought to a successful conclusion in 1897, special attention was paid to this new problem at the instigation of the Managing-Director, Heinrich von Brunck. As the result of these labours, Otto Schonherr succeeded in 1905, after eight years' work, in discovering and, with the assistance of the engineer Hessberger, in working out a process for producing an electric arc flame of a new form; and he was thus enabled to solve the problem in a surprisingly simple manner presenting considerable advantages over the method of Birkeland and Eyde. The new method was not a mere modification of their process, but differed fundamentally from it. Whereas Birkeland and Eyde caused the electric discharge to burn in a strong magnetic field, and thus spread it out in the shape of a flat (more or less circular) disc, Schonherr dispensed entirely with magnets and magnetic fields, and produced his arc inside an iron tube of comparatively small diameter, at the same time passing the air through the tube, and thus bringing it into contact with the arc. The methods in use for oxidizing and absorbing the nitrous gases and for converting the aqueous solution of nitric acid into nitrate of soda or lime were then dealt with by Professor Bernthsen, who pointed out that the greater concentration obtained by the new process he had described constituted an important advantage over that of Birkeland and Eyde. He concluded by giving some interesting details relating to the commercial and industrial development of his process. An agreement had, he said, recently been entered into with the Company exploiting the Birkeland and Eyde patents in Norway; and two new Companies had been formed, with capitals of 16,000,000 and 18,000,000 kronen respectively, to develop water power and erect works for the manufacture of nitrates.

The Gas Institution Benevolent Fund.

The Committee of Management of the above-named fund report that during the year ended Dec. 31, 1908, the amount of £337 11s. 1d. was received; subscriptions produced £144 1s. 6d.; donations, £97 7s. 5d.; interest on investments, £94 11s. 8d.; and interest on bank deposit account, £1 10s. 6d. The sum of £239 15s. 9d. was expended—viz., £212 10s. in the assistance of ten necessitous cases, and £27 5s. 9d. for printing, postages, bank charges, and incidental expenses. Leaving out of account the amount received from donations (an uncertain source of income), the receipts practically only just met the expenditure. The Committee feel that with the means at present at their disposal they are in many cases unable to afford as much relief as is deserved. As they would like to deal adequately with all the applications that are brought under their notice, they hope all those members who have not yet done so will become annual subscribers. They express much regret that during the period under review the fund suffered the loss by death of Sir George Livesey, who was one of the Trustees and a constant supporter for many years. At a special meeting of the contributors held for the purpose of filling the vacancy thus caused, Mr. Charles Hunt was unanimously elected. The suggestion made at the last annual meeting of the contributors, that steps should be taken to arrange for the representation of the District Associations on the Committee of Management, has been fully considered by the Committee, and unanimously adopted. With the object of giving effect to it, an alteration to Rule 12 will be proposed at the forthcoming meeting, whereby the District Members of Council may be added to the Committee. The desirability of arranging for contributors to have the power of nominating candidates for service on the Committee of Management has also been considered. Believing that such a provision would tend to increase interest in the fund, the Committee recommend the necessary alteration to Rule 13, which will be submitted for approval at the meeting.

SEVENTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The proceedings connected with the Seventh International Congress of Applied Chemistry, which was opened in London on the 27th ult. (*ante*, p. 583), were formally brought to a close last Wednesday, when the President (Sir William Ramsay) announced that the congress had been attended by 3000 members and 650 ladies. The reports presented by the Presidents of the different Sections showed that, out of 105 papers presented to the Section of Analytical Chemistry, 60 were read and discussed; the Section of Inorganic Chemistry and Allied Industries heard and discussed 47 papers; and of 111 in the Section of Organic Chemistry and Allied Industries, 60 were read. It was resolved that all the communications should be submitted to an English Publication Committee, on the understanding "that they be judged with perfect fairness and impartiality." The Committee will consist of experts in all branches of science—members of the Chemical Society, of the Society of Chemical Industry, of the Iron and Steel Institute, and similar bodies. The American Ambassador (Mr. Whitelaw Reid) read a letter from the Secretary of State of the United States, intimating that the President had approved a joint resolution of the Senate and the House of Representatives inviting the members to hold the Eighth International Congress in the United States in 1912. He said that if the delegates accepted the invitation, they would go next to a country which looked especially on the work of science as, above all, tending to promote happiness and diffuse peace among the nations of the earth. Dr. Wiley, of the Department of Agriculture, Washington, and Professor Meldola, representing the Society of Chemical Industry, supported the invitation; and it was accepted with acclamation. It was then resolved that Professor E. W. Morley should be the Honorary President and Dr. W. H. Nichols the Acting-President of the Eighth Congress; and with expressions of thanks by the delegates for the entertainment extended to the members, and by the President to the University of London and the Imperial College of Science and Technology for the use of their buildings, the proceedings closed.

In addition to the papers noticed last week, others were submitted on the following subjects in which our readers are more or less closely interested.

POWER GAS FROM LOW-GRADE FUELS.

Mr. B. G. McLellan, in the course of an interesting paper on the above subject, said that in the early days of gas-producer practice it was customary for the users of these plants to be somewhat restricted in their choice of suitable fuel. The purchaser of a gas-producer of almost any one of the usual types found that while the maker of the plant gave a very generous statement that any coal was admirably suitable for use in it, he was obliged as a matter of fact, after trials with the cheaper coals, to limit himself to one or two classes of fuel. Thus, one might find that a gas-producer user at Sheffield, in the heart of the South Yorkshire coalfields, was obtaining his coal from some entirely different source. The colliery owners consequently, as soon as they found that they possessed a supply of coal which was in demand for a special purpose, raised the price; and this particular fuel left the class of what, from a money point of view, might be called low-grade fuels. The natural course of development for gas-producer practice lay in the conquering of these difficulties, and in giving to the power-gas maker the ability to use the particular class of coal which could be obtained cheaply in his locality. The author dealt *seriatim* with the difficulties attending the use for producers of bituminous or coking coals, and of fuels high in ash content or producing a fusible ash. On the latter point, he stated that for producers doing high duty the proportion of ash in the fuel is of great importance; while if this ash is of a fusible nature, further difficulties, due to clinker formation, will occur. Briefly stated, the conditions which go to the formation of fused hard clinker were a fusible coal ash, a large percentage of ash, a thick fuel bed, and a low steam and air-blast temperature. M. Marconnet, of Paris, had invented a producer which aimed at the removal of these troubles. In this apparatus coal dust was employed—the dust and air being blown into the producer in the proper proportion. The heat generated was so intense that the ash was melted and might be tapped off at the bottom. The gas generated from gas-producers using bituminous coal was charged with soot or tar, which had usually to be settled or scrubbed out. The aim of those working on the subject, therefore, should be to design and construct a producer which would turn out a gas requiring less purification. This was a problem which had been much neglected by chemical technologists in this country, and had been left almost entirely to engineers; whereas it demanded most careful study by a chemically-trained mind.

M. Sepulchre, of Paris, and Mr. A. B. Searle, of London, contributed two papers describing gas-producers for dealing with low-grade fuels; and following these, three papers were submitted on bye-product coke-ovens by representatives of the types now in general use.

LIQUID FUEL.

A lecture on this subject was delivered by Sir Boverton Redwood. He pointed out that our principal fuels, in addition to wood, are coal and petroleum, including the natural gas yielded by some petroliferous territory and the products obtained by the

destructive distillation of bituminous shale. To these might be added, as of secondary importance, lignite, peat, and alcohol. In February last, President Roosevelt announced the calling of an international conference on the conservation of natural resources, and stated that the first immediate result of the conference was expected to be a general inventory of the natural resources of the world; an effort being made to ascertain just where the world stands regarding such resources, what has been done by different nations towards their conservation, what is best to be done, and what may be reasonably expected. As an illustration of the importance of such action, attention might, said the lecturer, be drawn to a recent report in which Dr. David T. Day, the petroleum statistician of the United States Geological Survey, gave the data upon which he arrived at the somewhat startling conclusion that, at the present rate of increase of the output of petroleum, the known oilfields of that country would, on the basis of the estimated minimum quantity of oil obtainable, be exhausted by the year 1935; while if the present output were maintained, the supply would, on the same basis, only last for about 90 years. Within recent years there had been a rapidly growing appreciation of the value of petroleum as liquid fuel, and the holding of this congress furnished an appropriate and timely opportunity for a general international review of the subject. Having described the sources of petroleum, Sir Boverton passed on to deal with the question of its uses. In this connection, he said that it seemed almost certain that for most purposes on land the internal combustion engine would before long replace the steam-engine, at any rate for moderate powers; for whereas the best types of the latter furnish only about 12 per cent. of the energy of the fuel in the form of work, the former can ordinarily be made to yield 25 per cent., and in the case of the Diesel engine the return is as much as 37 per cent. At the same time, he wished to utter a few words of warning against any indulgence in extravagant anticipations in regard to the extent to which liquid fuel might replace coal. A comparison of the output of coal and petroleum showed at once that even if the whole of the petroleum now being obtained were employed as fuel, it would displace but a small percentage of the coal; and it must be borne in mind that the present output of petroleum had been the outcome of very large expenditure extending over half-a-century. Nobody knew what additional stores of oil lay concealed in the earth; but it was in the highest degree unlikely that the quantity available was such as to revolutionize the fuel industry.

AIR AND COAL DUST.

Professor P. Bedson, of Newcastle, read a paper on the "Inflammability of Mixtures of Air and Coal Dust." The author described a method and apparatus for the experimental study of this question founded on that suggested by Professors Holtzworth and Von Meyer, and modified by Mr. Widdas and himself. One gramme of the air-dried sample of coal dust, ground so as to pass through a No. 100 sieve, is projected by compressed air into a cubical tin box provided with mica windows, the mixture of air and dust being ignited by a coil of platinum wire. The temperature attained by the coil can be altered at will by varying the current passing through it; and in this way a record can be obtained of the temperature necessary to ignite samples of coal dust of different origin and composition. It has been found by direct experiments with this apparatus that coal dusts differ very materially in their inflammability; the current required for heating the wire ranging from $10\cdot8$ up to 17 amperes, and representing a range of temperatures from 800°C. up to 1400°C. The dust from brown coal was found to be the most readily inflamed; while bituminous coal dust containing a high percentage of volatile matter came next in order of inflammability. Mineral charcoal and finely divided wood charcoal do not inflame under the conditions of the test. Damping the dust was found to raise the ignition or inflammability point considerably; an increased current of between $0\cdot7$ and 2 amperes being required in these cases. An admixture of silica with the coal dust had a similar effect.

DECOMPOSITION OF CEMENTS.

M. Le Chatelier read a paper on the above subject. He stated that all hydraulic cements decompose more or less rapidly on contact with water saturated with sulphate of lime, or on contact with sea water. The object of his investigations had been to study these reactions in the laboratory by submitting different products of this type to the prolonged action of certain salt solutions. The cements used in the experiments were mixed with the largest possible amount of water in order to obtain porous briquettes, and then were moulded in the form of cylinders $0\cdot8$ inch in diameter and $0\cdot8$ inch in height. After a setting and hardening period of one month's duration, the cylinders were divided longitudinally into four pieces; and the small briquettes thus obtained were immersed in the salt solutions. The conclusions drawn by the author from his investigations were that there is at present no hydraulic cement which can be guaranteed to stand prolonged immersion in sea water. The least destructive results are obtained with cements that contain an addition of puzzuolana, and by employing the least possible quantity of water for mixing,

ROAD MAKING AND REPAIRING.

Two papers dealing with these subjects were submitted by delegates from America. Mr. Allerton S. Cushman, Assistant-Director of Public Roads in the United States Department of Agriculture, in a paper entitled "The Contribution of Chemistry

to the Art of Road Building," remarked that the growing use of the automobile had made it apparent that even the best form of ordinary macadam construction is unfitted to stand the disruptive action of rapidly moving rubber tyres. It was from this point onwards that the engineer was absolutely obliged to turn to the chemist for information in regard to new forms of road-building and road-treating materials. Those which had been principally used to overcome this difficulty consisted of the natural oils or their residues and the various forms of tar products resulting from the destructive distillation of coal. Neither oils nor tars were in any sense standard substances; they varied widely in their physical characteristics. The engineer was quite helpless to cope with the subject without the aid of the chemist; and therefore the author emphasized the necessity for young civil engineers who are training themselves in road construction to take up a thorough course in the chemical laboratory, in order that they may not only be well posted in regard to the nature of binding materials, but may act in the capacity of analysts and investigators as occasion arises.

The author of the other paper was Mr. Prevost Hubbard, also of the Roads Office of the United States Department of Agriculture; his subject being "The Examination of Bituminous Road Binders." The author dealt with the necessity of establishing systematic methods of examining various bituminous materials employed as road binders. The methods employed by the United States Office of Public Roads were described in some detail; and their applicability to the different bitumens, as well as their practical value, was discussed. Considered broadly, bituminous road binders may be divided into two main classes: (1) Oils and oil products, including asphalts; (2) tar and tar products. An outline of what the author believes to be the most important determinations relative to each class is as follows: (1) The examination of oils and oil products for colour, odour, specific gravity, flash and burning points, flow or melting point, consistency, volatilization (character and consistency of residue), total bitumen and insoluble organic and inorganic matter, naphtha, insoluble bitumen. (2) The examination of tar and tar products for colour, odour, specific gravity, flow or melting point, consistency, results of distillation, free carbon or soot (material insoluble in carbon bisulphide). Where a mixture of the two classes is suspected, a combination of the methods will often be required to determine the character of the mixture.

THE SMOKE PROBLEM.

A paper on "The Legal Status of Industries Giving Rise to Noxious Gases" was read by Dr. Baskerville. Though it was based on the author's operations in America, his criticisms were applicable to this country, where only one law is enforceable, though local requirements are widely different. He argued that decisions should not rest with lawyers, but with a Board composed of persons possessed of knowledge of what was possible and reasonable. Dr. Elliott, of New York, threw all the blame for smoke on the engineer who persists in using fuel direct, where its previous conversion into gas would result not only in greater cleanliness but in economy; while Mr. Chamberlain thought the problem might be left to take care of itself, as manufacturers were fast realizing that black smoke meant loss to them. Ultimately the following resolution was passed: "That an International Commission be appointed to establish uniformity in the control of the escape of noxious gases."

PATENTS WORKED ON LICENCE.

In the Section devoted to Law, Political Economy, and Legislation Affecting the Chemical Industry, the Lord Chief Justice, as President, discussed, in his Inaugural Address, the right method of legislating respecting scientific knowledge. He said he did not believe there should be different rules in different countries; but as far as possible they ought to see whether in the British Empire, France, Germany, the United States, and other great countries, they could not approximate to an international code in connection with the proper protection of inventions. Recent legislation in Great Britain made it a condition that there should be working in the country in which the patent had been taken out. In his opinion, this was a step in the wrong direction, as it would discourage inventors, and would make many people revert to secret processes—one of the worst forms by which inventions could be developed. Further, it was hard upon the genuine inventor, who was often a very bad man of business. It was not too late, he hoped, to suggest, from an international point of view, that patents should be worked by those desirous to work them on fair royalties paid to the patentee. There ought to be international recognition of invention and discovery. There was no class of invention to which the observations he had made applied more strongly than to the chemical industry. Knowledge was the birthright of no particular nation, and should be shared by the whole human race. There ought to be no temptation to bottle-up or keep secret the discoveries of scientific men or the results of their labours. The perfect system would be to give to every inventor a fair and full—might he say a generous?—reward for his invention, and relieve him in many cases of the anxiety of developing it, so that he would be free to pursue his studies for the benefit of mankind, and, further, to investigate the inexhaustible fields of knowledge yet unexplored. The following resolution was adopted: "That the Committees of the various countries party to the International Convention for the Protection of Industrial Property be requested to consider the advisability of

adopting the provision that the manufacture in one country of the union protects the patentee against revocation of his patent in all countries."

CARBONIZING COAL IN BYE-PRODUCTS COKE-OVENS.

In a paper by Mr. E. Lloyd, of Manchester, the author set forth the progressive changes which the coal undergoes in the modern bye-product coke-oven during the coking period, and the character of the carbonization products. When the coal is charged into the coke-oven, carbonization of the surface quickly results in a dense layer, about $1\frac{1}{2}$ inches thick, composed of coal in the process of decomposition. The tar and water vapour resulting from this decomposition condense on the cool side of this layer farthest away from the wall, and are in turn re-distilled as the heating proceeds inwards, and again condensed on the cool adjacent coal; this process going on until the carbonization penetrates to the centre of the charge. Until the layer undergoing carbonization advances to the middle, the coal in the interior of the charge is unchanged. This condensation of the moisture and tarry matters on the inner layers of a charge plays an important part in the coking process; the latter acting as a binding material of the coal particles, particularly in the case of poorly coking coals.

With regard to the rate of penetration of the heat into the charge, according to Herr Hilgenstock the temperature at the centre rises to 100°C . towards the end of the first hour, remaining stationary at this temperature until the end of the eighteenth hour. The rise in temperature from 100°C . becomes gradually slower as the inner zones are reached; whereas the temperature immediately above the coal ranges between 800° and 900°C . Similar results have been obtained by other observers in this country; the time at which the temperature at the centre of the charge rises above 100°C . varying with the nature of the coal, the width of the oven, moisture, and the temperature of carbonization.

The constitution of the gases evolved in the coking process is essentially that of coal gas obtained in retorts in ordinary gas making; being, however, richer in hydrogen and nitrogen. At the beginning of carbonization, the gas is rich in illuminants and relatively poor in hydrogen. As the coking proceeds and the temperature increases, the illuminants and the methane steadily decrease, and the hydrogen steadily increases in proportion.

With respect to the passage of the gases, there appears to be a difference of opinion; it being maintained on the one hand that they pass to the centre and upwards through the charge, and, on the other, that they pass outwards and upwards between the outside of the charge and the walls of the oven. The difficulty which the gas would have in forcing its way through the finely-ground and closely-packed coal would alone appear sufficient to preclude the former view; while the formation of "scurf" on the walls through the breakdown of the hydrocarbons in the gas in contact with the highly-heated surface, the increased density of the outer coke, with, in many cases, the actual appearance of carbonaceous feathers of carbon deposition on it, give support to the latter view. It would be not unreasonable also to expect results, as regards the constitution of the tar and the yield of ammonia, analogous to those obtained in the vertical retorts for gas making, if the former view be correct. But this is not the case. It is probable, however, that when the coking of the charge has advanced to the inner core, the gases begin to pass upwards through the centre, through the clearance which forms in the centre of the charge.

The paper concluded with descriptions of the Simon-Carvés regenerative and non-regenerative vertical fluid coke-ovens.

Action of Coal Gas upon Asphalt.

In a recent number of "Het Gas," an account was given by Heer Ternen of a case of corrosion of an asphalt pavement in Amsterdam. A number of fissures were noticed in the asphalt, and leakage of gas was detected. The pavement was repaired, and an attempt was made to put the cost upon the gas undertaking. The author pointed out that asphalt is soluble in the presence of some of the constituents of coal gas—benzol, for example; but he thought the risk should not be exaggerated. In the first place, the bed of concrete under the asphalt should be impermeable to gas. If it is not, escaping gas will, of course, reach the asphalt. But this may crack of itself when worn by traffic; and in this case it suffers more than it does from the effects of gas. When attacked by the latter, it becomes soft underneath, and the cracks are not very deep and their edges are soft. When 41 grammes of asphalt are placed in 1 cubic metre (35.3 cubic feet) of gas, the weight increases by 75 grammes, and the asphalt softens; but it returns to its original condition in two or three days. Compressed asphalt is more resisting than that which is merely melted and spread. When cracks are found in asphalt, the adjacent gas-pipes should be carefully examined; but it must not be concluded that the fissures are necessarily due to an escape of gas. Even if there should be one, the thickness of the pavement must be taken into account, for it may have been too much worn to last.

The Manchester and District Junior Gas Association are arranging to visit the works of Messrs. W. J. Jenkins and Co., at Retford, next Saturday. Subsequently, the members will have the choice of joining in a drive through the "Dukeries" or of being shown round the Retford Gas and Water Works by the Engineer and Manager, Mr. T. B. Fenwick.

THE USE OF TAR FOR ROADS.

Some Hints from America.

At the last Annual Meeting of the New England Association of Gas Engineers, Mr. C. P. Price, of Malden (Mass.), read a paper, illustrated by lantern slides, on the subject of the use of tar for roads. In the course of it he gave the following as the latest and best methods of using tar as a surface preservative and for the construction of new roads.

The road surface is swept clean of all loose material and the tar is applied hot by means of a spreading-machine, or it is delivered on the road surface by means of a hose attached to the tar-waggon. Whichever method is used, it is necessary to provide several men with "squeegees" for removing surplus tar from the depressions in the road, and to prevent the liquid material from running into the gutters. As soon as the tar has been spread, and while it is still hot, a quantity of clean pea-stone should be applied, as evenly as possible, and immediately afterwards rolled with the steam-roller. Upon the following detail depends the success of the work: The tar used should be refined to the proper consistency; crude tar containing water and ammoniacal liquor is unsuited for the purpose. The road should be free from dust, and bone dry. The pea-stone should be applied in every case while the tar is still hot.

In constructing tar macadam roads by the penetration or grouting method, the following specifications were offered as being the latest development of this class of work: Broken local stone shall be spread, bound and rolled on the roadbed, prepared as before described. The width of the broken stone shall be 15 feet. The stone shall be laid in two courses, the lower of which shall be 3 inches thick at the centre and 2 inches deep at the sides; the upper course, 2 inches thick at the centre and $1\frac{1}{2}$ inches deep at the sides. The depths of the courses shall in each case be as if measured after rolling. In both courses the stones shall vary from $\frac{1}{2}$ inch to $2\frac{1}{2}$ inches in their longest dimensions.

After the bottom course, above described, is thoroughly compacted, broken stone screenings shall be spread thereon, and rolled until the interstices between the stones are filled. The screenings so used may contain the dust, and they shall not be larger than will pass through a $\frac{1}{2}$ -inch mesh. After the bottom course has been rolled to the satisfaction of the engineer, and evened up to conform to the proposed cross section, the top course shall be spread and rolled until fairly compact and as the engineer shall direct. When the stones are absolutely dry, a refined tar, conforming in all particulars to the requirements hereinafter specified, heated to a temperature approximating 180°Fahr ., shall be grouted into the voids between the stones of the upper course until all the interstices are filled with the tar, and a thin coating of tar covers the tops of the stones. The tar may be poured from hods or buckets, it may be distributed by a hose with a flattened nozzle, or it may be sprayed from any machine of which the engineer approves. If necessary to secure proper distribution of the tar and the surface film above required, the tar shall be broomed while hot.

The quantity of tar used shall be not less than $1\frac{1}{2}$ nor more than $1\frac{3}{4}$ gallons to the square yard of surface to which it is applied. As soon as possible, after the tar is applied to the satisfaction of the engineer, a thin, even layer of sand shall be spread thereon to such a depth that, after rolling, no surplus tar shall appear at the surface. The sand used shall be clean, sharp, and dry, free from loam, clay, and adventitious matter of all kinds. It shall contain no pebbles which will not pass through a $\frac{1}{2}$ -inch mesh, nor practically any grains or particles which will pass through a screen of 100 meshes to the linear inch.

If the contractor prefers, he may use stone screenings in place of the sand; but such screenings shall conform in all respects to the specifications for sand contained herein. When the sand or screenings have been applied, the road shall be rolled again to the satisfaction of the engineer. All rolling shall be done by a steam road-roller, of such weight and pattern as the engineer shall approve.

Each course shall be evened-up with material of the same sizes and quality as have been used therein, and to the satisfaction of the engineer; and deficiencies or inequalities in the surface of either course shall not be filled with sand or stone screenings. All broken stone shall be spread from the carts by hand, or from a dumping board or self-spreading carts. No soft or disintegrated stone shall be used.

If so ordered by the engineer, the thickness of the broken stone shall be increased or diminished at such points as he may direct. The grade of the finished surface of the road shall present a crown of half-an-inch to the foot.

The tar must be uniform in colour, character, appearance, and viscosity, and must have the following qualities: (a) It shall contain not more than 0.5 per cent. of mineral matter or dirt. (b) It shall have a specific gravity between 1.18 and 1.25. (c) It shall not contain more than 14 per cent. by weight of free carbon. (d) It shall contain no body that distils at a lower temperature than 225°C ., nor more than 10 per cent. by weight shall distil below 270°C ., and it shall contain at least 65 per cent. by weight of pitch or bituminous material remaining after all bodies up to 360°C . have been distilled. (e) When 20 grammes are heated in a flat-bottom dish, 3 inches in diameter, for 21 hours, in an oven kept at a temperature of 100°C ., the loss shall be not more than

10 per cent. by weight. (f) It shall be of such viscosity that 60 c.c., measured at the room temperature (78° Fahr. or 26° C.), shall, when at 100° C., be not less than 85 seconds, and not more than 240 seconds, in passing through a viscosimeter orifice 5-64ths of an inch in diameter when acting under a head of 4½ inches.

When 12½ per cent. by weight of the material is mixed with 87½ per cent. by weight of sand, of such a grade that all will pass through a sieve having 10 meshes, and practically none through a sieve with 190 meshes, to the linear inch, and briquettes are made 3 inches square and ½ inch thick, such briquettes will so harden in seven days at ordinary room temperature that, when laid flat and held by their edges by two parallel knife-edge bars, they shall not bend when a weight is suspended from a third knife-edge or parallel bar placed across their centre, until this weight reaches 200 grammes, and shall not break at less than 250 grammes, and the weight causing bending shall not be greater than 80 per cent. of the weight causing breaking.

This tar specification is considered the best so far issued. It provides very simple and effective tests, and while these are considered as well adapted for comparing various bituminous materials, there is some question as to whether the material that will meet this particular specification is of a quality best adapted for the purpose. It will be noted that the percentage of free carbon is 14. This would, in almost every case, exclude straight coal tar; and the admixture of a considerable quantity of refined water-gas tar is necessary to meet the test given.

In constructing bituminous macadam roads by the mixing method, the following description gives the details of construction employed by the Rhode Island Department of Public Roads: The first course of No. 1 stone is laid in place and shaped to the proper grade, and on this surface is laid a 3-inch course of tarred No. 2 stone. The stones are tarred on a mixing-board; the bituminous materials being heated in tar-kettles alongside the road. The 3-inch course of tarred stone is thoroughly rolled; and when this work is finished, a flush coat of bituminous material is applied on the surface and covered with a light coating of stone screenings free from flour. In the Rhode Island work, in a number of experiments, an asphalt residuum has been used with the tar, and has given excellent results. The Rhode Island bituminous macadam roads are without doubt the best examples in the United States; and the estimated cost above ordinary macadam is about 21 c. per square yard.

A Joint Conference of Commercial Sections.

It has been arranged to hold a joint conference of the Gas Association Commercial Sections next Tuesday afternoon (Institution week), at 4 o'clock, in the meeting hall of the Institution of Mechanical Engineers, at Storey's Gate, S.W. Mr. H. Kendrick, the Hon. Secretary, *pro tem.*, says it is earnestly trusted that every member of a Commercial Section will be present; and all gas engineers interested in the work will be heartily welcomed, as it is hoped that important developments affecting the movement will accrue from this meeting. It has been suggested, also, that every member should invite his chairman or a representative of his committee or board to attend the meeting. Among other matters to be considered at the conference, will be: The publication of reports of the Commercial Sections; tar quotations; and sulphate sales.

Gas-Engine Pumping-Station.—The city authorities of Philadelphia have contracted for a new high-pressure pumping-station driven by gas-engines for fire service. It is to be practically a duplicate of the city's existing station, which has proved such a success. According to some particulars in "The Times," it will contain ten 300 H.P. Westinghouse vertical single-acting engines supplied with gas from the city mains. A year's records from the old plant report 32 alarms and nine services ranging from a few minutes to 24 hours, during which 27 million gallons were pumped at an average cost of 12½ c. per 1000 gallons. Any unit can be started to deliver water at 300 lbs. pressure in 45 to 60 seconds, and the whole put in commission in seven to ten minutes.

Treatment of Road Surfaces to Prevent Dust.—Reports received from various parts of the country show that local authorities are still favourably impressed with the value of coal tar as a preventive of dust on roads. At the same time, other materials are being tried with the same object. For instance, during the past two months Messrs. Brunner, Mond, and Co. have been supplying chloride of calcium in the form of a granulated powder for spreading on roads; and tests are now being carried out by the Roads Improvement Association, in conjunction with local authorities and the firm, on the behaviour of this material in comparison with the chloride of calcium solution. The use of a piece of virgin road between Ashford and Stanwell, half-a-mile in length, has been given by the Staines Rural District Council for the purpose of special tests; and the experiments will be watched during the next few weeks by a Committee appointed by the Association. It includes Mr. H. P. Maybury and Mr. A. Dryland, the County Surveyors of Kent and Surrey, Mr. George Manning, the Engineer and Surveyor to the Staines Rural District Council, and Mr. W. J. A. Butterfield, F.I.C., F.C.S. The work of dusting the road with the powder began on Monday last week. This system of dust prevention depends for its success on the property of chloride of calcium to absorb moisture from the atmosphere; the effect being, it is claimed, to keep the road sufficiently damp to prevent the formation of dust.

REGISTER OF PATENTS.

Lighting and Extinguishing Gas-Lamps.

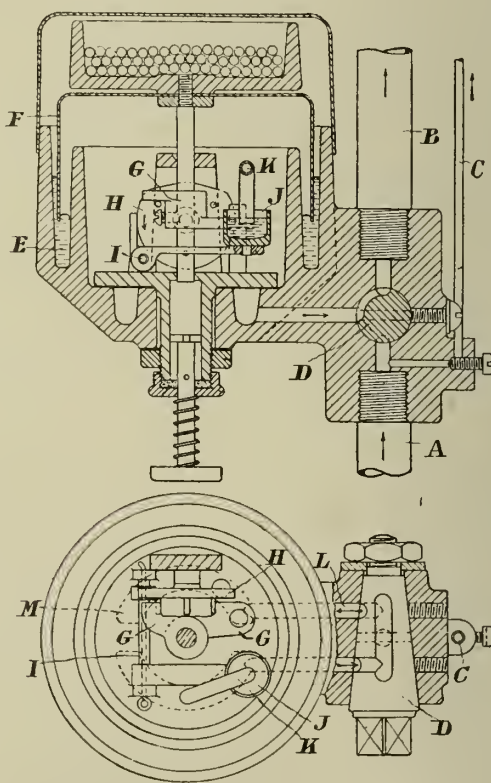
LEOPOLD, O., of Südende, near Berlin.

No. 3941; Feb. 17, 1909. Date claimed under International Convention, March 3, 1908.

This gas-igniter, working by increases of pressure and intended for use in street-lamps and the like, is of the type in which a cam disc provided with pins is turned by means of a rising and falling bell; the cam disc controlling a liquid closure for the gas supply. The chief feature is that a catch-block which engages with the pins of the cam disc has two projections, which engage successively on the rising and falling of the bell with successive pins on the disc and turn the disc always in the same direction.

From already known devices of this type, the present invention is distinguished, firstly, by the special method of controlling the gas-supply valve by means of the cam disc, and, secondly, especially by the arrangement named—that all catch plates or the like are dispensed with and the turning of the cam disc takes place always only in the same direction. A further advantage consists in that, in consequence of the considerable lift of the bell (which far exceeds the lift of previously known devices, and which can be increased according to need), slight variations of pressure in the gas-pipe never can become effective upon the control of the gas-supply valve.

These advantages are attained in the following manner: For the shutting off of the gas which flows to the burner, use is made of a movable quicksilver closure, raised or lowered by the depression or elevations formed on the periphery of the cam disc. By this means, on the one hand, the free end of the fixed gas-supply tube is opened or closed, and, on the other hand, in consequence of the quicksilver weight, a finger of suitable form sliding upon the periphery of the cam disc is firmly pressed thereon, so that a braking effect ensues between the two. By this effect, moreover, the cam disc is prevented from being accidentally turned by jerks or other outside effects. The cam disc, together with the driving pins, always moves in only one direction, in consequence of the special arrangement for the driving of the cam disc through a catch block with two projecting arms. These projections are so planned in their horizontal and vertical distance, that one comes into engagement with a pin of the cam disc on the rising of the bell, while the other pin can move past the edge of the other projection. Upon the sinking of the bell a second projection engages with the corresponding pin of the cam disc, while the first projection moves past its pin. Thus considerable free up and down motion is allowed to the bell whereby it is further secured that small unavoidable changes of pressure in the gas-pipe will not affect the actuation of the gas-ignition apparatus."



Leopold's Gas-Lamp Lighter and Extinguisher.

A indicates the end of the pipe from the street connection; and B the pipe leading to the main burner. C is a pipe for the bye-pass burner; and D is an adjustable gas-cock (of any known construction). The casing is hollow inside, and has an annular cavity E containing quicksilver, into which there dips the bell F (open underneath), on which is placed a receptacle which can be weighted with shot. The bell bears in the middle a rod to which is attached a specially constructed catch-block G—secured by a set-screw. Beside the rod is placed a disc H, which has at a given point one or more curved depressions, and upon the cam disc are placed three pins. Against the periphery of the disc a finger rests, firmly keyed upon one end of the shaft I. At the other end of the shaft is firmly secured an arm, which is normally in the horizontal position and bears upon its outer end a vessel J, filled with quicksilver, into which a tube K dips.

The gas flowing from the main passes into the inner channels L M, and thence through apertures into the interior of the casing. The construction is shown at the moment at which a pressure wave has been passed through the pipes, and the bell is again falling—the right-hand projection leaving the right-hand pin. As the bell rises, the cam disc H, with its pins, is turned in a counter-clockwise direction so far that the pin at the left passes directly under the left arm of the catch-block G. If, then, the pressure which has been sent through the pipes is relaxed, the weighted bell sinks down and will turn the cam disc by means of the left pin. Hereupon the curved depression shown comes opposite the finger on the shaft I, and, consequently, the arm, together with the quicksilver vessel J, is allowed to fall as far as the curved depression allows. The pipe K then no longer dips into the quicksilver in the vessel, and the gas from it can then freely flow through the apparatus and finally through a corresponding bore of the cock D into the main burner. By the turning of the cam disc H, the lowermost pin is turned to the right, and is raised until it comes to rest above the right part of the catch-block G. As soon, therefore, as, for the purpose of putting out the lamp, a pressure wave is sent through the pipes, and the bell F is raised thereby, the disc H is simultaneously turned, the curved depression comes out of engagement with the finger, the vessel J is thereby again raised, and the pipe K closed, which cuts off the supply of gas to the main burner.

Gas-Compressing Apparatus.

TEE, H., and ADAMS, F. E., of Birkenhead.
No. 9823; May 6, 1908.

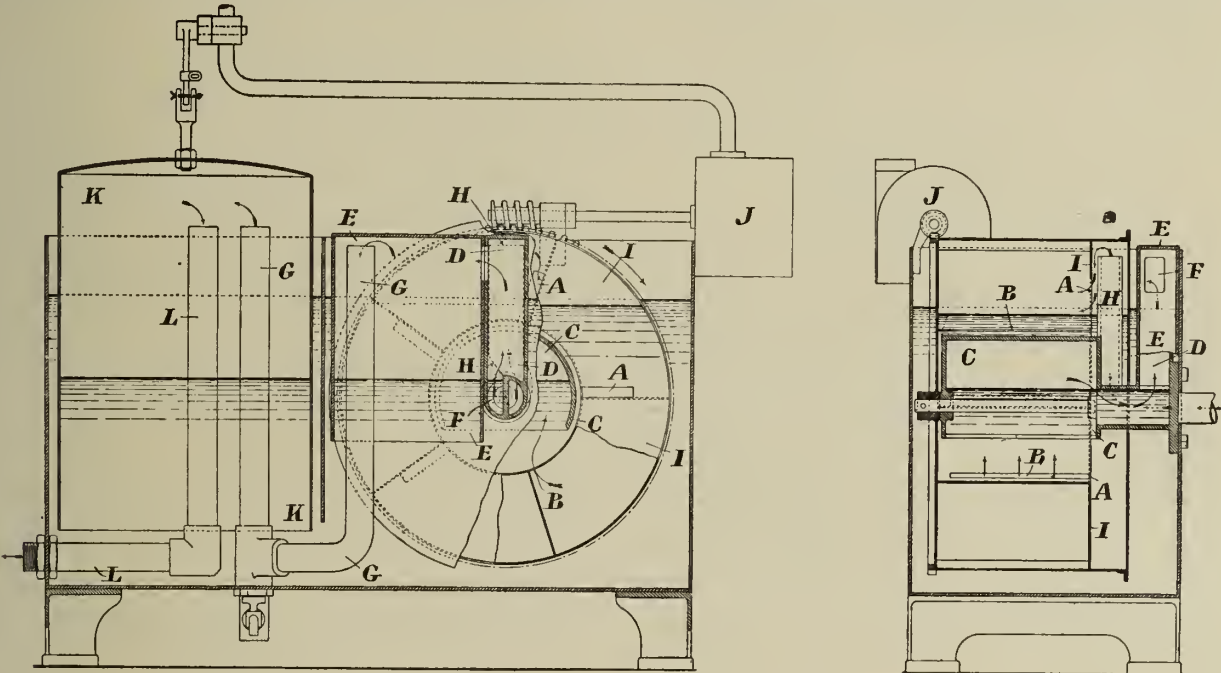
This invention has reference more particularly to compressors in which the gas is compressed to a comparatively small pressure—such as is required in many cases for use in burners for lighting and heating. It has primarily for its objects to provide simple and inexpensive appa-

ratus which is "efficient and will maintain a uniform pressure and supply or delivery in itself, and is without valves."

In the apparatus shown, the outer container is open at the top, and is fitted with a rotary drum having chambers in it. The openings in the chambers are at one end, and in the inner cylindrical wall; and they (A B) are respectively radial to, and parallel with, the drum axis. A central collecting vessel C fits inside the open central portion of the drum; and the gas collected in it passes, by way of a branch at the lower portion of the vessel C—concentric (say) with the axis of the drum—up an outlet conduit D, in connection with which there is used an inverted narrow vessel E dipping into the liquid in the container, to which the gas passes by an opening F, and from which it flows by a pipe G projecting up into it.

The gas enters the apparatus at the central conduit, and passes up, through a pipe H, into the upper part of one end of the revolving drum, which constitutes a species of similar chambers formed between the end plate of the drum, and an inner plate I forming the inner wall to the chambers, and extending between the outer and inner concentric cylinders of it.

The vessel and conduits are stationary, and carry the drum by a spindle fixed in the outer end plate and working in bearings in the stationary vessel C. The drum may be revolved by a water or other motor, or by other suitable means, such as a direct mechanical drive. When the apparatus is driven by direct mechanical drive, and economy of "power" is of little moment, the gas will be supplied in excess by the rotation of the drum, and the surplus simply escapes from the central collecting vessel C and passes up through the water into the upper part of the drum-chamber—that is, to the inlet openings A B, which it again enters, and is forced down and re-delivered. In cases where the drum is driven (say) by a water-motor or the like, as in the case shown, the motor J may be regulated by the pressure of the gas supplied through a bell K working in the containing vessel, and to the interior of which gas is delivered by the continuation of the pipe G, and



Tee and Adams' Gas-Compressing Apparatus.

from which it passes away by the pipe L, so that the pressure acts upon the bell and regulates its height in the liquid. By the movement of the bell through the levers to which it is connected, a valve for controlling the supply of working fluid to the motor is operated (closed or opened) as the pressure rises or falls. In this way, the rotation of the drum is governed by the pressure of the gas compressed or forced by it.

Exhausters.

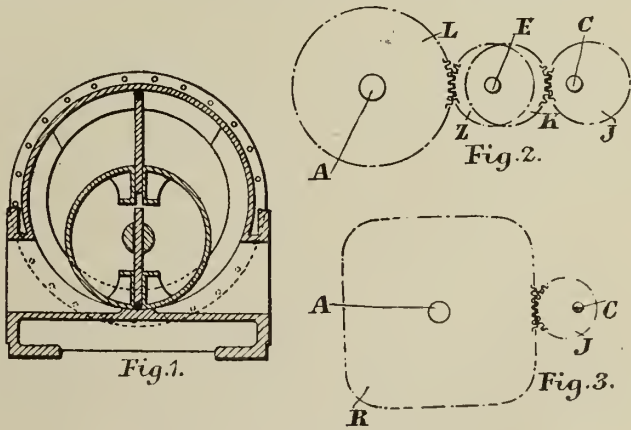
WALLER, E. B., of Stroud, Glos.
No. 10,324; May 12, 1908.

This invention relates to driving gear for exhausters, compressors, and the like, so as to overcome certain difficulties that have arisen from the fact that when the drum is driven at a substantially constant angular velocity the peripheral velocity of the blades varies at different points in the rotation of the drum—being less when passing the inlet and outlet port region than it is throughout the remaining portion of the revolution. The effect of this increased peripheral velocity at the point where the blades are most extended and are doing most work, is to cause fracture of the blades.

Fig. 1 represents a cross section of a well-known form of exhauster with two blades disposed along one diameter. Figs. 2 and 3 represent two forms of the improved driving gear.

On the shaft A of the exhauster is a gear-wheel L; and on the countershaft E is another gear-wheel Z, of such diameter in relation to the wheel L that the former shall rotate two, three, or four times the speed of the shaft, according to whether there are two, three, or four blades. On the countershaft E is also mounted an eccentrically set gear-wheel K, engaging with a similarly eccentrically set gear-wheel J on the driving shaft C. It will be seen that if a constant angular velocity is given to the driving shaft C, a varying angular velocity will be transmitted to the countershaft E. If the two gear-wheels K and J are of equal diameters, this varying velocity of the countershaft E will vary from a minimum to a maximum and back to the minimum during one complete revolution

of the shaft C; and this cycle of variations can be transmitted to the blades of the exhauster any desired number of times during one complete revolution of the blade by adjusting the relative diameters of the gear-wheels Z and L. For instance, with a three-blade exhauster it is



Waller's Driving Gear for Exhausters.

necessary that the blades shall be travelling at a minimum circumferential velocity three times in one complete revolution of the shaft A; and therefore the gear-wheel L must rotate once every three revolutions of the gear-wheel Z.

For an exhauster having three or more blades, a convenient form of gearing for obtaining the desired variations for the blade speeds is an

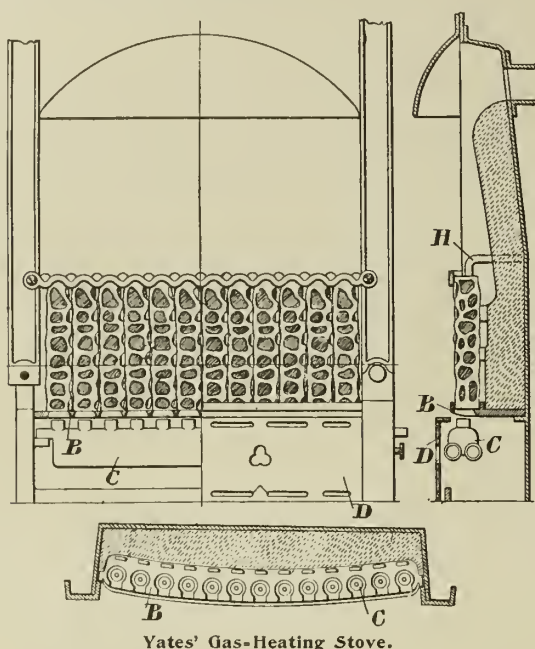
eccentric pinion measuring with a lop gear. Such a gear arranged for a four-blade exhauster is shown in fig. 3, in which the driving pinion J, set eccentrically on the driving shaft C, gears with a lop wheel R, carried on the shaft A, whereby four speed changes are effected in each revolution of the blower spindle.

Gas-Fires.

YATES, H. J., of Birmingham.

No. 15,782; July 24, 1908.

This invention relates to gas-fires heating to incandescence a mass of refractory material—the patentee claiming to obtain better combustion of the gas and more effective utilization of the heat generated than in apparatus of ordinary construction.



Yates' Gas-Heating Stove.

He employs any "suitable refractory material as the so-called fuel," and shapes the same into separate irregularly formed skeleton tubular columns with apertures in the sides and ends. The columns are supported vertically on a perforated tray B, which takes the weight of the fuel, and, in the event of breakage, prevents the falling of the pieces on to the burner, as is experienced when the fuel is suspended from the upper side of the grate. The tray is secured at a sufficient distance above the outlet orifices of the burner-tube C to admit the usual supply of air in addition to that previously mixed with the gas at the inlet to the burner. The detachable cover D, whereby the burner is enclosed, is also perforated with apertures or shaped to provide an opening along its upper edge, to ensure the requisite auxiliary supply of air to the underside of the tray or fuel support. Within the grate a fire-brick back, preferably of the cross section shown, is provided behind the fuel. In order to prevent possible displacement of the fuel, projections H are formed with, or embedded in, the fire-brick back to engage with the apertures in the fuel, or a single metal clip or binding strip may extend across the front of the fuel at its upper part and be secured at its ends to the frame as shown.

Vertical Retorts.

BROOKE, R. M., of West Vale, near Halifax, and ROBERT DEMPSTER AND SONS, LIMITED, of Elland.

No. 16,405; Aug. 4, 1908.

This invention consists essentially in the provision of separate combustion chambers and regenerator flues in connection with each of the compartments into which the setting is divided by the usual horizontal partitions, each of such combustion chambers having a separately regulated supply of secondary air and producer gas, and the amount of draught on each compartment being also separately regulated.

An illustrated abstract of the specification appears upon p. 643 of to-day's "JOURNAL."

Automatic Ignition of Gas-Lights.

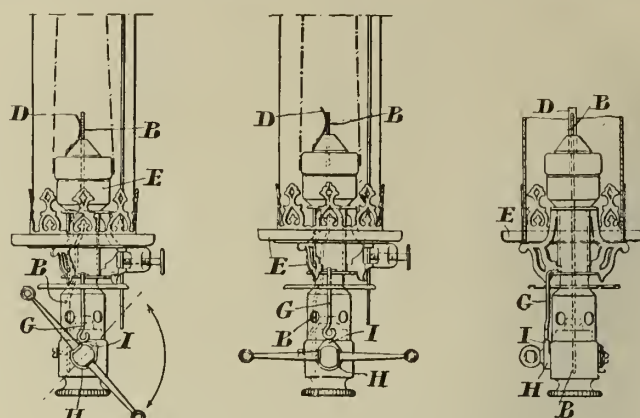
RUPPERT, H., of Zurich, Switzerland.

No. 19,315; Sept. 14, 1908. Date claimed under International Convention, Sept. 15, 1907.

This invention relates to automatic gas-lighters in which the gas is ignited by sparks caused by friction between two suitable materials on the turning of the gas-tap. This action causes a part rigidly supporting the moving part of the igniter first to be displaced upwards in a vertical direction and then allowed to drop, under the action of its own weight, to its initial position.

The illustration gives views of a burner in the closed and half opened positions of the tap respectively; also a section of the latter at right angles.

In the burner, a wire B is fixed in the interior of the gas-supply pipe (instead of the usual pilot burner pipe), and projects above the top of the burner. The projecting (somewhat roughened) part of the wire is in contact with a sheet spring D, fixed on the burner-cone. The part E of the burner has fastened to it a depending piece G, of wire, the lower



Ruppert's Automatic Gas-Burner Igniter.

end of which rests on the plug of the tap H, which is provided with a cam-piece I.

To ignite the gas, the tap is turned from the closed to the open position. By turning the tap, the part G, and with it the liftable part of the burner, is raised somewhat by the cam-piece I until the tap attains the half open position. On the further rotation of the tap into the open position, the part G and the part E of the burner slide down into the former position. By this relatively quick up-and-down movement of the part E of the burner, friction is caused between the spring D (participating in the movement) and the end of the stationary wire B, which suffices for the production of sparks. As simultaneously with the production of the sparks gas begins to flow, the latter is ignited.

APPLICATIONS FOR LETTERS PATENT.

- 12,168.—GILL, A., "Inverted burners." May 24.
- 12,178.—DUNCAN, W., "Gas-deflector for mantles." May 24.
- 12,247.—SCHEIDIG, M., "Producing power gas from a bituminous fuel or combustibles." May 24.
- 12,268.—WILLS, C. E., "Gas stoves and cookers." May 25.
- 12,299.—NEWHOUSE, W. A., "Inverted globe holders." May 25.
- 12,314.—RENKEWITZ, E., "Controlling gas-burners from a distance." May 25.
- 12,315.—DUCKHAM, A. M'D., "Discharging and charging gas-retorts." May 25.
- 12,363.—KOPPERS, H., "Coking and gas-generating ovens." May 25.
- 12,384.—THOMSON, J. M., and BRODIE, R. B., "Conveyors for coal." May 26.
- 12,397.—DARWIN, H., "Gas-lamps." May 26.
- 12,398.—DARWIN, H., "Atmospheric burners." May 26.
- 12,400.—DUCKHAM, F. E. & A. M'D., "Discharging and charging gas-retorts." May 26.
- 12,429.—POTTER, W. G., "Regulating gas." May 26.
- 12,466.—HADDAN, H. J., "Incandescent bodies for gas-burners." A communication from Bruno-Patente-Verwertungs G. m. b. H. May 26.
- 12,470.—GIORGI, A., "Controlling the supply of gas to burners, and igniting same." May 26.
- 12,508.—THORP, T., "Combined anti-pulsator and pressure regulator for gas-mains." May 27.
- 12,527.—FITZPATRICK, H. D., "Incandescent burner." A communication from Socié Anonyme "Alumina." May 27.
- 12,534.—HEINEN, L., "Gas-generators." May 27.
- 12,546.—DARWIN, H., "Inverted burners." May 27.
- 12,579.—NEUE KRAMERLICHT G. M. B. H., "Forming and hardening inverted mantles." May 27.
- 12,606.—SOLON, M. F., "Regenerative gas-burners and stoves." May 28.
- 12,650.—ROBIN, J. I., "Bunsen burners." May 28.
- 12,652.—MEHLER, M., and LOHMANN, G., "Measuring the calorific value of solid fuel." May 28.
- 12,678.—FALK, S., "Inverted burners." May 28.
- 12,683.—SCHIMMING, G., "Gas-engines." May 28.
- 12,713.—HAWLEY, W., "Grids for gas-purifiers." May 29.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Pontypool Gas and Water Bill, Wakefield Corporation Bill.

Bill read the third time and passed: Musselburgh Gas Order Confirmation Bill.

As may be remembered the Gaslight and Coke Company Bill was put down for the third reading stage last Thursday night; but as the House adjourned early it did not come up for discussion on Mr. W. Thorne's motion for its rejection. It was therefore fixed for the following day, during the time devoted to private business; but it was "passed over," and was once more set down for to-night—Mr. Thorne's motion still remaining on the paper.

Petitions have been presented against the Alliance and Dublin Consumers' Gas Bill by the Dublin Corporation, the Dublin and Wicklow County Councils, the Killiney, Ballybrack, Dalkey, and Pembroke Urban District Councils, and the North and South Dublin, Rathdrum, and Rathdown Rural District Councils; and against the South Staffordshire Water Bill, by the Earl of Dudley.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Livesey Memorial Fund.

SIR,—Will you allow me to thank you for the interest you have taken in the Endowment Fund for the Livesey Memorial Professorship, and particularly for the appeal made in the editorial columns of last week's issue of the "JOURNAL."

The object of the fund has received the approval and support of a large number of individuals, companies, and a number of corporation gas committees. It only requires for those members of the Institution who have hitherto stood aloof to now take a part in this grand movement, and make it truly representative of the whole industry.

Is it not possible to raise the balance of the amount required during the next few days, and before the opening meeting of the Institution?

I sincerely trust a real effort will be made.

THOS. GLOVER,

President of the Institution of
Gas Engineers.

Norwich, June 7, 1909.

The Relative Cost of Gas and Electricity.

SIR,—Regarding your reply to my last letter in your issue of May 25, and to which I regret extra pressure of business has obviated an early answer. You ask how it is I know the consumers quoted are getting a better light with electricity than with gas. I know it because they tell me so; and who should be a better judge?

As to your query regarding the allowance made for the gas-cooker, my statement was certainly not so clear as it might have been. The amount paid for cooking while gas was used for lighting was deducted from the consumer's total gas account, leaving the amount paid for lighting, with which figure the cost of electricity for a corresponding period was compared.

I have during the last ten days noted another instance where discrepancy of cost is such that it cannot be explained away by argument about trifles; and I append a copy of the actual letter received from our consumer. In this case, I give you (but not for publication) his name and address; and you can, by referring to the West Ham Gas Company, no doubt check the gas figures given. I would say that this particular consumer, before adopting electricity, complained to the Gas Company of the excessive cost of lighting. The meter was taken out and tested, and found to be absolutely correct. None but incandescent gas-mantles were employed; the most used being of the inverted type.

H. H. HOLMES, Sales Manager,

West Ham Corporation Electricity Department.

Stratford, E., June 4, 1909.

[ENCLOSURE.]

May 28, 1909.

Dear Sir,—Will you please send me a 35 c.p. Osram lamp, for which I will pay on delivery.

It may be of interest to you to know that I have been making a calculation as to the difference in the price of gas and electricity. My gas bill for the two quarters ending December, 1907, and March, 1908, amounted to £4 3s. 6d. for lighting. I had no gas-cooker. In August, 1908, the electric light was installed; and the electric lighting bill for the two quarters December, 1908, and March, 1909, amounted to £1 8s.—or, in other words, gas for lighting is three times dearer than electricity. At the same time, by using the Osram lamp, one gets as much, if not more, light than by the inverted gas-mantle.

To the Sales Manager,
West Ham Corporation Electric Supply.

[Mr. Holmes's letter does not appeal to us as being a complete answer to the editorial note to his communication of a fortnight since; but as to that readers perhaps will exercise their independent judgment. Mr. Holmes still declines to give the names and addresses of the consumers referred to in the previous correspondence, notwithstanding that the inquiry by us, assuming that there are no flaws in our correspondent's previous assertions, should do his department an immense amount of good. For the life of us we cannot understand why he refuses those names and addresses, but sends us a single one privately that he has obtained since the publication of his last letter. But to the present communication. Mr. Holmes does not know from personal observation that the consumers "are getting a better light with electricity than with gas;" but he knows it because the consumers tell him so. We can get a better light from gas than from electricity, spending the same amount of money. Mr. Holmes will testify to this fact now, because he knows it, seeing that we have told him, and who should be better judges of what we are able to do than ourselves? Now we are getting to somewhat nearer knowledge as to how the gas lighting cost figures were obtained. "The amount paid for cooking while gas was used for lighting was deducted from the consumer's total gas account, leaving the amount paid for lighting, with which figure the cost of electricity for a corresponding period was compared." It does not seem from this that the cooking gas and the lighting gas were separately metered; if not, what were the lines adopted in making an estimate of the quantity of gas used for cooking and the quantity used for lighting? We have no great faith in estimates of this kind made by the Sales Manager of any Electricity Department. Our correspondent is thanked for the testimonial he includes with his letter; and for the name and address of the writer. We are taking advantage of the permission to make

inquiries into this matter. On the showing of Mr. Holmes in his letter a fortnight since, a "much higher illumination" can be obtained from gas for the same expenditure. Our correspondent knows, too, that, taking lighting efficiency on the basis of consumption, the writer of the testimonial is appealing strongly to his imagination when he says that "gas for lighting is three times dearer than electricity." If a gas consumer uses gas wastefully, uses it simultaneously in a greater number of rooms than he does electricity, uses it for a greater number of hours in the greater number of rooms, of course when he comes to economize electricity, and stands watchfully over his switches, he can produce all sorts of queer comparisons. Would this consumer believe it, that we can run a 25-candle power inverted bijou gas-burner for nearly 1000 hours for 2s. 8d. worth of gas in West Ham, as against about 350 hours, using a 25-candle power Osram lamp, with 2s. 8d. worth of electricity at 3d. per unit? How strange that his view should be that gas is three times dearer than electricity; and that ours should be the reverse, and both based on practical experience—ours perhaps on a far more extensive one, with both gas and electricity, than the consumer in question. One word to Mr. Holmes, and not to the consumer who has written this testimonial. We calculate that £4 3s. 6d. will purchase rather more than 31,000 cubic feet of gas at 2s. 8d.; but take the round figure. Also that £1 8s. will purchase 112 units of electricity at 3d. Taking for Osram lamps 800 candle-hours per unit, the 112 units would be equal to 89,600 candle-hours, which would only represent 2.88 candle-hours per cubic foot of the 31,000 feet of gas. But, of course, Mr. Holmes will believe the consumer gets as much light with the Osrams as with inverted gas-burners, because the consumer "tells him so, and who should be a better judge?" On the very face of the figures, Mr. Holmes must know that there is some other explanation for the difference between £4 3s. 6d. and £1 8s. than that (advanced by this consumer), that electricity used with Osram lamps gives a greater light for less money than gas used with inverted burners.—ED. J.G.L.]

New Use for Asbestos Fuel.

SIR,—It has been said, and rightly so, that there is no limit to the use to which gas, and its immediate surroundings, can be put; and to illustrate this, I might mention that in this office we have found a new (at least, I have not heard of it before) use for the asbestos fuel in the gas-fires installed in the office.

We find that the balls, when broken in half, make an excellent substitute for pumice stone for removing inkstains, grease, &c., from the hands.

Correspondence Branch, General Post Office,
New South Wales, May 1, 1909.

L. F. D. CARTER
(late of Grafton Gas Company, Limited).

LEGAL INTELLIGENCE.

THE LATE GREENOCK GAS MANAGER'S CLAIM AGAINST THE CORPORATION.

In the Outer House of the Court of Session on Tuesday last, Lord Mackenzie closed the record and ordered proof, to proceed on a day to be afterwards fixed, in the action, already intimated, at the instance of Mr. William Ewing, formerly Gas Manager, against the Corporation of Greenock.

Mr. Ewing was appointed Gas Manager at Greenock in October, 1900; entering upon his duties in November. He resigned the post on Sept. 9 last; and his resignation was accepted. In the action, a claim is made for £1645 8s. as remuneration for work done by Mr. Ewing, which is said to have been outside his duties as Gas Manager. It is pointed out by the pursuer that, before his appointment, the defenders considered whether they should advertise for "a Gas Engineer to act as Manager," or for "a Gas Manager;" and by a majority they resolved on the latter. For many years Mr. Samuel Stewart had acted as Gas Manager, and also as Consulting and Resident Gas Engineer to the Corporation. He had a salary as Gas Manager; and for work he performed as Gas Engineer he received extra payment. Mr. Stewart resigned as Manager in March, 1900; and Mr. Chalmers was appointed to the office—Mr. Stewart being retained as Gas Engineer, at a salary of £100, with a retiring allowance of £150 as Gas Manager. Mr. Chalmers died in July; and Mr. Stewart, who had been acting as Manager during his illness, was asked and agreed to resume the managership, and did so till the pursuer was appointed. On his appointment, Mr. Stewart informed him of the extra payments he had received. When he was appointed, extensions at the gas-works were in progress, including the fitting up of a new installation of stoking machinery. In consequence of the illness of Mr. Stewart, the pursuer was asked to act as Consulting and Resident Engineer, which he did. He carried through and supervised the construction of the new stoking machinery, which was completed in April, 1901. The installation was not satisfactory, and proved so extravagant in working that in June the pursuer received instructions from the Gas Committee to do the best he could in the existing circumstances; and he was compelled to resort to hand labour. Mr. Stewart was never at the gas-works after November, 1900; but he was able to do some work in his house till his death in 1906. The pursuer specifies a large number of works which he did for the defenders, of an engineering nature, the fees he considers he is entitled to be paid for which amount to the sum sued for. Such works, he says, are never in practice

performed by a gas manager as such. It is the universal custom in all burghs in Scotland to employ an engineer to do such works; and of this the defenders were well aware. In view of this knowledge, the defenders, being desirous of getting a successor to the pursuer who could undertake and perform the duties of both offices, advertised, in October, 1908, for a Gas Manager "who will require to give his whole time and attention to the duties of the appointment," stating specifically that his salary (which they do not advertise, but ask applicants to say what they expect) "shall include all his work in connection with plans or engineering details with which he may be entrusted." The defenders knew quite well that the works the pursuer was doing were clearly outside the duties of a gas manager; and the pursuer all along expected he would be paid for them, and only undertook them in the belief that he would be paid, as Mr. Stewart was being paid at the time the pursuer took over his (Mr. Stewart's) duties. He frequently mentioned to the Town Clerk and to one of the Gas Committee the claim he would have when the whole extensions were completed, and only delayed making up his claim until the works should be completed. Owing to friction, however, between him and the Committee, he, on Sept. 9 last, was compelled to tender his resignation to the defenders; and on Dec. 24 he rendered the claim for which he now asks payment from the defenders.

Defenders say that the extra payments to Mr. Stewart were in terms of a special agreement entered into with him, and minuted; the designing and engineering of the new gas-works at Inchgreen (estimated to cost a sum not exceeding £50,000) being work of great magnitude and of quite exceptional character. In his letter of application for the post, the pursuer specially referred to his qualifications in the matter of designing, architecture, machine construction, and the carrying on of all departments of gas engineering; and in appointing the pursuer to the office, they relied on his rendering to them, in return for his salary, the services which he professed in his application to be able to perform, and which he offered to them in return for his salary. When he entered upon office, the pursuer took over, in ordinary course, the work of supervising the installation of new machinery. They admit that the installation proved unsatisfactory. Of an installation of generator re-tort-settings which the pursuer introduced into the works, they say that the settings were so faulty that they had to be superseded. The whole of the works in respect of which the pursuer's claim for special remuneration is made were within the ordinary scope of his duties, and were so regarded throughout, both by the pursuer and by them. During the whole period of his tenure of office, he never at any time intimated to them any claim, verbal or written, for special remuneration over and above his official salary, nor did he ever suggest that any part of the work was outside his ordinary duties. No special instructions were ever issued by them to the pursuer for any of the works; and he undertook the same in the ordinary course, without ever suggesting that he was entitled to special remuneration therefor. He regularly took payment of his salary, and granted receipts therefor without any reservation whatever. The defenders never employed the pursuer or agreed, expressly or by implication, to remunerate him in any other capacity than as their salaried Gas Manager. In point of fact, the works for which the pursuer now seeks special remuneration are all of the nature of services which the defenders were entitled to require of the pursuer as their Gas Manager, and are such as are performed without special charge by other persons holding similar appointments in other burghs.

the Company in the process of manufacture. He appears to have only partially done so, and his method seemed to the Directors to be an infringement of a prior patent. It subsequently transpired that the vendors had adopted another process (that of Böhm) in the manufacture of mantles; and the benefit of this process they, at the instance of Mr. F. E. Bodkin, passed on to the Directors. The Company proceeded with the manufacture of the Böhm mantle, but the season's trade had been lost; and, though some of the Directors made considerable advances to assist the Company, the works were ultimately closed on the 8th of January last.

The total number of shares issued for cash was 35,100, of which Mr. Sibthorp took up 30,163; but most of the £16,063 which he paid thereon was, by an arrangement between them, actually found by Mr. F. E. Bodkin. The balance due upon these shares was secured by promissory notes of Mr. Sibthorp for £14,100. On the discovery of the fact that Bruno's mantle could not be manufactured, Mr. Sibthorp commenced an action against the Company for rescission of the contract to take the shares, on the ground that he had been induced to apply for them upon fraudulent misrepresentations. The action was compromised under an agreement dated July 24, 1908, the general effect of which was that the promissory notes should be cancelled, and that the Company should pay £900 to Mr. Sibthorp.

The validity of the last-mentioned agreement is, in the Official Receiver's opinion, open to question, and will have to be inquired into in the liquidation. The Directors who entered into it (Sir C. J. Follett and Mr. F. E. Bodkin) appear to be equally liable for the amount. To the last-named Director 10,000 shares were given for services rendered to the Company in procuring the Böhm patent. They were allotted to him at a meeting of Directors held on July 21, 1908. Under the Articles of Association, a Director may only receive by way of additional remuneration such sum as may be determined in general meeting; and it is probable, therefore, that the gift to Mr. Bodkin was invalid.

The assets of the Company consist of £12 os. 6d. in cash, book debts estimated to produce £1070 19s. 3d., unpaid calls of £2, and the Böhm patent, now valued at £800 and deposited with Mr. H. P. Bodkin on Oct. 14, 1908, to secure advances amounting to £895. Arrangements have been made to keep the patent working pending the possibility of a sale. It is not anticipated that the book debts will be fully realized. The machinery and stock were put up to auction by the Sheriff, under an execution for about £340 for a judgment creditor and rent, shortly before the winding up of the Company; and such goods as were left after satisfying the execution were sold by Mr. F. E. Bodkin for £350. The books of the Company are stated to have been imperfectly kept; and the figures given in the deficiency account are generally estimates only. Creditors returned as partly secured are for loans on security of letters patent £895, and bank overdraft and interest £207 14s. The latter is guaranteed by the Directors only, and is not secured upon the assets of the Company. Preferential creditors are in respect of rates £18 8s. 8d.; salary, £3 10s.; and commission, £39 15s. 9d.

In the opinion of the Official Receiver, the failure of the Company is due to the fact that the original mantle purchased of the Cerofirm Gesellschaft proved to be valueless; and that the Böhm process was not obtained in time to be fully tested as to its commercial value, having regard to the crippled financial position of the Company. Mr. F. E. Bodkin states that the failure is also due, in a measure, to bad management at the works.

FAILURE OF THE BRITISH CEROFIRM COMPANY, LTD.

Report of the Official Receiver.

In the last number of the "JOURNAL," it was briefly reported that the Official Receiver had issued particulars under the failure of the British Cerofirm Company, Limited, which showed gross liabilities amounting to £10,508, of which a sum of £6610 is expected to rank against the estate for dividend, and assets estimated to produce £987; leaving a deficiency of £5623. As regards contributories, the paid-up capital is returned at £110,100, to which has to be added the above-mentioned deficiency; making £115,723. The report and observations of the Official Receiver furnish the following particulars.

The winding-up order was made on the 23rd of February last, upon the petition of a creditor presented to the Court on the 8th of February. The Company was promoted by Mr. H. Sanguinetti, and was registered on May 24, 1907, to acquire and work a patent for the manufacture of incandescent mantles for Great Britain and the British colonies and dependencies (except Canada), and to carry on business as manufacturers of, and dealers in, incandescent gas-mantles. The nominal capital of the Company was £120,000, divided into ordinary shares of £1 each, of which 110,100 have been issued and allotted. The following have acted as Directors of the Company: Sir Charles J. Follett, C.B. (Chairman), and Messrs. F. E. Bodkin, R. T. Glover, Shurmer Sibthorp, Waldemar Bruno (for the Cerofirm Gesellschaft), J. H. Ward, H. P. Bodkin, and R. Freericks. Messrs. Glover, Bruno, Sibthorp, and Freericks resigned before the winding-up of the Company. The qualification of a Director was fixed by the Articles of Association at 500 shares. Sir Charles Follett received 500 fully-paid shares as a present from Mr. Sanguinetti, and Mr. Ward received a like number as a present from Mr. F. E. Bodkin. The vendors were the Cerofirm Gesellschaft, of Berlin, who, under an agreement dated May 14, 1907, agreed to sell the patent and give all necessary information as to the manufacture of the mantle for the sum of £82,500, to be satisfied as to £17,500 in cash, and as to £65,000 by the allotment of 65,000 fully-paid ordinary shares. Of the vendors' shares, 35,000 were transferred to the promoter, who, in addition, received £5000 of the cash consideration. The shares were partly transferred by him to certain Directors—viz., to Mr. Sibthorp 15,000, to Mr. Glover 3453, and to Mr. F. E. Bodkin 1250. The Official Receiver says it will be the duty of the Liquidator to inquire into the circumstances concerning these transfers, and to determine whether the transferees are under any liability in respect thereof.

It was agreed that Bruno, on behalf of the vendors, should instruct

Embezzlement by a Sunderland Gas Collector.

At Sunderland last Wednesday, James Sparling, aged 37, a collector, was charged with embezzling two sums of money belonging to his employers, the Sunderland Gas Company; and he pleaded "Guilty." Mr. J. T. Green, who prosecuted, said prisoner had been employed by the Company as a collector for about six years. Part of his duty was to collect accounts and pay them over to the Chief Cashier daily. Recently there appeared to be large arrears due in the district where prisoner was collecting; and he was asked for an explanation. His excuse was that, owing to the depression in trade, his customers had not paid their accounts; but investigation showed that the prisoner had received the money, and had not paid it in. Only two cases would be taken. As prisoner was in receipt of a salary of £130 a year, he did not see what excuse he had. It was only fair to say, however, that prisoner had given the Company every assistance in the investigation of his deficiencies. Two customers then gave evidence to the effect that they had paid £2 3s. 2d. and £2 5s. to the prisoner. Mr. J. G. Kitts, Chief Cashier to the Company, said prisoner had not paid these moneys over; and the total deficiency was £98 14s. 9d. Prisoner had done his work well with this exception; and the Company had a fidelity bond on his account. Mr. Morton, for the defence, said prisoner had been in his previous situation twelve years, and bore an excellent character. He asked for leniency, especially on account of the prisoner's wife and two infant children. The Bench passed a sentence of four months' imprisonment in the second division.

Charge for Coal Trucks Left on Sidings.—In the "JOURNAL" for the 18th ult. (p. 460), we reported shortly a case in which the Midland Railway Company sought to recover from Messrs. Myers, Rose, and Co., Limited, certain sums arising out of a notice the Company had issued to the effect that after Aug. 1, 1905, they would charge 6d. per day per truck for coal-waggons kept on their "wait order" sidings for more than three days after the day of arrival, pending instructions from coal-factors as to their ultimate destination. The case came before Mr. Justice Channell and a Special Jury, and the latter found the charge reasonable. Judgment was accordingly entered for the Railway Company. We learn from the "Iron and Coal Trades Review," however, that the question will not be allowed to remain where the Jury left it, if there are any possible means by which defendants can procure a reconsideration of the verdict. Application is to be made for a new trial on numerous grounds, chief among which, perhaps, is the exclusion by the learned Judge of evidence which it is believed might have told strongly in favour of the defendants.

MISCELLANEOUS NEWS.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

The Question of Salaries - Price of Gas for Manufacturing Purposes - Organization.

It may be remembered that at the meeting of the Birmingham City Council on the 11th ult. the annual report of the Gas Committee, which contained certain recommendations with regard to the fixing of the salaries of officers, &c., was under consideration. The report was given in the "JOURNAL" for the 4th ult. (p. 320). The recommendation which gave rise to the debate was as follows: "That the maximum salary to be paid to each of the Engineers-in-Charge at the Saltley, Nechells, and Windsor Street works be fixed at £1000 per annum, and that the Committee be authorized from time to time to advance such salaries up to such maximum figure." To this two amendments were submitted—one to defer the further consideration of the proposed increases of salaries until the General Purposes Committee had investigated and reported upon the subject, and the other to omit the words following "£1000 per annum," so as to give the Gas Committee power to fix the maximum salary, but not to advance to the maximum without bringing the matter before the Council. Both amendments, however, were lost, as was also the original motion; and, in the result, the Chairman of the Committee (Sir Hallewell Rogers) said the subject would have to be again considered by them. This has been done, and the following report has been issued for presentation at a special meeting of the Council to be held next Tuesday.

In view of the debate that took place in the Council on the 11th of May last, your Committee have again carefully reviewed this portion of their report. In the course of the debate, the Council did not question the scheme of organization then submitted, but were opposed to the fixing of maximum salaries for the several positions therein mentioned. Your Committee, therefore, again submit the scheme of organization, omitting all reference to the ultimate salary to be paid to the respective officers.

For the convenience of the Council, they outline hereunder the staff changes in May, 1908, and their proposals for the future administration of the Department. On May 28, 1908, a report was presented by your Committee which announced the retirement, on superannuation, of Mr. Henry Hack, the Engineer-in-Chief; and the sanction of the Council was asked to a scheme, as a trial, whereby the Engineers of Saltley, Nechells, Windsor Street, and Swan Village works, having qualified for more responsible positions, should be appointed Engineers-in-Charge of their respective works. In presenting the report, the Chairman indicated that, should the trial prove successful, the Committee would later bring a definite scheme before the Council.

The duties and responsibilities of the Engineers-in-Charge were carefully reviewed and extended by your Committee, and weekly conferences of the chief officials, including the Chief Chemist, were arranged as a means of ensuring concerted action in matters relating to the manufacture and distribution of gas, and of full consideration being given to all proposals for the improvement or extension of plant. The organization thus formed twelve months ago has worked so smoothly and well, that your Committee are unanimous in their opinion that its continuance is in the best interests of the undertaking. It is rendered valuable by the blending of the commercial with the manufacturing forces of the department; and the Corporation is safeguarded on the engineering side under this scheme by the retention and active co-operation of several trained and experienced Engineers.

The principal works of the undertaking are situated at Saltley, Nechells, and Windsor Street; and their magnitude will be appreciated when it is stated that collectively they use nearly 500,000 tons of coal, and 2,500,000 gallons of oil in the production of 6500 million cubic feet of gas per annum. There are five works in all belonging to the department, two of them comparatively small—one at Adderley Street in the city, in charge of a Superintendent, but under the control of the Engineer-in-Charge of the Nechells works; and the other at Swan Village, in the borough of West Bromwich, where manufacture is necessary for the supply of gas required for Wednesbury and Darlaston. As these works are some distance away from Birmingham, your Committee concluded that it was necessary to place them under the control of an Engineer-in-Charge, who would take part in the weekly conferences of the staff, and so enable your Committee to keep closely in touch with both manufacture and distribution in that portion of the area of supply. Each of the Engineers named has proved himself to be assiduous, progressive, and resourceful in all matters pertaining to his profession and in the discharge of his duties.

With regard to the Secretary, from the discussion which took place in the Council in May, 1907, it was apparent that the title of Secretary created an altogether wrong impression of the position held, and the duties performed, by that officer. Your Committee would point out that the office in question is one of great and increasing responsibility. The holder of the position is the chief executive officer of the department, who not merely performs ordinary secretarial duties, but advises the Committee on questions of policy, negotiates and completes the purchase and sale of materials aggregating in value considerably over half-a-million sterling per annum, supervises manufacturing costs and all other charges, and is responsible for the organization and efficiency of the large staff necessary for the conduct of the business.

The present Secretary, Mr. G. Hampton Barber, commenced his duties with the department in February, 1901; and during the intervening eight years your Committee have had the fullest opportunity of proving his business knowledge, powers of organization, devotion to duty, and capacity for work. The outcome of his labours is shown in the development of the undertaking; and the financial results during his term of office are set out in the statistics published with the annual

statement of accounts. Your Committee recommend that Mr. G. Hampton Barber be appointed Secretary and Manager of the undertaking, and his salary increased from £1400 to £1600 per annum.

Your Committee further recommend that the appointment of the Engineers-in-Charge of the respective works be confirmed, and that the following increases of salary be granted:—

		Per Annum.
Mr. J. Foster.	Windsor Street works	From £650 to £700
Mr. W. Chaney.	Nechells and Adderley Street works	£625 to £700
Mr. F. J. Bywater	Saltley works	£425 to £600
Mr. T. H. Hack.	Swan Village works	£375 to £400

The foregoing increases to date as from the 1st inst.

The aggregate salaries of the Secretary, Engineers, Engineers-in-Charge, and Works Superintendents during the past ten years (1900 to 1909) are as follows: £5280, £5400, £5275, £4475, £4650, £4675, £4900, £5355, £5805, £4740. The quantity of gas sold has increased from 5700 million cubic feet in 1901 to 7000 millions in 1909; while the present increases recommended herein will only bring up the total to be paid to £5265, or less than was paid ten years ago.

Gas Used in Manufacturing Processes other than for Motive Power.

With reference to the memorial of the Birmingham Chamber of Commerce, in which the memorialists pray "for a reduction in the price of gas for heating irons and stoves in the operations of industry," your Committee report that they have for some considerable time had under consideration the question of the charges for gas used for manufacturing purposes.

Owing to the competition from producer gas now being experienced, it is necessary that town gas used for manufacturing purposes should be supplied at the lowest possible price; and it is important that the supply of gas for such purposes should, as far as possible, be retained by the Gas Department. It is difficult to estimate with any degree of accuracy the quantity of gas used for heating purposes in the various processes of manufacture within the area of supply; but it is very considerable, and, from careful calculation, it is anticipated that a concession of 1d. per 1000 cubic feet on the gas so used will represent a reduced charge to manufacturers of fully £5000 per annum.

Your Committee are of opinion that, having regard to the competition before mentioned, to the present favourable prices of coal and oil, and to economies that are being effected in the manufacture of gas, a reduction of 3d. per 1000 cubic feet may safely be made from the current lighting rates on all gas used in manufacture for heating purposes other than cooking; and they therefore recommend that, as from the next Michaelmas quarterly reading of the meters, the price of gas used for heating purposes as under shall be reduced 3d. per 1000 cubic feet off current lighting rates—viz., for japanning and lacquering stoves, mufles and furnaces, stills and plating-vats, blow-pipes and soldering-irons, ironing and pressing, and for other like purposes as may from time to time be approved by the Gas Committee.

If the recommendation of your Committee is accepted by the Council, regulations for the supply and registration of such gas will be drawn up; but it may be mentioned that manufacturers who purpose taking advantage of the present proposals will be required to provide, at their own cost, a separate service-pipe from the special meter required to register such gas to the point or points at which the gas is to be consumed, and that no gas for lighting or for purposes other than those scheduled or agreed to by your Committee must be taken from such special service-pipe. Otherwise the whole of the gas so registered will be charged for at ordinary lighting rates.

In the course of comments on the portion of the report referring to the question of salaries, the "Birmingham Gazette" says: "It will be seen from this report that the Gas Committee, in deference to the debate in the Council on May 11 last, omit all reference to the ultimate salary to be paid to their respective officers. The concession, of course, deliberately ignores a principle in municipal administration which deserves to be considered upon its merits and then either adopted or rejected. To keep so important a principle in a state of suspended animation is not pursuing an enlightened policy." The "Birmingham Daily Post" remarks: "The more the figures relating to the Gas Department are examined, the more apparent is the very able direction which has been brought to bear upon the business; and the Committee are entitled to look for a more than ordinary measure of confidence on the part of the Council in respect to the recommendations which they submit."

GAS DISCOUNTS AT BELFAST.

At the Quarterly Meeting of the Council of the County Borough of Belfast, the proceedings at which were reported in the "JOURNAL" for May 11 (p. 397), a proposition by the Gas Committee to allow increased discounts was referred back to them for further consideration. At the monthly meeting last Tuesday, the Committee again brought forward practically the same recommendation—namely, "That, in order to equalize the rate of discount over all consumers who use gas through ordinary meters, the discount of 15 per cent. at present allowed to consumers using up to and including 400,000 cubic feet per quarter on the same premises be increased to 20 per cent., thus making a discount of 20 per cent. on all accounts for gas consumed quarterly on the same premises through ordinary meters if paid in the gas office within one month from date of furnishing account."

Mr. J. A. Doran, the Chairman of the Gas Committee, in moving the adoption of the minutes containing the proposal, said that since the question was before the Corporation last month, there had been a decision of the House of Lords which had induced those members of the Committee who were opposed to the increase to change their minds and fall into line with those of them who were favourable to the bigger discount being granted; so that now they, as a Committee, were unanimous on the subject, and hoped that there would be no further opposition from the other members of the Council. The House of Lords' decision suggested that 1 per cent. on the outstanding capital might be

contributed towards the rates; but he thought they would try to do better than this. He was of opinion that they should continue to pay the dividends and sinking fund on stock issued for the erection of the new City Hall. This would amount to over £12,000 per annum, and would be between 3 and 4 per cent. on outstanding liabilities. If this could be done after they had provided a sufficient sum for depreciation and reserve fund for themselves, he was quite sure it would be appreciated by the ratepayers, as it would save them about 2½d. in the pound on the rates, and would, besides, be paying for the new City Hall entirely out of the gas profits. The decision of the House of Lords Committee to which he had alluded was of a somewhat sensational character. A Bill was promoted by the Salford Corporation; its main proposals being to raise £250,000 of additional capital, and to reduce the illuminating power from 17 to 14 candles. The Committee decided that the Corporation must not allocate to rate relief in any one year more than 1 per cent. on the outstanding debt of the undertaking. During the ten years ending March, 1908, the Salford gas undertaking paid in relief of rates from profits an average of £24,148 per annum, or 2·82 per cent. of the capital employed. The decision of the Lords Committee would reduce the amount that could be so applied by nearly two-thirds; and the Salford Corporation had taken so serious a view of the decision that they were thinking of withdrawing the Bill before it reached the House of Commons. If they accepted the clause, the Corporation would be thrown back upon utilizing the gas profits to duce the price to consumers. It was a curious thing that at Widnes, where this condition was already incorporated in a Local Act, the gas manufactured and supplied by the Corporation was the cheapest in the world. Widnes people testified that the observance of the rule had resulted in an enormous development of the use of gas—a development which could not have taken place if charges had been made that produced big profits for rate relief. Some time ago he (Mr. Doran) was laughed at when he said they ought to be able to reduce the charge in Belfast to 1s. per 1000 feet; but at Widnes they were supplying gas at this price, and he did not see why they could not do the same in Belfast. However, the Committee were not proposing to do this now. They only asked the Corporation to agree to a further increase in the discount of 5 per cent., which would mean from £6000 to £7000 a year. There was a sad matter to mention. About two months ago, they appointed as Gas Engineering Assistant, Mr. James Browne, a candidate from the South of England. While in their employ, he caught a cold, which developed into pneumonia, and caused his death.

Mr. Squire, in seconding, said he had objected to the increased discount when brought forward before; but circumstances had since been considerably altered owing to the decision of the House of Lords Committee. He was entirely in favour of the payment of interest and sinking fund on the City Hall being continued out of the gas funds, if the House of Lords permitted them to do so—which, however, he doubted. But they could not continue to do as they had been doing in allocating large sums to the relief of the rates. Of course, if they were not going to the House of Lords, they might continue to go on as they had been doing; but they were bound to go there in connection with the new gas-works, and it was absolutely necessary for them to meet the circumstances raised by the Lords' decision in the Salford case. The increased discount would mean a sum of £7000 a year; and this must be taken as given to the relief of the rates. They would not be allowed, any more than Salford, to allocate more than the 1 per cent. upon the capital; and they would also probably be limited in connection with the reserve fund. The whole tendency of thought, in fact, at the present time was that profits from municipal gas undertakings should go to the consumers. If he felt that they could help themselves, he would oppose this extra discount; feeling it was dangerous to tie them up so tight, just as they were going to undertake a new gas scheme which would not be very productive at first. It was unfortunate they should be compelled to sail so close to the wind. There was an opinion abroad that the gas-works were a mine of wealth. This was not so. He had gone into the question of profits for the last eight years. During that period they had made an average profit of £29,000 a year; ranging from a minimum of £5000 to a maximum of £45,000. As a matter of fact, the total of their average profit was only 5 per cent. upon their capital—by no means an extravagant amount.

Mr. Curley moved, as an amendment, that the minutes be passed omitting any reference to an increase in the discounts.

Mr. Johnston, in seconding, said he could not understand the attitude of Mr. Squire. He could not see why, because the House of Lords Committee had refused their consent to another Corporation's Bill, they in Belfast should take fright, and say that the House of Lords would do the same thing to them. The rates would be high enough, and they would require all the relief that could be given.

The amendment was lost—6 voting for it and 25 against; and the minutes were then passed.

A Good Year at Lincoln.—Referring to the operations of the gas undertaking during the past financial year, Alderman Wallis, the Chairman of the Gas Committee, told the members of the Lincoln City Council that he did not think they had ever had a better year; and the Committee had to thank the Manager (Mr. John Carter) and staff for the success obtained. It was a very great pleasure to work with them. The Committee had paid £3000 out of the profits to the district rate. During the present year they would be spending a large sum on new purifiers and on retort-house extensions.

Ratepayers' Claims in Respect of the Bermondsey Gas Explosion.—The Valuation Committee of the Bermondsey Borough Council have notified their willingness to receive a deputation of ratepayers from the vicinity of Grange Road and Crimscoth Street, where the gas explosion took place at the close of last year. Several ratepayers have written to the Council asking for a rebate of rates in consequence of the alleged serious financial loss they have sustained through the road being closed for repairs. The Committee have informed the applicants that they are unable to find that the Council have power to remit any portion of the rate, and that any financial loss which they have suffered must be recovered from the party who is responsible for the explosion.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

The Past Year's Working—Increased Profits.

The Annual Report of the Gas Committee of the Nottingham Corporation was issued last week, and it was to come before the City Council yesterday. The following are the salient features of the report.

The quantity of gas sold during the year ended the 31st of March was 1,980,416,700 cubic feet, compared with 1,995,780,900 cubic feet the previous year; being a decrease of 15,364,200 cubic feet. The total income amounted to £333,686, and the total expenditure to £226,746; leaving a balance of £106,940 carried to the profit and loss account. After deducting the interest on capital and sinking funds, and placing £2000 to depreciation of stoves, there is a net profit of £50,656 at the disposal of the Council, compared with £50,317 this time last year. The Committee recommend that £31,000 should be handed over to the Finance Committee in aid of the general district rate, and that the balance of £19,656 should be disposed of as follows: £3000 to be carried to the depreciation fund, £10,000 to the reserve fund, and £6656 to the renewals account.

The Committee express regret that during the year the market values of all residuals were adversely affected, in sympathy with the general depression in trade. Compared with the preceding year, the income from tar, sulphate of ammonia, coke and breeze, &c., showed a diminution of £8713. The increase in the rate of pay granted to almost every grade of employee, which came into force at the beginning of the financial year, cost the Gas Department a considerable sum. On the other hand, there was a substantial increase in the quantity of gas made per ton of coal carbonized; and the unaccounted-for gas shows a considerable improvement. These two factors are stated to be largely responsible for the increased profit, which is the largest on record.

Considerable sums were spent during the year in maintaining the works in an efficient state of repair. At the Eastcroft works, a large portion of the carbonizing plant was entirely rebuilt, and a new electric coke-conveyer installed. New bath-rooms and mess-rooms were built for the workmen employed on the works. The show-rooms at the Woodborough Road stores were entirely reorganized, and arrangements made with the leading gas apparatus manufacturers for a permanent exhibition of the latest and most up-to-date appliances. The £10,000 allocated in last year's account for the new retort-house at the Radford works has not yet been appropriated.

The Committee call the attention of the Council to the fact that in several German and Continental gas-works many great improvements have been made in carbonizing processes during the last two or three years; and they therefore decided that, before embarking upon any large expenditure, full inquiries should be instituted as to these new and improved systems of carbonizing and purification. Accordingly, the Chairman and Engineer were instructed to inspect and report upon several of the newest and most successful systems. New large gas-works where installations of the latest plant had recently been erected were inspected at Vienna, Königsberg, Zurich, Berlin, Mariendorf, Bochum, Potsdam, Paris, Amsterdam, Rotterdam, &c. After careful inspection and examination of the results submitted by the Engineers of the various works, it appears to the Committee that the German system of carbonization in vertical retorts is by far the most successful and economical method for the production of coal gas. Unfortunately, by this system, considerable difficulty is experienced in producing gas of sufficiently high illuminating power to comply with the standard to which the Committee are now working. Where, however, incandescent gas-burners are generally in use, the gas is quite adequate to meet all requirements; and in almost every large Continental city where enlargements had recently taken place in the gas-works plant, vertical retorts were found in operation. The heating value of the gas is quite equal to that produced by horizontal or inclined retorts.

The Committee also made an inspection of more recent installations of the system of producing gas in large coke-ovens at Vienna, Bochum, and Rotterdam, by which coal is carbonized in large bulk charges of 7½ tons each, and a coke is produced of a quality far superior to that obtained by ordinary gas-works processes. The patentees of this plant are prepared to guarantee results, both with regard to illuminating power and the quantity of gas produced per ton of coal, which are quite satisfactory to the Committee; and should their guarantees not be fully complied with, they are prepared to remove the whole of the plant at their own expense. They will also undertake that the whole of the plant, material, &c., shall be of British manufacture. The Committee are strongly of opinion that a small plant of this type, to produce 750,000 cubic feet of gas per day, should be erected at the Radford works at a cost of about £13,000.

Inspection was also made by the Committee of a system for the purification of gas which was installed at the Königsberg Municipal Gas-Works. It is confidently anticipated that this process, when perfected, will completely revolutionize existing methods of gas purification; but at present the Committee are not prepared to recommend its adoption in Nottingham.

In conclusion, the Committee express the hope that in the near future advantage will be taken of the new Bulwell Hall Estate for the concentration of the whole of the gas-works plant and apparatus on one site; for it is anticipated that by this arrangement they will eventually be able to make a substantial reduction in the cost of gas manufacture. They are of opinion that some reduction should be made in the price charged for gas supplied through prepayment meters; and they therefore propose to make a rebate of 1d. in the shilling on all money collected from these meters after the 25th of September next.

Appended to the Committee's report is that of the Engineer and General Manager (Mr. J. H. Brown) on the works and manufacturing operations, &c., last year. It contained the following particulars.

The plant, buildings, &c., and the machinery generally, are in a good and efficient state of repair; the amount spent on the annual repairs and maintenance of works being £37,691, compared with £36,009 for the year 1907-8. The reconstruction of the carbonizing plant in the electrically operated retort-house at Eastcroft was completed during

last autumn; and it was in continuous operation throughout the past winter, with satisfactory results. The whole of the new plant in this house is now complete, with the exception of a small portion of the coke-screening plant. Mr. Brown says this new carbonizing plant is an improvement on previous installations, and has considerably reduced the amount of arduous work and materially improved the conditions of labour in this retort-house.

At Basford, the carbonizing plant continues to give improving results. Owing to the increased yield obtained per ton of coal carbonized, it was for the first time not necessary to put into operation the older plant in the No. 1 and No. 2 retort-houses. The compressed air stoking-machines and coke handling and conveying plant, &c., operating No. 3 retort-house have been maintained in efficient working condition. The carburetted oil-gas plant was again found to be of considerable assistance in meeting sudden demands from fogs or other causes, though it was used to a less extent than the previous year.

The carbonizing results, which have gradually improved from year to year, again show record figures. During the past year, 186,374 tons of coal and 54,775 gallons of oil were carbonized, yielding 2,085,306,000 cubic feet of gas, or equivalent to a production of 11,123 cubic feet per ton of coal, against the previous highest make of 10,870 cubic feet for 1907. The gas sold per ton of coal increased from 10,240 cubic feet in 1907-8 to 10,564 cubic feet last year. This is by far the highest figure in the history of the undertaking, and is 1418 cubic feet more than the quantity of gas sold per ton of coal carbonized for the year 1902. The improvement represents a saving on the past year's figures, compared with 1902, equivalent to 29,065 tons of coal. The carbonizing cost per 1000 cubic feet of gas sold was reduced from 2'7d. in 1907-8 to 2'39d. in 1908-9; this figure again establishing a new record.

In the distribution department, special difficulty was experienced with breakages of mains, due to subsidences and other similar causes. A considerable amount of money has been spent in searching for leakages, and making good broken mains. A very satisfactory reduction has been shown in the amount of unaccounted-for gas—from 5'36 per cent. to 5'03 per cent.—again the lowest figure on record.

The chemical works and plant were maintained in efficient working order during the year. The sulphuric acid plant continues to give very satisfactory results; 2157 tons of acid having been made from spent purifying material produced on the three gas-works. The sulphate of ammonia plant at Basford deals with the whole of the ammoniacal liquor produced at the gas-works, though it is being operated at considerably above its normal capacity. Unfortunately, in spite of improved working results, the great reduction in the market values of all chemicals, which have fallen in sympathy with the general trade depression throughout the world, has materially reduced the income from residuals; one product—carbolic acid—having fallen 40 per cent. in value during the past twelve months. The return from coke, which showed great improvement during the year 1906-7, has fallen from £40,395 in 1908, to £37,564 in the past year. Owing to the reduction in the market value of sulphate of ammonia, the receipts are down from £18,649 to £16,580. The total receipts for residuals for the year are therefore less by £8714.

The rate of wages paid to almost every grade of workman was advanced very considerably at the commencement of the year under review. This increase has been felt most in the carbonizing and distribution departments. The coal cost the department £95,018, against £98,446 in 1907-8. This reduction (£3428) is due to the smaller quantity carbonized owing to the higher yield of gas obtained per ton. The reduction in the receipts from residuals, which was foreshadowed in Mr. Brown's preceding report, considerably more than counterbalances the saving effected in coal. There are, however, he says, indications of some slight improvement in the value of chemicals during the coming season; and it is confidently anticipated that a saving will be effected in the purchase of coal required for the coming year. Mr. Brown thinks it probable that the new tax on petrol will again bring into extended use benzol for the propulsion of motor vehicles, which would have a beneficial effect on the market values of the products made at the Giltbrook chemical works; and the proposals for the tar painting of main roads will remove a considerable quantity of this material from the chemical trade, and favourably affect market values.

In spite of an increase in the total number of consumers, the consumption of gas shows a decrease of 15,364,200 cubic feet, owing to the depression in trade, the very mild winter, and the almost phenomenal absence of fog. This decrease was undoubtedly accentuated, Mr. Brown says, by the extended use of incandescent gas-burners, and by the removal to Coventry of one of the large local cycle company's works. The saving effected by the adoption of incandescent gas-burners in the public lamps is shown by the following figures.

Year.	No. of Lamps.	Total Consumption of Gas.
1902	5787	115,026,500 cubic feet.
1909	7222	88,134,800 " "

The amount of gross profit realized by the gas undertaking has risen from £75,907 in 1902 to £106,940 last year.

The prepayment meters in use continue to increase in proportion to the total number of consumers; being 43 73 per cent. in the past year, compared with 41'48 per cent. in 1907-8. This increase has again raised the average price per 1000 cubic feet of gas from 2s. 6'27d. to 2s. 6'4d. Deducting the extra amount charged for rent for slot meters and cookers supplied to these consumers, the average price obtained per 1000 cubic feet of gas sold is 2s. 4'62d.

The following statement of working results will show the development of the gas undertaking since 1902:—

	1902.	1908.	1909.
Coals carbonized (tons)	196,681	194,890	187,469
Gas sold (thousands)	1,798,779	1,995,781	1,980,417
Do. per ton of coal	9,146	10,240	10,564
Average price of gas	2s. 8'93d.	2s. 6'27d.	2s. 6'4d.
Gross profit.	£75,907	£106,250	£106,940
Interest and sinking-fund charges, &c.	50,891	53,933	54,284
Net profit	£25,016	£52,317	£52,656
In aid of rates	24,516	30,000	—

The concluding portion of the report relates to the distribution department. It shows that the total mileage of mains is 377'49—an increase of 6'78 miles during the year. The number of meters fixed to the 31st of March (including 465 lamp meters) was 72,506; being an addition of 2960. Of these, 69,739 belong to the Gas Department and 2767 to the consumers. The demand continues for prepayment meters; and at the end of the financial year, 31,711 of them were in operation—an increase of 2853. There were 3037 new services laid in the past year, compared with 3350 before. Mr. Brown says the application of gas for trade and domestic purposes other than lighting continues to increase. There are in use about 29,408 cooking-stoves, 14,183 gas-fires, and 688 gas-engines, besides a large number of other appliances of almost every description which have not been numbered. Of the 29,408 cookers in use, 9626 are rented from the department, and 19,080 are supplied with the automatic meter rent free.

Appended to the report is a table showing the comparative workings per ton of coal and per 1000 cubic feet of gas sold for the past and the preceding year; and this is followed by the accounts of the Gas Department in the usual form.

ST. HELENS GAS UNDERTAKING.

The Past Year's Results.

It was stated in the "JOURNAL" for the 18th ult. (p. 462) that the St. Helens Gas Committee had had before them the results of the working of the gas undertaking for the year to March 31, and that, after providing for interest, sinking fund, and other charges, the net profit amounted to slightly over £9100. Out of this sum, the Committee decided to vote £5000 to the borough fund in relief of the rates. The report of the Committee on the past year's operations of the department was submitted to the Town Council last Wednesday, when the Council, through the Mayor, expressed great satisfaction at the results.

Dealing first with the public lighting, the Committee remarked that the year under review was one of considerable activity in this direction. The lighting arrangements had been carefully revised by them from time to time, including the improved lighting of Victoria Square, without increasing the lighting rate. The incandescent system had been extended to 166 lamps, giving a total of 886 lamps so fitted. There were 68 additional lamps erected in various parts of the borough; making the total number now lighted 2082. The report continued: "The amount provided in the estimate was found barely sufficient. The Committee, however, are pleased to be able to extend the incandescent system to several parts of the borough (while levying the same lighting rate for the current year), making extended use for this purpose of the new combination of inverted light devised by the Engineer (Mr. Samuel Glover), the lanterns for which are being manufactured in the town."

The total quantity of gas made during the year was 465,252,060 cubic feet—an increase of 4,387,760 cubic feet, or 0'95 per cent., over the previous year. The unaccounted-for gas amounted to 3'3 per cent., which the Committee pointed out was a very low figure considering that the whole district was so much disturbed by mining operations. The total amount of fuel used in the manufacture of gas (including coal, cannel, and oil) was 46,542 tons; and the illuminating power of the gas supplied was equal to 17'79 standard candles. There were 663 consumers' meters added during the year, which brought the total number now at work up to 16,310. Close upon 3½ miles of gas-mains and 764 service-pipes were laid in the twelve months; and 772 cooking-stoves, &c., were fixed—bringing the total number of stoves of all kinds in use up to 14,210. The quantity of gas used in engines was 23,535,000 cubic feet; the number of engines now at work being 124, amounting to a total horse power of about 1759. The capital account is £334,221, of which £196,622 has been repaid, leaving a present debt on capital account of £137,599.

The net income from gas sold was £47,102; while the sum collected from coin-meters was £21,708 1s. 6d.—equal to 46 tons weight of copper, and 5,148,443 coins. The income from bye-products was £21,639 net, which the Committee said they believed to be the highest percentage of income recovered from bye-products in the country—being more than the cost of coal and oil for enrichment. The total wages paid by the department during the year were £16,685.

After referring to the net profit (already noticed), the Committee went on to say: "During the year, the process for the removal of naphthalene from the gas continued to work successfully; the trouble to both consumer and supplier (which used to be very great) having been entirely removed. During the period under review, the new method of carbonizing coals in vertical retorts (which our Engineer, in conjunction with West's Gas Improvement Company, has introduced by arrangement with the Committee) has been worked for a considerable time; and the Committee have taken great interest in the development of the new system, and have had it officially tested on behalf of the Corporation by a competent London expert, who has reported very favourably of the system and the way in which it is worked. This new system of setting retorts is likely to prove of particular value to the Gas Estate, as it is the only hope we have of being able to increase the production of gas at the old works; and our Engineer is to be congratulated upon having taken another important step in advance."

Opposition to the Coatbridge Gas Order.—As mentioned in our "Parliamentary Intelligence" last week, a petition of the Provost, Magistrates, and Town Councillors of Coatbridge has been presented to the House of Lords, praying them to set aside the Gas Company's Order as settled by the Board of Trade. Besides objecting to the lowering of the illuminating standard and to the new system of testing, the Council are desirous of introducing a clause making it possible to test the calorific value as well as the candle power of the gas, and penalizing the Company under certain circumstances. They also require the Company to write-back to their profit and loss account certain sums in the reserve fund.

BOLTON CORPORATION GAS UNDERTAKING.

Report and Accounts of the Gas and Lighting Committee.

The Gas and Lighting Committee of the Bolton Corporation have submitted to the Town Council their report and accounts for the year ended the 31st of March. In the former, they state that during the year the rebuilding of the retort-house at the Lum Street works, to which reference was made in their preceding annual report, was completed; and they add that in the near future the costly work of altering the retort-benches into the regenerative system of firing, and providing stoking machinery, will be imperative. A new purifying-house and new condensers will also have to be erected in order to keep pace with the latest improvements and cheapen the cost of gas manufacture.

The Committee submit the following statistics of working for the past and the preceding year:—

	1909.	1908.
Coal and cannel carbonized, tons	94,802 ..	99,635
Average cost per ton	11s. 7d. ..	11s. 2½d.
Percentage of cannel used	1'02 ..	1'33
Gas made, thousand cubic feet	970,577 ..	1,022,493
" " per ton of coal carbonized	10,238 ..	10,262
Gas accounted for, cubic feet per ton	9,700 ..	9,716
Gas unaccounted for, per cent.	5'25 ..	5'32
Maximum quantity of gas supplied in 24 hours during the year, cubic feet	6,047,000 ..	5,714,000
Minimum quantity supplied, ditto	797,000 ..	879,000

The accounts accompanying the report show that the sale of gas produced £112,367; residuals, £38,135; the revenue from the gas-fittings trade was £1163; and cottage rents and the receipts from the electricity and fittings departments brought up the total to £152,877, compared with £160,568 in the year 1907-8. The expenditure on the manufacture of gas was £80,896; on distribution, £9936; on management, £2055; and the total expenses were £102,479, against £103,973. The amount carried to the net revenue account is £50,398, compared with £56,595. The net result of the year's working has been to secure a disposable balance of £24,844, out of which the Committee have voted £17,500 in aid of the district rates, and carried the balance of £7344 to the credit of the reserve fund account.

Since the transfer of the gas-works to the Corporation in 1873, there has been made a total gross profit of £1,766,301, which has been disposed of as follows: Annuities, £404,686; interest on loan debt, £151,049; dividend on stock (since 1886), £212,584; sinking fund, £79,238; reserve fund, £387,168; voted in aid of rates, £531,576.

MARKET HARBOROUGH GAS UNDERTAKING.

Annual Report of the Manager—Reduction in Price.

At the Meeting of the Market Harborough Urban District Council last Tuesday, the report of the Gas Engineer and Manager (Mr. A. T. Harris) for the past financial year was presented. It showed that the balance of £1565 on the capital account had been spent in the erection of new carbonizing plant, coke-breaking machinery, &c.; so that the whole of the £49,000 borrowed in respect of the undertaking has been expended. The revenue for the year was £9131, the expenditure £6388; leaving a gross profit of £2743. Deducting the interest on loans and the payment into the sinking fund, amounting together to £2101, there was left a net profit of £642. The balance on the profit and loss account at the close of the year was £2607—an increase of £482, after allocating £160 to the district rate. Coal cost £3417; being £105 more than in the year 1907-8. This was due to the increased quantity of gas produced. The make per ton of coal carbonized was 11,567 cubic feet. The quantity of gas made was 51,174,000 cubic feet—an increase of 1,548,000 cubic feet; and the sales per consumers' meters and public lamps amounted to 47,202,000 cubic feet—an increase of 1,435,900 cubic feet. The net receipts from private consumers were £6441—an increase of £103; and the income from prepayment meters showed a rise of £242 during the year. The total receipts from this source were £1546; while the income from ordinary meters showed a decrease of £139, due to a slightly lower consumption and a reduction in price of 1d. per 1000 cubic feet in the two winter quarters. The net receipts from the sale of residual products amounted to £1967, or £80 less than before, owing to the lower price obtained for coke, tar, and sulphate of ammonia. The number of ordinary meters in use at the close of the year was 766, and of prepayment meters 574—together, 1340; while the number of cookers was 764. Mr. Harris concluded his report by saying that, having regard to the heavy charges incurred in maintaining the works and plant in a proper state of efficiency, together with the lower prices realized for residuals, the financial results of the past year's working compared favourably with those of former years.

In moving the adoption of the report, the Chairman of the Gas Committee (Mr. G. G. Gardiner) expressed his pleasure at being able to lay before the Council a satisfactory record of the past year's working. Briefly, the net result was that, after payment of interest on loans and repayment of principal, amounting to £2101, and transferring £160 to the relief of the rates, the financial position had improved during the year to the extent of £482. Having regard to the lower average prices realized for residuals, and a portion of the coal having been purchased at the previous year's high price, together with a reduction of 1d. per 1000 feet in the price of gas in September, it was a matter of congratulation that the profits had been so well maintained; being only £26 less than last year. Although during the year the department lost one large consumer through the Midland Tannery Company's works being closed, the increase in the consumption of gas had been well maintained, which was not the general experience in most towns. He said it was a source of satisfaction to the Committee to be able to announce a further reduction of 2d. per 1000 cubic feet; making a total of 3d. within the year, and representing a concession of £440 to the consumers. This

would make the net prices 2s. 4d. to a fraction over 2s. 9d. per 1000 cubic feet to ordinary consumers, according to quantity consumed, and an all-round flat-rate of 1s. 9½d. for all gas employed for power and industrial purposes. Having regard to the long distance the works were situated from the gas coalfields, he ventured to remark that these prices compared very favourably with those of any town of a similar size in the country, more especially taking into account the heavy standing charges to meet interest and the repayment of loans, which amounted practically to 1s. per 1000 cubic feet of gas sold. The year had been an anxious one, especially to the Manager, as the erection and working of the new semi-vertical (45°) retorts required a considerable amount of time and attention, and caused anxiety as to the results. Though the productive capacity of the plant had not quite reached anticipations, the make of gas per ton of coal carbonized with this particular setting had been quite satisfactory, and had undoubtedly been a contributing factor to the success of the past year's working. As the result of the experience gained during the past winter, further improvements would shortly be made, which it was expected would increase the efficiency of and economy in production realized by the system. It was gratifying to him personally, as Chairman of the Gas Committee since the undertaking was acquired, to present for the tenth successive year a favourable report, and to be able again to recommend some tangible advantage to the consumers. It might be interesting to state that during the ownership of the works by the Council the make of gas had increased from 31 million cubic feet per annum to 51 millions; also that during this time the average price had, with the reduction now recommended, been reduced 4d. per 1000 cubic feet to ordinary consumers, 1s. per 1000 cubic feet for power and other industrial purposes, while a corresponding reduction in the price charged per lamp for the public lighting had also been made, and the lighting of the district vastly improved. In conclusion, Mr. Gardiner tendered, on behalf of the Committee and himself, their heartfelt thanks, first to the Manager, who had worked so hard to attain the present position, and then to the staff and the whole of the workmen, for the excellent results obtained.

The Chairman of the Council (Mr. Sharman Goward) said it was a matter for congratulation to the Council and to the whole district that the gas-works were in such a flourishing state; and he should like to add his congratulations to Mr. Gardiner, to the Committee, and to the Manager on the good results shown. He considered them excellent. The report was adopted.

NEWBURY CORPORATION GAS UNDERTAKING.

The report and accounts of the Newbury gas undertaking for the past year, which have been submitted to the Town Council, show that the total sum owing at the end of March was £33,610. Loans paid off totalled £5482. The receipts for the year amounted to £12,708, and the expenditure to £9869; leaving a balance to profit and loss account of £2839. After deducting sinking fund instalments, interest on mortgages, and other charges, there was a surplus on the year's working of £529. This was more than absorbed by charging the profit and loss account with extensions of mains, services, and fittings, and stoves fixed. During the year 6141 tons of coal were carbonized; and the total quantity of gas made was 65,025,000 cubic feet, of which 2,613,400 cubic feet were unaccounted for. Expenditure on repairs and maintenance cost £1043; £238 had been spent on stoves let out on hire; while new mains, meters, and prepayment meter fittings had cost £482.

In moving the adoption of the report, Alderman Smith said the Gas Committee felt that the undertaking was going steadily on in its output; but the area of the town was extending, and the expenses of supply increased. The quantity of gas unaccounted for was rather more than last year; but there were good reasons for this, and 4 per cent. in loss was fair and justifiable. There was very little variation in the revenue account. Their profits were less by £650; but this was explained by their having to pay £450 more for coal, £230 for overhauling the boilers, and other extra work, absorbing some £759 altogether. The surplus of £529 had been utilized in paying for extended mains and other improvements, rather than borrowing further money for the work. The Committee, who were thoroughly satisfied with the report, felt that the undertaking had reached its limit in the direction of relieving the rates, and hoped the Council would agree to the principle that in future profits should be devoted to meeting current expenses. He thought that with gas at 2s. 10d. per 1000 cubic feet, and discounts which amounted in the course of a year to nearly £600, there was little to complain of.

Mr. Stradling said he could not agree that the accounts were satisfactory, and added that the balance-sheet was stamped with the imprint "No progress." The report was, however, passed, with only one or two dissentients.

THE PAST YEAR AT LANCASTER.

Mr. Armitage's Report.

Mr. Charles Armitage, the Engineer and Manager of the Lancaster Corporation Gas-Works, in his report on the operations for the year to March 25, says that the total receipts, including bank interest, less commission, were £28,875, and the expenditure, £19,879; leaving a gross profit of £8996. This sum has been disposed of as follows: Interest on stock and mortgages, £3559; redemption fund, £1814; income-tax, £589; borough fund, £2000; reserve fund, £1034. The reserve fund now amounts to £12,046. A sum of £1814 has been added to the redemption fund, making, with interest accrued, £34,054. Nothing has been added to capital account during the past year; but the sum of £1556, cost of new mains, services, meters, and prepayment stoves, has been charged direct to revenue account. The receipts for gas through ordinary meters were £14,351—a decrease of £844. Of this, £687 is due to the reduction in price, and £157 to decreased consumption. This decrease, no doubt, has been caused by many consumers

adopting incandescent lighting, which gives greatly increased illumination for a smaller consumption. Of prepayment meters, 3003 have been fixed up to date; and the receipts for the past year amounted to £4623—a decrease of £5, notwithstanding an increase in consumption of 3,080,646 cubic feet. To the public lamps, 16,636,766 cubic feet of gas were supplied free of charge. This is equal to a sum (at 1s. 11d. per 1000 cubic feet net) of £1594. The average price received per 1000 cubic feet of gas sold was 1s. 10.41d. The low net cost of gas—viz., 10.72d. per 1000 feet sold—will compare favourably with any works in the United Kingdom, and can only be equalled by a very few works which are more favourably situated for the purchase of coal and sale of coke. The average cost of coal (slack) was 11s. 8.79d. per ton, against 12s. 4.98d. the preceding year. Coke contributed in return 5s. 8.87d., and products from tar and ammoniacal liquor 3s. 2.70d., making a return for residual products of 8s. 11.57d. per ton of coal carbonized, or 76.40 per cent. on the cost of coal. Products had not maintained their prices since his last report, but had a steady tendency at present. The working statement, concludes Mr. Armitage, shows that the total quantity of gas sold and used at the works and offices during the last twelve months was 205,496,534 cubic feet, an increase of 1,674,471 cubic feet, or 0.82 per cent. Referring to the remarks in his last report regarding extensions to the carbonizing plant, he says he has delayed formulating a plan, as the consumption of gas is practically stationary at present. This matter will, however, require consideration in the near future.

The working statement shows that the coal (slack) carbonized was 20,195 tons; the make of gas per ton was 10,451 cubic feet; and the illuminating power supplied was 16.32 candles. The unaccounted-for gas was 2.64 per cent. The coke made was 13 cwt. per ton of coal; and of this 88.14 per cent. was available for sale, 11.86 per cent. being used for fuel.

WEST BROMWICH GAS UNDERTAKING.

At the Meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Alderman J. E. Wilson) referred to the accounts of the Gas Department for the past financial year, as presented by Mr. Hudson, the Borough Treasurer and Secretary to the Gas Committee (see *ante*, p. 592). He said he thought the reduction of £836 in the gross profit required some explanation. They had had to bear increased prices of coal during the last two or three years, and they had borne them fairly well. But they could not fight always successfully against depression in trade. The consumption of gas had decreased some 12 million cubic feet, which was a very serious figure. But he believed that in the previous year there was an increase of 13 millions; so that they were not far behind, if they took a series of years. On the net profits there was a drop of nearly £800. The total decrease in the revenue in connection with the sales of gas was £1510. Though there were more consumers, they had apparently been very economical. With regard to the residual products, they had sold 1862 tons less coke, equal to £680, also 20,973 gallons less tar (£326), and 159,478 gallons less ammoniacal liquor (£472); the decreased revenue in respect of these sales being £3097. The income from fittings was £109 less. In connection with the decreased expenditure, the principal items were coals, £294; fuel for firing, £287; purifying, £310; wages, £344; maintenance, £587—the total decrease being £2370. The Committee proposed to transfer to the extensions suspense account £556. He might mention that this account, which at one time stood at £23,000, was now less than £7000; and the Committee hoped to completely wipe it off in a few years. He moved the approval of the accounts.

Mr. Halford, in seconding the motion, expressed his appreciation of the work of the Committee and their officers, who, he said, were doing their best for the undertaking. He thought the Committee should consider what steps could be taken to increase the demand for gas; and he suggested that some concession might be made to the people who used gas for cooking purposes, so that they might be encouraged to employ it more freely. Alderman Blades said the gas undertaking had been thoroughly well managed; and it spoke volumes when the Chairman of the Committee could get up and refer with such equanimity as Alderman Wilson had done to a loss of £800. In reply, Alderman Wilson said the Committee did not think it would be wise at the present time to further reduce the price of gas. He added that the Committee were very much indebted to Mr. Hudson and Mr. Copp (the Gas Engineer) for the success of the undertaking. The accounts were approved.

KENDAL GAS AND WATER DEPARTMENTS.

Prospective Concessions to Gas Consumers.

At the last Meeting of the Kendal Town Council, the Chairman of the Gas and Water Committee (Alderman Monkhouse), in moving the adoption of their minutes, furnished particulars in regard to the working of the Gas and Water Departments in the past financial year.

Taking first the Gas Department, Alderman Monkhouse said the past year had been a successful one. The gross income had been £14,069, and the gross profit £3804. The net profit had been £1064; and with £297 balance from last year, there was a disposable balance of £1361. The quantity of gas made was 82,823,000 cubic feet, of which 76,990,600 cubic feet had been sold. This showed a decrease of 1,509,300 cubic feet; but two or three former large consumers now had their own suction-gas plants, and of these the department had not yet felt the full effect. On the other hand, the Corporation would partially recoup themselves for this loss of consumption by the projected supply of gas to Burneside. In the fourteen years of the Corporation's possession of the gas-works, they had been able to vote £6050 towards the relief of the rates. He believed that the consumption of gas by means of cookers would be a growing source of revenue. He hoped soon to propose a reduction in the price of gas, believing that this could not be much longer delayed. There was no reason why the cost

should not be lowered, as they could now afford to do it; and every time they had taken a step in this direction, and been generous to the consumers, they had improved their results. He looked forward, too, if not to the abolition of rents for gas-cookers, at all events to their reduction, especially to those customers who had had them in their houses for ten years or more, and who, he thought, were entitled to relief. Their Manager (Mr. W. R. Wilson) had "gone one better" even than Mr. Thomson, his predecessor. Formerly there was an enormous pile of what appeared to be nothing better than scrap-iron; but these cookers Mr. Wilson had had refurbished up, and every one had been made equal to new, and been sent out for use. This year the Committee were hoping to effect a saving in their coal contracts. With an ordinary year's working in the current year, it was not too much to say that they would again be able to assist the rates to the same amount as before, and, in addition, give some relief to consumers and to the users of cookers.

Turning to the Water Department, Alderman Monkhouse said the accounts showed a surplus profit of £253, which was gratifying, as in some years they had had deficits. The water revenue last year was £3558, compared with £2796 in the year 1896. He should like to allude to the carelessness and indifference of the public as to the use and waste of water. People seemed to think that because it was only water it did not cost anything. They forgot that there was a sum of about £2500 a year to pay for interest and sinking fund. While the Committee did not desire to be in any way stingy in regard to the use of water, they did not wish to see it wilfully wasted.

Appreciation was expressed of the work of the Committee, the Chairman, and the Manager; and the minutes were adopted.

TEIGNMOUTH GAS UNDERTAKING.

Satisfactory Report.

The Gas Engineer and Secretary of the Teignmouth Urban District Council (Mr. J. A. Gray) presented last Tuesday his report for the year ended the 31st of March. He stated that there was a larger gross profit in the period named than in any previously recorded in the history of the gas undertaking. The amount was £2247, or 14 per cent. on the present capital debt. Of this sum, £984 was absorbed for the repayment of loans, and £527 for interest. The net profit for the year was consequently £736. The credit balance on the revenue account amounted to £2310; having risen from £1574 at March 31, 1908. On March 31, 1909, there was a deficit of £1283; so that financial improvement to the extent of £3593 had been effected in the intervening six years. Mr. Gray remarked that the repeated reductions in the price of gas, which totalled 1s. 1d. per 1000 cubic feet, had not diminished the profit producing powers of the department, but, on the contrary, had exercised a beneficial effect by stimulating the consumption of gas—thus reducing the working and capital charges per 1000 cubic feet. The economy of production was to a large extent dependent upon the amount of the consumption; and the cheaper the supply became, the brighter the prospects for further development and the maintenance of a stable position. The average make of gas per ton of coal carbonized last year was 10,237 cubic feet, which was 58 cubic feet per ton more than in the previous year. The total make was 38,974,480 cubic feet—an increase of 2 per cent. on the production in 1907-8. Of the total output, 27,742,000 cubic feet were sold to ordinary consumers, or an increase of 7.7 per cent. on the preceding year; 3,721,000 cubic feet to slot-meter consumers, or 7.8 per cent. more; 667,300 cubic feet were used on the works; and 5,146,000 cubic feet were consumed in the public lamps. The unaccounted-for gas amounted to 4.4 per cent. of the registered output. This, said Mr. Gray, was a very low and satisfactory figure, and represented a reduction of 4.5 per cent. on the previous year's return. It was equivalent to a saving of 170 tons of coal. The revenue from the sale of gas was £200 higher for ordinary consumers, and £60 for slot-meter consumers, than in 1907-8. The average consumption per slot-meter consumer was 11,457 cubic feet.

The Gas Committee recommended that the price of gas should be reduced from 3s. 6d. to 3s. 3d. per 1000 cubic feet as from the 30th inst.; and Mr. Denny, moving the adoption of the recommendation, said the Gas Manager's figures showed that the undertaking was in a very satisfactory position. Mr. Francis proposed that the question of the reduction of the price of gas should be referred back to the Committee for further consideration. If the consumers had gas at 3s. 6d. per 1000 cubic feet, there was not much to complain of; and if the Manager, by his ability, could show a considerable profit, it should be applied in reduction of the rates, as was done in other towns. The Chairman (Mr. F. Slocombe) said the Gas Committee had considered the point, and had come to the conclusion that it would be wise to look into the question of using the profits for reducing the rates after the price had been lowered to 3s. 3d. Mr. French contended that it would be unfair to the large gas consumers to make them pay an extra sum towards the general district rate. After some further remarks, it was decided to refer the matter back to the Committee. A resolution was passed thanking Mr. Gray for his report.

We have received from Messrs. Revy, Phillips, and Co., of No. 181, Queen Victoria Street, E.C., a newly-issued sectional catalogue of their cooking apparatus of every description—for gas, coal, or steam—and accessories, boilers, hot-water cisterns, &c. Many of the appliances are on a large scale, suitable for restaurants and hotels. There are also separate pamphlets dealing with the "Reliance" automatic tubeless counter boiler and with the "Revy" patent silent boiling nozzle, which are claimed to be the most efficient, reliable, and economical caterers' requisites that have yet been offered for sale. The "Reliance" boiler is said to be automatic in every sense; the gas being controlled by a super-sensitive automatic valve, which permits of only a sufficient amount of gas being used to heat the quantity of water to boiling-point, and then closes down. The water-valve allows only a sufficient quantity of water to pass to supply the amount withdrawn. The "Revy" nozzle has been designed to overcome the difficulty of obtaining full efficiency in heating liquids by steam. Among its uses is stated to be that of keeping the water-seals of gasholders from freezing in winter.

MALTA AND MEDITERRANEAN GAS COMPANY.

The Government Electricity Supply.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 59-60, Gracechurch Street, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. A. W. Cooper) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said, both last year and in 1907, the shareholders had been prepared by remarks from the chair for a reduction in the amount of gas sold, in consequence of the installation of electricity at Malta by the naval establishments (which had always been good customers of the Company), and possibly from the military establishments if the authorities should decide to continue adopting electricity, and purchase it (as they would have to do) from the Government of Malta. Now these events had taken place, or to a certain extent were taking place, because they were still in a state of transition. It was only lately the military authorities had informed the Company that they had decided to extend the system to the various barracks. He for one—probably a good many of the shareholders also—knew how careful the War Office were in the matter of expenditure; and he therefore indulged the hope that, however desirable it might be to use the electric light in the hospitals, it could not be on the score of economy that they proposed to extend it to the barracks, because, as the shareholders were aware, the Company could supply the barracks with gas lighting, under the incandescent system, at about half the price at which the same illumination could be obtained by electricity. It must therefore be from some other cause than that of economy that had brought the authorities to this decision. It would be satisfactory to the shareholders to know that, notwithstanding the great reduction in the supply of gas to the naval establishments, the amount of gas sold during the financial year under review was only £649 short expressed in sterling, and by measurement the sale was 122,459,000 cubic feet, as against 126,518,000 cubic feet the preceding year. Therefore, they had been making up the consumption in other ways. In Malta—for that was their principal station—they were pushing extensions wherever they could see their way to do so with any prospect of profit. Times, the Directors were told by their Manager, had been very bad in Malta. So far as he (the Chairman) could make out, they had been bad everywhere. But their active officers—and they were active ones—on the other side, were doing, each in his own particular sphere and capacity, his very best to compete with the Government electricity. They were pushing out their services, wherever possible. The position of affairs at the two Sicilian stations was certainly no more satisfactory than a year ago. It was responsible for the increase in the amount due by sundry debtors. As the shareholders knew, the Company had secured judgment against the towns in respect of the principal part of the old debt; but the Directors had had to invoke the aid of the Foreign Office, and ask them to request the British Ambassador in Italy (Sir Rennell Rodd) to approach the Ministers with a view to enable money to be raised, or rather to instruct that money be raised, for the payment of the Company. This having been done, he could not, of course, say much to the shareholders on the subject beyond this, that the people on the other side seemed very anxious that the Company should renew the concessions. But, of course, the Directors could not do such a thing until the Company were paid in full, and, further than that, until they had some guarantee of better payment in future. He believed the authorities were anxious to do this; and from what the Board had heard that day from Trapani—it was Trapani he was now referring to—there seemed to be some little activity in trying to raise money for the purpose of paying the Company. If it was necessary—he hoped it would not be—he was perfectly prepared to personally push the matter on the other side. But it was much better left to the Foreign Office if the Directors could manage to push them here, and let them do the pushing the other side. Of course, he must say something on behalf of Trapani and Marsala. Everything had been put out of gear by the terrible earthquake at the end of last year; but he fancied they were recovering from that, and would not be able to use it as an excuse to the Company. To sum up the position, the accounts showed that the profit was £10,939, against £13,481. But in the course of the year, it would be observed, the debenture debt had been reduced by £4,000; and the amortization account had been increased from £32,966 to £35,491. The £10,500 of debentures that they now had were to run at 4 per cent. Going a little in detail into the accounts, coal cost about £53 less, although they had consumed 362 tons more. The reduction must therefore be due to the price at which they had been enabled to buy coal. The cost was 19s. 0½d. per ton, against 19s. 5½d. the previous year. He might say that they carbonized 10,273 tons, and produced 10,777 cubic feet of gas per ton. This, he thought, would be considered satisfactory. It would be observed that maintenance had increased to £6781, from £5238 in the preceding year. This was easily explained, because the mains and services that had been laid had cost £555 more, extension of mains had cost £607 more, and on telescoping a holder £1316 had been spent. These items represented a great deal more than the difference between the two years. The item of general trade charges was £311 more; and bad debts were £136 more. If London expenses were £427 more, it was perhaps rather pleasant to feel that the law expenses were less by £379. The general revenue account he had already dealt with. As to the general balance-sheet, the stocks of coal were greater; but this was in consequence of having more coal and coke.

Mr. STEPHENSON R. CLARKE seconded the motion; and it was unanimously carried.

The CHAIRMAN next proposed that dividends at the rate of 7 per cent. on the first preference shares, of 7½ per cent. on the second preference shares, and of 6 per cent. on the ordinary shares, be declared for the year ending March 31, deducting the payments made on account.

Mr. A. M. PADDON seconded the proposition; and it was adopted.

Moved by Mr. S. R. CLARKE, and seconded by Mr. JOSEPH CASH, the retiring Director (Colonel Daniell) was re-elected; and subsequently, on the proposal of Mr. F. R. SMITH, seconded by Mr. E. L.

BURTON, the Auditors (Mr. R. Hesketh Jones and Mr. Thomas Guyatt) were re-appointed.

Mr. PADDON, in moving a vote of thanks to the officers, remarked that their duties at the Company's stations were more difficult than those of officials of normal gas undertakings in this country. It was altogether a different thing competing with company or municipal electricity to competing with Government supplied electricity. In this country municipal suppliers of electricity were under the control, or were supposed to be, of the Local Government Board; but when they came to the Government, they were, in the discharge of their duties, practically under the control of no one. When they started this electricity enterprise, so far from trusting it to rest on its own bottom, they absolutely inserted clauses in the leases of their property to compel people to put it in. Their officers had to compete with this sort of thing; and the criterion of how successfully they did it, was the amount of the business with the private consumers. There was this consolation about the position, that the private consumers paid more than the Government departments. If the Company were to have an increase in the consumption of gas, let it be on the private consumption; and if a decrease, then let it be on the lower-priced gas. The accounts reflected the patience and the assiduity of their officials; and to the mature guidance of Mr. Cooper, they owed much of their capacity for extricating themselves from trouble.

Mr. A. F. PHILLIPS seconded the motion; and it was heartily passed.

Mr. COOPER, in acknowledgment, said he was very gratified with this vote of confidence, and he was sure the officers abroad would share in his feelings.

Mr. JOSEPH CASH, in moving a vote of thanks to the Chairman and Directors, said he must say that the way the affairs of the Company had been managed the last few years had been very satisfactory indeed, considering the difficulties the Board had had to contend with, especially in regard to the electric light. If people would go to other quarters for what they required, the Company could not help that. But it could be easily shown that gas was an infinitely cheaper commodity than electricity, and he also said better, though he was a gas man. The use of gas in barracks and hospitals had the effect of producing a better sanitary condition than the electric light could ever do. It had the effect of causing a certain amount of heat; and, given proper ventilation, a purer atmosphere for the men and the invalids was maintained. This fact might be impressed upon the Government officials. In conclusion, he congratulated the Board on the accounts presented.

Mr. T. WILKINS seconded the motion; and it was cordially agreed to.

The CHAIRMAN, in responding, said he quite agreed with Mr. Cash in his remarks as to electricity. The people, however, who had to decide upon matters of this kind were Royal Engineers; and if someone now invented another light they would take it up, so long as it was the newest thing.

This concluded the proceedings.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have this week obtained particulars of the claim made by Mr. W. Ewing against the Corporation of Greenock in respect of engineering services rendered by him in connection with the Corporation gas-works during the eight years he was Manager there (see p. 655). The sum—£1645—is not a large one, and but for the friction which is mentioned in the record as existing between the parties, the litigation need not have been looked upon as serious. Proof has been ordered, and the leading of it will give opportunity for clearing up some matters in connection with gas affairs at Greenock which have not hitherto been made common property—most probably rightly so, because everyone is entitled, to paraphrase Burns, to keep something to themselves which they will tell to nobody. There have been two actions of a similar nature in recent years, in which claims have been made on behalf of Corporation officials for services rendered over a series of years outwith, or said to be outwith, the scope of their employment—one against the Corporation of Edinburgh, and the other against the Corporation of Dundee; and in both instances the Courts have decided against the claims. Mr. Ewing's claim is stronger than either of the other two, in that the period embraced in it is much shorter, and also in that the special work involved was not completed—the latter of which Mr. Ewing makes a point of. As the summer session is within six weeks of its close, it is highly probable that the proof will not be heard till October.

I omitted last week to refer to an item of business which was before the Edinburgh and Leith Gas Commissioners on the previous Monday, which consisted of a report by the Finance and Law Committee to the effect that, a copy of the report by Mr. G. Lisle, C.A., upon the super-annuation scheme of the Commissioners having been sent to the Secretary for Scotland, he had replied that he had no view to express as to the security deed for the sum required to be found by the Commissioners to make the fund solvent; and that Mr. Kenward Shiells, C.A., the Government Auditor, having been consulted on the matter, he had expressed the opinion that a document in security of an annual payment of £2035 would be sufficient. Such a deed had accordingly been prepared; and, having been approved by the Committee, it had been signed and sealed on behalf of the Commissioners. Mr. Lisle in his report (see *ante*, p. 322) recommended an immediate contribution by the Commissioners of £67,830.

On Monday last, Treasurer Soutar presented the gas accounts of the Corporation of Dundee to a Joint Committee meeting, and made a statement in the course of which he said that the financial position of the Gas Department was now most satisfactory. The capital account, compared with the annual make of gas, was £433 per million cubic feet; being the lowest on record. When the works were purchased, in 1869, the capital was £1278 per million—a difference of £845. It might not be out of place to point out that the present actuarial value of the undertaking, based on the profits earned, would not be less than £750,000—the capital value in the event of a transfer from a company to the corporation. In fact, £1000 per million cubic feet was considered a low estimate. The present capital was £378,717, less a balance in the bank of £12,362—being £366,355 net at the close of the

year. The make of gas had increased by 49½ million cubic feet. The sales of gas during the year realized £91,127, or £2686 less than the previous year, due to the reduction of 2d. per 1000 cubic feet on the rate, which was equal to £6635 on the quantity of gas consumed. The net income was £3211 down. The total expenditure was £2933 less than in the previous year. The charge for sinking fund was £11,170; and the fund was now on a sound financial basis, which ought to maintain the stability of the department. Annuities, interest, and sinking fund charges were 6'95d. per 1000 cubic feet, against 7'35d. in the previous year. The anticipated net income for the current year, with the gas reduced by 1d. per 1000 cubic feet, was £122,326—a reduction of £3846. A differential charge was proposed for gas for industrial purposes, and also a sliding-scale for that used in gas-engines. In anticipating the expenditure required for the year, it was found that a saving would be effected in carbonizing charges. On the net cost incident to the manufacture of gas, the charge would be £3773 less, which was more than was required to meet the lessened income. It was some four years since cooking stoves and appliances were given on loan with free fixing, and the result had verified the anticipations then formed of the benefits to the consumers. The time had come when the Corporation could still further confer benefits upon consumers. As it would not be advisable meantime to give gas-fires on the same lines as cooking appliances, it was proposed to hire them at a fixed rental of 10 per cent. on the cost. The accounts and estimates were approved; and on the motion of Lord Provost Urquhart, Conveners and officials were specially thanked for their services.

The policy proposed by the Corporation of supplying gas-fires was submitted to criticism in the Dundee Trades' Council on Wednesday evening. A resolution in favour of the proposal was submitted. One of the members pointed out that plumbers did most of the gas-fitting work in Dundee, and were paid 9d. per hour; whereas the Corporation allowed their employees on this work only 7d. per hour. By the proposal, therefore, they would be cutting the feet from the employers, and taking away the earnings of the plumbers and gas-fitters. The same member also pointed out that there was a great wastage of gas-pipes in the city, in respect that, when a stove or heater was removed, the piping which had been introduced was left. An amendment was submitted; but the Council approved of the action of the Town Council by 28 votes to 6.

Extensions are in progress at the Arbroath Corporation gas-works, which are very efficiently managed by Mr. A. C. Young. Part of the scheme is the erection of new condensing plant, the work of which is now completed. A new gasholder, of 400,000 cubic feet capacity, is in course of erection, which will bring the total storage capacity of the works up to 700,000 cubic feet—nearly equal to one-and-a-half times the maximum daily output. The cost of both the condensers and the holder will be about £6000. The connections with both have been made by the Corporation employees, by which means a saving of about £250 has been effected in comparison with the lowest tenders received for the work. The Manager's report for the past year was submitted to the Gas Committee on Monday. He stated that the quantity of gas made was 97,665,700 cubic feet—an increase over the previous year of 1,778,880 feet. The gas made per ton of coal was 9852 cubic feet—an increase of 57 feet. The gas sold amounted to 90,881,637 cubic feet—an increase of 2,316,907 feet. Gas unaccounted for—5,153,364 cubic feet—was equal to 5'27 per cent. of the quantity made. The gas sold through ordinary meters showed a decrease of 2,448,993 cubic feet; but coin-meters showed an increase of 4,618,400 cubic feet, and gas-engines an increase of 147,500 cubic feet. The total amount collected for gas was £13,786—a decrease of £486, due to a reduction of 2½d. in the price last year. The number of prepayment meters in use at May 15 was 2880—an increase of 319. The number of stoves, grills, and rings belonging to the Corporation in use was 4003—an increase of 794. There were, in addition, 36 radiators hired to consumers; and 31 gas-fires were sold during the year. Cookers are depreciated by 10 per cent. yearly; and the present value of such plant is £4516. The output of sulphate of ammonia had increased from 21'4 lbs. per ton of coal used in 1901 to 29'9 lbs. in 1908-9; the total quantity sold last year having been 134 tons, compared with 69 tons in 1901. During the past seven years there had been put down and paid for out of suspense account: New retort-bench, £1049; new scrubbers, £2018; new boiler and pump, £563; additional new retort-bench, £1251; twelve new waggons, station meter, &c., £2411; new 12-inch mains, £232; and coal-testing plant and new governor, £412. There had been put down and paid for out of revenue: Part of new retort-bench, £1221; new retort-house, £964; new sulphate plant, £359; and new mains, £1242—a total from both accounts of £11,728. After meeting all liabilities, there is a balance of £2000 at credit; and the Gas Committee have felt justified in recommending that the price of gas be reduced by 2½d., making it 2s. 8½d. per 1000 cubic feet.

I have before now commented upon the lenient view which Sheriff Campbell Smith, of Dundee, takes of the crime of theft from prepayment meters. Another example of his Lordship's leniency is afforded by a case which came before him on Wednesday. Two youths were charged with having, in about twenty cases, broken into houses and committed thefts, chiefly from prepayment meters, to the amount of £2 13s. 10d. The accused started on May 12 to go through the houses of poor people who were out working, and by the 17th they had committed these offences. Sheriff Campbell Smith fined them £2 each, with the alternative of twenty days in gaol; and they would have to find caution to the extent of other three guineas, or go to gaol for thirty days more.

In the Kirkcudbright Town Council last week, the Gas Manager—Mr. J. Gibson—reported that the income for the year had been: From gas, £1218; and from residuals, £231—altogether, £1449. The expenditure amounted to £1199; leaving a surplus of £250. The Gas Committee recommended an increase of £10 a year to the Manager's salary. This was eventually granted by eleven votes to four.

On a recent evening, a fault on a feeder caused a complete failure of the electricity supply in the whole of the Seafield district of Broughty Ferry.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, June 5.

Sulphate of Ammonia.

The market has been quiet, partly owing to the intervention of holidays no doubt, and there has been no special feature upon which to comment. Prices are the turn in favour of buyers, though available supplies have not been abundant. The closing quotations are £11 per ton f.o.b. Hull, £11 2s. 6d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. For delivery over the near months, the equivalent of spot prices are being quoted speculatively abroad, and business is reported to have been done. For delivery further ahead, the divergence between makers' and buyers' ideas remains too great to admit of much first-hand business.

Nitrate of Soda.

This market has also been quiet, and spot prices have been reduced to 10s. 4½d. per cwt. for 95 per cent., and 10s. 7½d. for refined quality.

LONDON, June 7.

Tar Products.

The market for pitch has been very firm indeed throughout the past week; and although prices have not actually advanced, there is decidedly more disposition to pay them. Creosote is steady, but business is rather quiet just at present. It is a good sign, however, that in the railway contracts which have been let lately, the Companies have exercised their option to take the maximum quantity asked for. Benzol is as quiet as ever; and sales have taken place in the North at 5½d. to the end of August. Crude benzol and coke-oven crude naphtha are fetching very poor prices. Solvent is steady without very much business; while 60's carbolic are quiet. The late spurt seems to have died away. Tar is very firm, and decidedly difficult to secure for near delivery. Owing to a clerical error, the lowest price for tar in last week's issue was given as 11s. 6d. This, of course, should have been 14s. 6d.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 27s. 6d. to 28s.; east coast, 27s. to 27s. 6d.; west coast, 26s. to 27s. f.a.s. Mersey ports, 26s. 3d. to 27s. 3d. f.o.b. others. Benzol, 90 per cent., casks included, London, 5½d. to 6d.; North, 5½d. to 5½d.; 50-90 per cent., casks included, London, 6½d.; North, 6d. to 6½d. Toluol, casks included, London, 8d. to 8½d.; North, 7½d. to 7½d. Crude naphtha, in bulk, London, 3½d. to 3½d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 9d. to 10d.; heavy naphtha, casks included, London, 10½d. to 11½d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. to 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is very little change reported in sulphate of ammonia, though the market has been steady. Beckton prompt is quoted at £11 10s.; and ordinary makes on Beckton terms at £11 to £11 1s. 3d. In Hull, the price is £11 to £11 1s. 3d.; and in Liverpool, £11 2s. 6d. In Leith, £11 5s. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a good demand for coal for prompt shipment, and the export is full; but there are few forward sales, owing to the uncertainty of the early future. In the steam coal trade, best Northumbrian kinds are quoted from about 12s. 9d. to 12s. 10d. per ton f.o.b. Second-class steams are 10s. to 10s. 9d. per ton, and steam smalls from about 5s. 6d. to 6s. 6d.—the latter being firm and in strong request. The output at the collieries is maintained, and is also well taken up. In the gas coal trade, there is a strong demand for this season, though the shipments to the southern gas companies are low, as usual near the middle of the year. Durham gas coals vary in price from about 9s. 3d. to 10s. 10½d. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," up to 11s. 3d. is quoted. There is a heavy export, both to the Baltic and to some of the ports of southern Europe, chiefly on contracts that were entered on some time ago. For forward delivery prices are firm, and there is not much disposition to enter into business. It is, however, understood that the sales to Italy include about 10,000 tons for delivery over the rest of this year, at a price equal to 11s. 3d. per ton f.o.b. for special kinds. Coke is firmer; and gas coke, being in moderate output, is steady at about 13s. per ton f.o.b. in the River Tyne.

Scotch Coal Trade.

The market does not seem to be much affected by the situation brought about by the failure to come to an agreement over the wages question. The foreign request remains unsatisfactory, and the demand for home consumption is accelerated by the desire to cover the chance of a strike. But that the prospect of a strike is considered remote is reflected in the quotations, which are almost the same as a week ago. These are: Ell 8s. 9d. to 10s. 9d., splint 9s. 6d. to 10s., and steam 9s. to 9s. 3d. The shipments for the week amounted to 315,264 tons—a decrease of 1017 tons upon the preceding week, but an increase of 14,236 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,676,631 tons—an increase of 308,261 tons upon the corresponding period.

The Clacton Urban District Council have rejected a recommendation by a Special Committee, appointed to inquire into the working of the gas and water undertakings, that the services of the Gas and Water Consulting Engineer be not retained, and that Mr. F. Robinson be retained as Manager, at an increased salary.

The New Gas-Works at Coventry.

The new gas-works which have been erected by the Coventry Corporation at Foleshill, to meet the needs of a rapidly extending city, are to be officially opened on Thursday. The Mayor (Alderman William Lee) will perform the ceremony, and afterwards entertain a large company at dinner in St. Mary's Hall. The new works are about a mile-and-a-half from Coventry, and occupy 40 acres, 7 acres of which are separated from the main portion by the Nuneaton Railway. A locomotive owned by the Corporation brings the coal into the sidings, and hydraulic power is used in tipping the waggons. The coal-stores have a capacity of 4000 tons, and the overhead hoppers in the retort-houses hold sufficient coal for 48 hours' supply. The total capacity of the works is $4\frac{1}{2}$ million cubic feet of gas per day, to which can be added, in case of necessity, $1\frac{1}{2}$ million cubic feet of water gas. The two holders have a capacity of $1\frac{1}{2}$ million cubic feet each, and are connected with those at the Coventry works by a 24-inch main. The chemical works are capable of producing daily 5 tons of sulphate of ammonia, or, if desired, the same quantity of sulphuric acid. In addition, there is plant for producing concentrated ammonia. The electrical plant consists of two 75 H.P. gas-engines, coupled direct to two 45-kilowatt generators. The hydraulic plant gives a pressure of 750 lbs. for turning the capstans and tipping the trucks. It is calculated that 200 men will be employed when the works are in full operation; and every provision has been made for their comfort and convenience.

Morley Gas Undertaking.—The Manager of the Morley Gas-Works (Mr. H. J. Hemingway) has presented his report to the Corporation, showing that for the year ending March 31 the profit was considerably less than in the previous year, due largely to two causes—the smaller consumption of gas and the increased cost of coal. The net profit was £89, which was £817 less than that of the previous year. There were 3577 prepayment meters in use; and the weight of copper removed from them during the twelve months was 9 tons. The total revenue was £19,505, compared with £20,420; and the expenditure was £12,126, compared with £12,253.

New Joint-Stock Companies.—The Kirbymoorside Lighting Company, Limited, has been registered with a capital of £5000, in £1 shares, to take over the business of the Kirbymoorside Gas and Water Company, Limited, as well as certain land at Kirbymoorside, and to adopt agreements with the Company, the Liquidator (Mr. C. Whittell), and others. Among the subscribers is Mr. H. Tobey, of Malton, who is also one of the first Directors. The East Coast Water Company, Limited, has been registered with a capital of £10,000, in £5 shares, to adopt an agreement with the North-East Lincolnshire Water Company. The Metropolitan Incandescent Company, Limited, with a capital of £1000, in £1 shares, has been formed to acquire the business carried on by A. Cross, at No. 21, Atlantic Road, Brixton, S.W., and to trade in incandescent-mantles and gas-fittings and as makers and agents, &c.

New Water Supply for Exmouth.

An analysis of the new water supply from the Dotton borehole at Exmouth gives the most satisfactory result. Mr. Tickle, the County Analyst for Devon, to whom the sample was submitted, describes the water as remarkable for its freedom from all qualities which characterize drainage from the surface land or soil. Its organic purity is thus unsurpassed; and from the nature of the circumstances, its excellent quality is permanently assured. In regard to mineral constituents, the water is hardly less remarkable. Nothing is included of a prejudicial nature; and the water is of a moderate degree of hardness. The report was read at a meeting of the District Council on Wednesday, and the Medical Officer of Health (Mr. O. Eaton), corroborating the opinion of the County Analyst, expressed the view that the quality of the water was unique. A long discussion ensued as to the scheme. Mr. Randell moved that the operations at Dotton be suspended, and the scheme abandoned. He contended that the undertaking would be very costly, and that the pumping might interfere with the sources of the present water supply. The Rev. O. J. Reichel, who seconded the resolution, said that, according to the Bill which was to have been promoted this session, the cost of the scheme was estimated at £43,000; but including the interest on the loans it would amount to £90,000. There would be an annual charge of £1000 for upkeep; and the total charge on the rates would not be less than £4000 a year. Mr. Crews said it would be absolutely wicked to abandon the scheme, seeing that the trial boring had proved a magnificent success, for they had tapped an unlimited supply of the purest water. As to the cost, he did not think that it need exceed £25,000, against £100,000 required for an impounding reservoir. Mr. Beavis, who was the Manager of the undertaking when it was owned by the Water Company, considered that the Dotton scheme would be very expensive; and he supported the proposal for putting an end to the operations at this spot. The resolution was rejected by a majority of 12 to 6.

Warrington Gas and Water Works Results.—The Secretary of the Warrington Corporation Gas-Works has presented a balance-sheet for the year ended March 31 last, showing a net profit of £13,387, which will be carried to the credit of the improvement rate. The Borough Treasurer reports that for the same period there was a gross profit on the water undertaking of £19,596; and after paying out of this the sinking fund and interest charges, amounting to £18,500, there remains a net profit on the year's working of £1091, against a loss of £1047 for the previous year. The net profit has been kept in hand to increase the working balance, which has been considerably reduced during the past five years. The capital account is overdrawn by £19,250; and the loans outstanding amount to £384,548. The sinking fund has £1065 in hand; the accumulated profits forming the working balance in the revenue account amount to £4034; and the reserve fund has £3853 standing to its credit.

The "ROSTRUM."



A New Power!

When the

'ROSTRUM' Roasting and Baking Oven

was introduced Hotel Proprietors and Restaurateurs felt that a new power had appeared which was destined to place ordinary Steam-Heated Cooking Apparatus in the background. Immediate and wide appreciation of its time-saving, labour-saving qualities quickly followed, and Gas Undertakings are finding this

Fresh Outlet

for Gas Consumption a medium of great value.

These Ovens can be supplied in Batteries of Two or more as desired.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

The First Year's Working at Wolstanton.

A report on the first year's working of the gas undertaking of the new Urban District Council of Wolstanton has just been published. The quantity of gas sold to ordinary and prepayment consumers was about 50 million cubic feet; and the amount consumed for the public lighting brought the total up to 59 millions. The make of gas per ton of coal carbonized was 11,775 cubic feet. Additional consumers during the year numbered 196, and there were 218 new customers for cookers. The number of consumers by ordinary meters is now 1327, and by prepayment meters 2067; making a total of 3394. The number of cookers and grills on hire at the close of the year was 1059. With regard to finances, the Council received £9158 for gas, meter and stove rents, and public lighting, and £1799 from the sale of residuals; making a total revenue of £10,957. The total expenditure was £5952, leaving a gross profit of £5005. Up to March 31, 1908, the total loans amounted to £48,446. During the past year, there was paid off an outstanding balance on the building of the gas-works, interest and repayments of loans had been met, and there was a net profit of £1146. A sum of £3269 had been repaid on capital account.

Gas Tragedy at Leeds.—Charles Wilson, whose age was about 25, and whose father was for a time Labour representative in the Leeds City Council, was left alone in the house on Whit Monday; and his younger brother, on returning home in the evening, noticed a strong smell of gas. On entering, he found his brother Charles lying dead. In his mouth was one end of a piece of rubber tubing, the other end of which was attached to a gas-burner.

Gas Profits at Birkenhead.—The Deputy-Chairman of the Gas Committee (Mr. Halsall) informed the Birkenhead Corporation, at their monthly meeting, that there was a divisible profit on the undertaking of £22,000; and during the year £164 had been spent to provide work for the unemployed. A sum of £1000 had been put to the renewals fund; and the amount standing to the credit of the fund was £29,178, equal to 6½ per cent. on the capital outlay. There was also a further £13,000 as a special reserve fund; and the amount the Committee were able to hand over to the relief of the rates was £10,000.

New Issues of Gas and Water Stocks and Shares.—As announced in our advertisement columns, at the Mart, Tokenhouse Yard, E.C., to-morrow, Messrs. A. & W. Richards, will offer for sale, by order of Directors, 750 new ordinary £10 shares (5 per cent. maximum) in the Southend Water Company, and £1000 of 4 per cent. perpetual debenture stock and £8000 of new ordinary stock of the Great Yarmouth Water Company. The Reading Gas Company are inviting applications for £5000 of 4 per cent. perpetual debenture stock, at a minimum price of £102 per £100, tenders for which are to be sent in by Monday next. Messrs. Geo. Nichols, Howes, Young, Alder, and Co., will offer for sale at Bristol, on the 17th inst., £25,000 of general capital stock and £10,000 of new debenture stock of the Bristol Gas Company.

Gas Workers' Wages at Blackpool.

At their meeting last Tuesday, the Blackpool Town Council had before them the question of the wages paid to the labourers in the employ of the Gas Department. The Gas Workers' Union recently wrote asking that the wages be increased 6d. per day; but the Committee refused the application. When this decision came up for confirmation, Mr. Laycock proposed, as an amendment, that the increase be granted. He said the cost of living in Blackpool was higher than in most other towns, and that the 22s. per week earned by the gas labourers was not sufficient to maintain a family properly. The average profit from the Gas Department that went towards the reduction of the rates was £15,000; while the actual wages bill of the men who earned this profit was £12,000. He suggested that the Gas Manager's salary be reduced from £600 to £400, and remarked that the difference of £200 would pay the required increase in the men's wages, without any addition to the annual expenditure of the department. A few members expressed themselves as being in favour of the advance, but not by reducing the Manager's salary; and the Mayor, in opposing the amendment, said the wages paid at Blackpool were fair and on an average with other towns, according to the list of wages presented to the Committee. The Blackpool men were better off as regarded holidays than those in other towns. The amendment was defeated by a large majority.

Satisfaction at Neath.—In his annual report to the Neath Town Council, Mr. R. A. Browning, the Gas Engineer and Manager, showed that the profits from the Council's undertaking enabled the Committee to again recommend the transfer of £1000 in relief of the rates, and to carry forward £5000 odd to the current year's accounts. Alderman Morgan, in moving the adoption of the report, remarked that the Committee were very satisfied with the condition of the works; while the profits of the undertaking not only provided for the repayment of loans and interest, but enabled the Council to transfer a large sum in reduction of the rates. A further cause for congratulation was the increase of gas consumption.

Liquidation of Moffat's Limited.—The shareholders in this concern having decided upon voluntary liquidation, the Liquidator (Mr. R. H. Lerney) called a meeting of creditors, which was held last Tuesday at the Company's offices. It was reported that the liabilities to unsecured creditors amounted to £8480, while the assets totalled £26,702. The preferential claims amounted to £134, and after providing for these, and for debentures of £7597, the net assets were reduced to £19,050. Included among them was a sum of £13,000 for goodwill and patents. The Liquidator stated that he was endeavouring to arrange for the business to be carried on with a view to its sale as a going concern; and it was decided to adjourn the meeting for a month in order to enable the Directors to place a scheme before the creditors.

APPRECIATIONS.

SERIES No. 3.

Gas Engineers have written:—

"A nice and suitable Booklet. Please send on a supply at earliest possible moment."

"Thanks for advance Copy. Please forward an early supply."

"Herewith Particulars showing rates of Cookers on Hire. Booklets will oblige."

**May we forward a Supply of
Booklets for distribution to your Consumers?**

THE RICHMOND GAS STOVE & METER CO., LTD.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C.

General Offices and Works: Warrington.

Cleethorpes Gas Company's Assessment.—The assessment of the works of the Cleethorpes Gas Company was recently placed by the Assessment Committee at £3595. The Company had retained Messrs. W. A. Valon and Son; and on Friday, the 28th ult., Mr. Arthur Valon appeared before the Assessment Committee, with the result that the £3595 has been reduced to £2600.

Sales of Shares.—Ten £10 shares in the Dorking Water Company, which were offered for sale at the Oddfellows' Hall, Dorking, last week, by Messrs. Arnold and Son, realized £177. Some new £10 shares in the Burgess Hill Water Company, recently submitted to public competition by a local firm of auctioneers, Messrs. Drawbridge and Ansell, fetched from £15 to £15 10s. each.

A Smaller Profit at Carlisle.—The statement of accounts which the Treasurer has laid before the Carlisle Corporation Gas Committee shows the gross profit on the gas-works revenue account for the year to March 31 to have been £5909, as against £9290 for the previous year. After deducting loan charges, interest, &c., the net profit to be transferred to the city fund is £287, as compared with £3634 for the twelve months before. The net profit for the year 1906-7 amounted to nearly £7000.

Ownership of Money in Prepayment Meters.—At the Tower Bridge Police Court last Friday, before Mr. Rose, a question in regard to the ownership of money deposited in prepayment meters was raised on a charge brought against Alfred Higsmore, a plumber, of Avondale Square, Old Kent Road, of stealing 2s. from a meter of this kind belonging to the South Metropolitan Gas Company. Mr. Washington, who appeared for the Company, admitted that previous deficiencies had been forgiven, because the Company, in whose employment prisoner was, were unwilling to make him a felon. Accused was the consumer of the gas which had passed through the meter in question; and it appeared that he had taken coins from the money-box, and had used tin discs to obtain a supply. When, however, the collector called, he paid the amounts which were registered as due until the last occasion, when his offer to pay was refused. He now contended that he was within his right in using the money till the time of settlement arrived on the call of the collector. Mr. Rose observed that it was a question for a Jury whether or not prisoner's intent was felonious. Mr. Washington pointed out that, according to law, all moneys dropped into the meter became at once the property of the Company, and were removable only by their agents. Evidence having been given, the case was adjourned.

Mr. F. J. Gould, who recently resigned his position as London Manager for Messrs. James Milne and Son, Limited, has been appointed Manager to the Bland Light Syndicate, Limited, of London and Manchester.

The Corporation of Ghent have decided to duplicate their Kramers and Aarts water-gas plant with another section of a capacity of 500,000 cubic feet per diem, as they have been so satisfied with the first set which has only been working three months.

The fusing of an underground electric cable was responsible for the appearance of flames which shot up from the pavement in New Bridge Street, Newcastle-on-Tyne, last Saturday week. The brigade were sent for; and in due course the fire was overcome by the application of sand.

At the last meeting of the Gas Committee of the Leipzig Corporation, it was decided to carry out an installation of coke-quenching plant for the chamber furnaces of the No. 2 gas-works in Leipzig-Connewitz, in the form of a travelling quenching tower with transport appliances and intermediate bunkers. The contract has been entrusted to Messrs. Adolf Bleichert and Co., of Leipzig and London.

A recent number of the "Manchester Courier" contained the following appreciative remarks in regard to "Coalexld": "Manchester has heard a lot in recent years of smokeless coals—has, indeed, heard more than it has seen of certain kinds. One of these coals, however—'Coalexld'—seems to be selling very well here, judging from the reports of agents in the district. It is contended that 'Coalexld' can be burnt in Salamander stoves in which anthracite has hitherto been the only combustible material. Freedom from arsenic is one of the good features of the new comer, which, by the way, won a diploma of merit at the Smoke Abatement Exhibition in Sheffield last March."

The "Sunday Times" is responsible for a statement that the prices of thorium nitrate have recently declined 20 per cent., and fears are entertained of a further fall. Our contemporary continues: "The manufacture of thorium nitrate was hitherto either in German hands or in those of the Vienna Welsbach Company, which belongs to the English Welsbach concern. The monazite sand was supplied by John Gordon, of Rio de Janeiro, and by Messrs. A. C. De Freitas, of Hamburg. The latter firm had entered into a contract with the Brazilian Government by which it undertook to work the monazite deposits and to export 1200 tons per annum. The yearly consumption of monazite is about 2100 tons, of which the United States supply 300 tons and Brazil 1800 tons. Of the latter quantity, De Freitas supplied 900 tons; but in addition the firm exported a further 2000 tons a year in order to accumulate a large stock in Hamburg. Gordon, too, exported more than his requirements. In this manner, a stock of about 12,000 tons has been accumulated in Europe. Last February, the chief partner of Messrs. De Freitas died; and his heirs began to sell to outsiders. Seven years' consumption has been supplied ahead; and thorium nitrate is offered on all sides. The Thorium Convention, which exists practically only in name, has lowered the price from 32 M. to 25 M. per kilo.; while outsiders are selling at 23 M. The prospects for the thorium manufacturers are therefore the reverse of promising, at least for the next five years. The total production of gas mantles is given as follows in the 'Plumber and Journal of Heating': Germany, 100 millions; United States, 55 millions; Great Britain and Colonies, 35 millions; France, 15 millions; Austria, 3 millions; and divers 5 millions—together 213 millions. This would require 230,000 kilos. of thorium nitrate. Since 40,000 kilos. are won from the ashes of old mantles, the new requirements total 190,000 kilos. of thorium nitrate, or 1800 tons of monazite sand."

MEETING OF THE INSTITUTION OF GAS ENGINEERS LONDON.

June 15 to 18, 1909.

When in London make a point of seeing
the New Show-Rooms of

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent Geyser Co.),

at 129, High Holborn, W.C. (close to Kingsway and adjoining the British Museum Tube Station).

They are full of interest and replete with

MODERN GAS-HEATING APPARATUS

embodying the latest models in

GAS COOKERS,

RADIATORS, FIRES,

MAUGHAN'S GEYSERS,

and other

WATER HEATING APPLIANCES.

THE
PARKINSON STOVE Co., Ltd.

(Incorporating

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BIRMINGHAM:
STOUR STREET,
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LONDON:
Office and Show-Room:
129, HIGH HOLBORN,
W.C.

We learn from the Liquidator of the Khoma Gas Arc Lamp, Limited, that arrangements have been made to organize a new Company with a capital of £10,000, of which £5000 has been underwritten. The reason assigned for the formation of the new Company is the need of more capital for the purposes of the business. The winding-up of the old Company is voluntary, to enable the new one to take over the business.

The Imperial Stove Company, of Leamington, have again been successful in securing from the South Metropolitan Gas Company their contract for packed cookers. The firm obtained the two former contracts for 2000 cookers; and the Company have now placed with them a further contract to supply them with the whole of these cookers during the next three years. It will take no less than 150 large railway waggons to despatch this order. To avoid inconvenience to the Company, and loss to themselves, the firm made special fittings for a number of waggons so as to prevent rocking during shunting operations. This has proved very successful; and the breakage in transit is practically nil.

The Gas Committee of the West Bromwich Corporation propose to have the water-gas plant, which was installed in 1901, completely overhauled without delay, and to carry out such alterations and additions as may be found necessary. They have under consideration an exhaustive report on the subject by the Gas Engineer (Mr. Harold E. Copp); and while they have not decided on any of the schemes set before them, they believe the work may be executed for a sum of £1500 or £2000, which will be paid out of revenue.

The minutes of the Bradford Gas Committee contain the following resolution: "That for the present no canvassing shall be done by either the Gas or the Electricity Department, one department against another, in any district where there are now gas mains or electricity cables; but that where applications are received for a supply of either electricity or gas, the department shall be at liberty to canvass for customers on giving notice of such intention to the other department. Both the above clauses not to affect canvassing for power purposes where the other department is not affected."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CHEMIST. No. 5103.
WORKS CHEMIST. Preston Gas Company. Applications by June 14.
DRAUGHTSMAN. No. 5103.
DRAUGHTSMEN. W. J. Jenkins and Co., Retford.
CLERK (Gas-Works). Schultz, Comins, and Co., Cannon Street, E.C.
IMPROVER TO GAS-FITTING. Dorking Gas-Works.

Situation Wanted.

SECRETARY, MANAGER, OR ACCOUNTANT. W. B. Mimmack, St. Paul's Cray.

Correspondence Classes.

CORRESPONDENCE COLLEGE COMPANY. Department B., Cambridge.

Process for Disposal.

SELF-IGNITING MANTLE. 57, Holtwhites Hill, Enfield.

Plant, &c. (Second-Hand), for Sale.

ASCENSION PIPES, &c., CONOENSERS, PURIFIERS, GOVERNOR, ENGINE AND EXHAUSTERS, WEIGHT-BRIDGE, &c. Draycott Gas Company.
GAS-COOKERS. Coventry Gas Department.
PURIFIERS, &c. Sutton Gas Company.

Plant, &c. (Second-Hand), Wanted.

LIVESEY WASHER. No. 5098.

Meeting.

INSTITUTION OF GAS ENGINEERS. Institution of Mechanical Engineers, Storey's Gate, S.W. June 15, 16, and 17.

Stocks and Shares.

DRAKES LIMITED. June 18.
PORTSMOUTH WATER COMPANY. June 15.
RAINFORD GAS COMPANY (PROSPECTUS). June 16.
READING GAS COMPANY. June 14.
SOUTHERN WATER COMPANY. June 9.
YARMOUTH WATER COMPANY. June 9.

TENDERS FOR

Brass Fittings.

DARWEN GAS DEPARTMENT. Tenders by June 26.

Coal and Cannel.

ATHERTON URBAN DISTRICT COUNCIL. Tenders by June 16.
BANGOR (CO. DOWN) GAS DEPARTMENT. Tenders by June 21.
BEVERLEY GAS DEPARTMENT. Tenders by June 24.
BURY CORPORATION. Tenders by June 14.
EVESHAM GAS DEPARTMENT. Tenders by June 26.
HINOLEY GAS DEPARTMENT. Tenders by June 14.
NEWBURY GAS DEPARTMENT. Tenders by June 11.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by June 14.
NORTHWICH GAS COMPANY. Tenders by June 10.
ROTHERHAM GAS DEPARTMENT. Tenders by June 22.
SALISBURY GAS COMPANY. Tenders by June 12.
SKIPTON URBAN DISTRICT COUNCIL. Tenders by June 14.
SPALDING GAS DEPARTMENT. Tenders by June 17.

Lighting.

WHITEHAVEN HARBOUR COMMISSIONERS. Tenders July 20.

Lime.

HINOLEY GAS DEPARTMENT. Tenders by June 14.
KEIGHLEY GAS DEPARTMENT. Tenders by June 14.

Oxide of Iron.

DUNDEE GAS DEPARTMENT. Tenders by June 12.

Pipes, &c.

DARWEN GAS DEPARTMENT. Tenders by June 26.
KEIGHLEY GAS DEPARTMENT. Tenders by June 14.

Sulphuric Acid.

KEIGHLEY GAS DEPARTMENT. Tenders by June 14.

Tar and Liquor.

BRIERLEY HILL GAS COMPANY. Tenders by June 26.
DARWEN GAS DEPARTMENT. Tenders by June 26.
HEREFORD GAS DEPARTMENT. Tenders by June 21.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by June 14.
OLDHAM GAS DEPARTMENT. Tenders by June 22.
ROAING GAS COMPANY. Tenders by June 21.
ROTHERHAM CORPORATION. Tenders by June 22.
SKIPTON URBAN DISTRICT COUNCIL. Tenders by June 14.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 620.

Issue	Share.	When ex. Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			P.C.				£ s. d.	£	Stk.		P.C.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½-18	..	5 11 1	561,000	Stk.	Feb. 25	10	Liverpool United A.	225-227	..	4 8 1
298,955	10	"	7	Do. 7 p.c.	12½-13	..	5 7 8	718,100	"	"	7	Do. B.	168-170	..	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	9½-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	May 27	6½	Bombay, Ltd.	5½-5½*	..	5 12 7	75,000	5	Dec. 11	6	Malta & Mediterranean.	4½-5	..	6 0 0
40,000	5	"	6½	Do. New, £4 paid.	4½-4½*	..	5 18 10	560,000	100	Apl. 1	5	Met of } 5 p.c. Deb.	100-102	..	4 18 0
50,000	10	Feb. 25	14	Bourne- } 10 p.c.	28½-29½	..	4 15 9	250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	101-103	..	4 7 5
51,810	10	"	7	mouth Gas } B 7 p.c.	16½-17	..	4 2 4	541,920	20	May 27	3½	Monte Video, Ltd.	12½-12½*	..	5 8 9
53,200	10	"	6	and Water } Pref. 6 p.c.	15½-15½*	..	3 15 7	1,775,892	Stk.	Feb. 25	4½	Newcastle & Gateshead Con.	106½-107½	..	4 3 9
380,000	Stk.	"	12½	Brentford Consolidated	250-252	..	4 19 2	518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	5½	Do. New	189-191	..	4 19 6	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	198-20	..	5 0 0
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	55,940	10	"	7	Do. 7 p.c.	13-13½	..	5 3 8
226,250	"	Dec. 11	4	Do. 4 p.c. Deb.	101-103	..	3 17 8	309,000	Stk.	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
202,000	Stk.	Mar. 12	10	Brighton & Hove Orig.	212-214	..	5 0 6	60,000	5	Mar. 31	8	Ottoman, Ltd.	6-6½	..	6 8 0
246,320	"	"	7½	Do. A Ord. Stk.	154-156	..	4 19 4	31,800	53	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
467,000	2½	Apl. 16	10	British	42½-43½	..	4 12 6	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	118-120	..	5 0 0	100,000	50	"	12	Do. C.	119-121	..	4 19 2
165,700	"	"	4½	Do. do. 3½ p.c.	88-91	..	4 18 11	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½-14	..	5 0 0	398,490	5	May 13	7	Primitiva Ord.	6½-7	..	5 0 0
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	796,81	5	Jan. 28	5	Do. 5 p.c. Pref.	5½-5½*	..	4 10 11
100,000	10	"	—	Cape Town & Dis., Ltd.	41-5	..	—	483,900	100	June 1	4	Do. 4 p.c. Deb.	94-96*	..	4 3 4
50,000	50	May 3	6	Do. 4½ p.c. Pref.	5½-6	..	—	1,000,000	10	Apl. 29	8	River Plate Ord.	14½-15½	..	5 4 11
100,000	Stk.	Dec. 30	4½	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
157,157	Stk.	Feb. 25	5	Do. 4 p.c. Deb. Stk.	77-79	..	5 13 11	250,000	10	Mar. 31	8	San Paulo, Ltd.	13½-14	..	5 12 3
1,493,280	Stk.	Mar. 12	5½	Chester 5 p.c. Ord.	109-111	..	4 10 1	62,500	10	"	—	Do. 6 p.c. Pref.	11½-12	..	5 0 0
500,000	"	"	5	Commercial 4 p.c. Stk.	108-110	..	4 14 6	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	5½-5½*	..	4 17 1
475,000	"	"	5	Do. 3½ p.c. do.	102-104	..	4 16 2	135,000	Stk.	Mar. 12	10	Sheffield A.	230-238	..	4 4 0
800,000	Stk.	Dec. 11	5½	Do. 3 p.c. Deb. Stk.	82-84	..	3 11 5	209,984	"	"	10	Do. B.	233-25	..	4 5 1
200,000	"	"	5	Continental Union, Ltd.	92-101	..	4 19 0	523,500	"	"	10	Do. C.	233-235	..	4 5 1
492,270	Stk.	"	7	Do. 7 p.c. Pref.	139-141	..	4 19 3	70,000	10	Oct. 29	10	South African.	14-14½	..	6 17 11
55,000	"	"	4	Derby Con. Stk.	121-123	..	4 1 4	6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	123-125	..	4 5 4
143,995	"	Mar. 31	5	Do. Deb. Stk.	103-105	..	3 16 2	1,895,445	"	Jan. 1	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
351,660	10	Jan. 28	12	East Hull 5 p.c. Ord.	97-99	..	5 1 0	209,821	Stk.	Mar. 12	8	South Shields Co. Stk.	152-154	..	5 3 11
15,161,545	Stk.	Feb. 11	4/10/8	European, Ltd.	24-24½	..	4 18 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
2,620,000	"	"	3½	Do. £7 res. paid.	18-18½	..	4 17 4	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
3,799,735	"	"	4	Gas 4 p.c. Ord.	103½-104½	..	4 6 6	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
4,193,975	Stk.	Dec. 11	4	light 3½ p.c. max.	88-89	..	3 18 8	502,310	Stk.	May 13	5	Southampton Ord.	110-112	+3	4 9 3
258,740	Stk.	Mar. 12	4½	and 4 p.c. Con. Pref.	105-107	..	3 14 9	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c.	132-134	..	5 0 9
82,500	"	"	3	Coke 3 p.c. Con. Deb.	86-87	..	3 9 0	423,940	"	"	5½	Do. B 3½ p.c.	111-113	..	4 12 11
70,000	10	Apl. 29	11	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	149,470	"	Dec. 30	4	Edmonton } 4 p.c. Deb.	101-103	..	3 17 8
123,500	Stk.	Mar. 12	6½	Do. do. 5 p.c.	118-120	..	5 4 2	182,360	10	"	8	Tuscan, Ltd.	82-84	..	8 13 0
65,781	"	"	5	Hongkong & China, Ltd.	17½-18	..	6 2 3	149,900	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
4,940,000	Stk.	May 13	8	Ilford "A" and "C"	138-140	..	4 12 10	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105-107	..	4 13 6
473,600	Stk.	Feb. 11	3½	Do. "B"	105-107	..	4 13 6	255,606	Stk.	Feb. 25	6½	Wands- } B 3½ p.c.	130-141	..	4 12 2
195,242	Stk.	Mar. 12	6	Do. 4 p.c. Deb.	102-104	..	3 16 11	79,416	"	Dec. 30	3	worth } 3 p.c. Deb. Stk.	73-75	..	4 1 1
				Imperial Continental	179-181	-1	4 8 5	835,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	121-123	..	4 5 4
				Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	..	3 18 9
				Lea Bridge Ord. 5 p.c.	120-123	..	4 18 4	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-119	..	3 13 5

† Next dividend will be at this rate.

Prices marked * are "Ex div."

A representative of the "Eastbourne Chronicle" who has visited the West Kent yeomanry camp there says, in describing his visit, a distinct innovation is seen this year in the provision made for artificial illumination. The Eastbourne Gas Company have been invited to lay on a supply of gas, by means of which the camp will be lit as effectively as a well-planned modern barracks. At the entrance a fine 1000-candle power lamp has been erected; and the canteen has been brilliantly lit with a number of "Graetzin" inverted lamps, each of 300 candle power. Near by is another marquee to be used by the troopers as a recreation tent, which is lit with four "Humphrey" lamps yielding an aggregate illumination of nearly 1500 candles. In the four large dining marquees

are clusters of inverted burners hanging from the ridgepoles, and yielding most efficient light. The sergeants' mess and recreation tent is most brilliantly lit with incandescent burners, as also are a number of other smaller tents used as stores, &c. In the officers' quarters, the Company have secured a very beautiful effect by the use of many pretty coloured globes, in which are inverted incandescent burners; while other smaller tents are similarly illuminated. This is the first occasion, the correspondent thinks, that an attempt has been made to light a large camp in this manner. The Gas Company will render valuable assistance in cooking a considerable proportion of the food for this large aggregation of members of the territorial forces.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Resists 4500° Fahr. Best for GAS-WORKS.

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See Advertisement on p. 615.

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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

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See Illustrated Advertisement June 1, p. 559.

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DESSAU PATENT VERTICAL RETORTS.
FOR list of Installations, see "Journal,"
May 18, p. 1, of Centre.
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117, Galloway Road, Shepherd's Bush, LONDON.

CITY AND GUILDS EXAMS., 1910.
FULL Courses now starting in Gas Engineering and Gas Supply; also courses for Matric., Inter., and Final B.Sc. (Engineering), Student and Assoc. M.Inst.C.E., Chemistry, Drawing, Building Construction, Practical Mathematics, Steam, Mechanics, &c.
CORRESPONDENCE COLLEGE Co., Dept. B., 26, Green Street, CAMBRIDGE.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

GAS Engineers attending the Meetings
of the Institution of Gas Engineers are cordially INVITED TO VISIT us at 49, 50, and 51, Wool Exchange, Coleman Street, E.C. We can show you the TWIN-LIGHT BURNER, which, on low pressure, puts up Lighting Values at least 50 per Cent. This is no idle boast.

THE Institution OF Gas Engineers.

THE ANNUAL GENERAL MEETING

WILL BE HELD ON

TUESDAY, JUNE 15 (10.30 a.m.)

WEDNESDAY, JUNE 16 (10 a.m.),

AND

THURSDAY, JUNE 17 (10 a.m.),

AT THE

INSTITUTION OF MECHANICAL ENGINEERS,

STOREY'S GATE, ST. JAMES' PARK,
WESTMINSTER,

By kind permission of the Council.

The Chair will be taken by the President,
THOMAS GLOVER, Esq.

In connection with the Meeting an Excursion to Norwich, will take place on the Friday, June 18. Full Particulars are announced in the Programme.

THE BENEVOLENT FUND.

The Annual General Meeting of the Contributors to the Benevolent Fund will be held at the Institution of Mechanical Engineers on Wednesday, the 16th of June, at 10 a.m.

WALTER T. DUNN, Secretary.

39, Victoria Street, Westminster, S.W.,
May 24, 1909.

SUTTON GAS COMPANY.

APPOINTMENT of Show-Room Sales-
man. Candidates who sent in Applications are THANKED for the Same, and are Informed that the VACANCY HAS BEEN FILLED.

DRAUGHTSMEN wanted experienced
in Gas-Works Plant, Coal and Coke Plants, &c.
Apply to **W. J. JENKINS AND CO., LIMITED, RETFORD.**

SUBURBAN Gas Company requires
a Young DRAUGHTSMAN, and a Young CHEMIST.

Apply, by letter, stating Age, Experience, and Salary required, endorsed "Draughtsman" or "Chemist," to No. 5103, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED—Clerk for Gas-Works in
Durham (25-Million make), to work under Manager. Must have had Training in Gas-Works' Office and Competent to Keep Books.

Apply, in own handwriting, stating Age, Qualifications, and Salary required, to Messrs. SCHULTZ, COMINS, AND CO., 50, Cannon Street, LONDON, E.C.

THE Preston Gas Company require the
Services of a Young WORKS CHEMIST. Salary, £80 per Annum.

Applications, with copies of Testimonials, to be received by the undersigned not later than June 14.
SAMUEL TAGG, Engineer

WANTED, a Smart, Intelligent Young
Man as IMPROVER to GAS-FITTING. One trained on Gas-Works preferred. He would be employed at present principally on Prepayment Fitting, Stove Repairs, and Cleaning. Wages 24s. per Week (57½ hours). To an intelligent Lad position would improve. Apply, by letter, to the MANAGER, Gas-Works, DORRING.

LIVESEY Washer Wanted, Modern
make, 10-inch Connections, to effectively deal with 250,000 to 300,000 Cubic Feet per day.
State Price to No. 5098, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PROCESS for the Manufacture of Self-
Igniting Incandescent Mantles TO BE SOLD in England to One Firm only. Great success in other Countries.
Address 37, Holtwhites Hill, Enfield, MIDDLESEX.

FOR SALE—Three Purifiers, by Newton,
Chambers, and Co., 20 ft. square by 5 ft. deep, Flanged Joints, 18-inch Valves and Connections, with Bye-Passes, Travelling and Lifting Gear. In Good Condition. Being Removed for Extension.
Apply to the SECRETARY, Gas Office, Sutton, SURREY.

FOR SALE, Cheap, the undermentioned
GAS PLANT:—
Kirkham's "STANDARD" WASHER-SCRUBBER to pass 250,000 cubic Feet per diem.
GASHOLDER, 3-Lift, 50 ft. dia., cap. 128,000 c.f.
EXHAUSTERS, 10,000 and 8000 cub. ft. per Hour.
4-inch Cast-Iron Vertical CONDENSER.
Wrought-Iron SCRUBBER, 9 ft. high by 3 ft.
Donkio's VALVES, 12-inch, 10-inch, 6-inch.
Apply to **SAMUEL WHILE and SON, 60, Queen Victoria Street, LONDON, E.C.**

ADVERTISER has to Offer, for Im-
mediate Delivery by Railway Trucks, in Large or Small Quantities, Fine Material from a large English Iron-Works, containing from 45 per cent. to 60 per cent. FERRIC OXIDE, and should be Useful for Gas Purification Purposes. Free Sample sent on Application.
Address No. 5102, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAYCOTT GAS COMPANY.

FOR SALE—The Dismantled Plant at
the Castle Donington (near Derby) Gas-Works, viz.: ASCENSION PIPES, ARCH PIPES, MOUTH-PIECES, HYDRAULIC MAIN, CONDENSERS, PURIFIERS, CENTRE VALVE, STATION GOVERNOR, EXHAUSTER, and CART WEIGHBRIDGE.
Also at Draycott Gas-Works, FOR SALE (hut still in use) FOUR PURIFIERS (nearly new), GAS-ENGINE, EXHAUSTER, &c.
For further Particulars and to view, Apply to the MANAGERS at the respective Works.

THE Coventry Corporation Gas Depart-
ment have FOR SALE about 170 WESTERN GAS-COOKERS, made by the Davis Gas Stove Company. These are excellent Gas-Cookers for Slot Consumers and are only offered for Sale because of being replaced by larger Cookers. They have been thoroughly Repaired, Cleaned, and Renovated, and supplied with New Grill Pans and Grids.
Price 12s. each, f.o.r. Coventry.

FLETCHER W. STEVENSON,
Engineer and General Manager.
Gas-Works, Coventry,
April, 1909.

KEIGHLEY CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for
the Supply of the following Materials required during the Twelve Months commencing on the 1st of July next:—

CAST-IRON PIPES AND OTHER CASTINGS.
B. O. VITRIOL.
LIME.

Also for the Purchase of SPENT OXIDE during the same period.

Particulars and Form of Tender can be obtained on Application.

Tenders to be sent in on or before the 14th inst.

JOHN LAYCOCK,
Engineer.

Gas Offices, Cook Lane,
Keighley, June 1, 1909.

SPALDING URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for
the Supply during the period ending June 30, 1910, of any quantity not exceeding 5000 Tons of GAS COAL or NUTS, delivered f.o.b. Tyne, Keadby, Goole, or Pit, or by Rail at Spalding Station.

Forms of Tender and other Information can be obtained on Application to Mr. H. R. Wimbhurst, Engineer and Manager, Gas-Works, Spalding.

Tenders, on the prescribed Form, sealed and endorsed "Gas Coal," must be received by me the undersigned on or before the 17th of June, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

H. H. HARVEY,
Clerk to the Council.

Council Offices, Spalding,
June 4, 1909.

COAL WANTED.

THE Urban District Council of Bangor
(Co. Down) invite TENDERS for Supplying about 8000 Tons of Best Screened COAL, to be delivered and Trimmed into Coal-Store at the Gas-Works, Bangor, at such times and in such Quantities, of about 250 Tons, as may be required from the 1st of July next.

Deliveries of Coal into the Works will only be received between the hours of Six a.m. and Eleven p.m.

Persons tendering to name the Pit from which the Coal offered is raised.

Tenders should be accompanied by Analyses, placed in sealed envelopes, marked "Tender for Coal," and must reach me not later than Monday, the 21st of June, 1909.

No Tender Forms issued.

Any further Particulars required can be had from Mr. Barker Mitchell, the Gas Manager.

The Council do not bind themselves to accept the lowest or any Tender, and will require security for the due and faithful performance of the Contract.

By order,
J. MILLIKEN,
Clerk to the Council.

Town Hall, Bangor, Co. Down,

June 2, 1909.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the
Supply of about 8000 Tons of Best GAS COAL, Screened, Unscreened, and NUTS, to be delivered free into the Council's Boats at the Pit Wharf, or at the Railway Station, Skipton, or at the Council's Wharf adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1909, and July 1, 1910, in Monthly Quantities.

Full Particulars as to Periods and Quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton, and Tenders, endorsed "Gas Coal," are to be sent to him on or before June 14, 1909.

TAR.

The Council also invite TENDERS for the Purchase and Removal of the Surplus TAR produced at the Skipton Gas-Works between the 30th of June, 1909, and the 1st of July, 1910.

Tenders, endorsed "Tar," are to be sent in on or before the 14th of June, 1909.

The lowest or any Tender not necessarily accepted.
RICHARD WILSON,
Clerk to the Council.

THE Urban District Council of Atherton invite TENDERS for the Supply of about 7000 Tons of Screened GAS COAL or NUTS from the 1st of July, 1909, to the 30th of June, 1910.

Forms of Tender and further Information may be had from the undersigned, to whom Tenders should be delivered on or before Wednesday, June 16 inst.

W. GARNETT, Clerk.

June 2, 1909.

BOROUGH OF NEWCASTLE-UNDER-LYME. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Delivery of 9000 Tons of GAS FUEL during the Twelve Months ending June 30, 1910. Forms of Tender may be had from the undersigned. Tenders to be sent to the Town Clerk on or before June 14, 1909.

The Committee do not bind themselves to accept any Tender.

E. P. BASKEYFIELD,
Manager and Secretary.

Newcastle, Staffordshire,
May 22, 1909.

NEWCASTLE-UNDER-LYME CORPORATION. (GAS DEPARTMENT.)

THE Gas Committee of this Corporation are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR produced at these works for Twelve Months ending June 30, 1910.

Tenders, endorsed "Tar and Liquor," to be sent to the Town Clerk on or before June 14, 1909.

The Gas Committee do not bind themselves to accept the highest or any Tender.

The Tar and Liquor to be taken in Boats.

E. P. BASKEYFIELD,
Manager and Secretary.

Newcastle, Staffordshire,
May 22, 1909.

DUNDEE GAS COMMISSIONERS. (DUNDEE CORPORATION.)

THE Dundee Gas Commissioners are prepared to receive TENDERS for the Supply and Delivery of 500 Tons of BOG ORE or OXIDE OF IRON for Gas Purification purposes.

Copy of Specification and Form of Tender may be obtained from the Subscriber.

Sealed Tenders, endorsed "Oxide of Iron," to be lodged with Wm. H. Blyth Martin, Esq., Town Clerk, City Chambers, Dundee, not later than Saturday, the 12th of June.

The Commissioners do not bind themselves to accept the lowest or any Offer.

ALEX. YUILL,
Engineer and Manager.

Engineer's Office, Gas-Works,
Dundee, June 1, 1909.

BOROUGH OF DARWEN.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply of the following Goods for One Year: WROUGHT-IRON TUBES AND FITTINGS. CAST-IRON MAINS AND SPECIALS. BRASS FITTINGS.

Full Particulars and Forms of Tender may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed and endorsed Tenders, must be delivered to me the undersigned not later than Saturday, June 26, 1909.

The lowest or any Tender not necessarily accepted.

By order,
Wm. P. HALLIWELL,

Town Clerk's Office,
June 3, 1909.

BOROUGH OF DARWEN.

TENDERS FOR TAR.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Surplus TAR produced at their Gas-Works for One Year.

Further Particulars and Forms of Tender may be obtained on Application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Tender for Tar," must be delivered to me the undersigned not later than Saturday, the 26th day of June, 1909.

The highest or any Tender not necessarily accepted.

By order,
Wm. P. HALLIWELL,

Town Clerk's Office,
June 3, 1909.

READING GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Reading Gas Company invite TENDERS for the Purchase of their Surplus CARBURETTED WATER-GAS TAR, for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on Application to the Engineer and Manager, Mr. Douglas H. Helps, Assoc.M.Inst.C.E.

Under the Conditions of the Contract, an allowance will be made for all Water that may be found in the Tar in excess of 5 per cent.

Railway and River Communication direct to the Works.

Tenders, endorsed "Tender for Tar," and addressed to the undersigned, must be delivered not later than Monday, the 21st inst.

The Directors do not bind themselves to accept the highest or any Tender.

A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
June 2, 1909.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas Committee invite Tenders for the Supply of 24,000 Tons of Screened COAL, PEA, and Large NUTS, up to June 30, 1910.

Tenders to be sent to the undersigned not later than June 22 next, endorsed "Tender for Gas Coal."

Forms of Tender and Particulars can be obtained from Mr. J. S. Naylor, Gas Engineer.

Firms whose Tenders are accepted will be required to enter into Contracts which will contain the Fair-Contract Clause.

The Committee do not bind themselves to accept the lowest or any Tender.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
May 29, 1909.

COUNTY BOROUGH OF ROTHERHAM.

THE Corporation of Rotherham are prepared to receive OFFERS for the Purchase of the Surplus GAS TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Year.

Forms of Tender and Specification may be obtained on Application to Mr. J. S. Naylor, Gas Engineer.

Offers, endorsed "Gas Tar and Ammoniacal Liquor," to be sent to me not later than June 22 next.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
May 29, 1909.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the Supply of not exceeding 6000 Tons of Screened GAS COAL or GAS NUTS, for use at the Gas-Works, Beverley, for a period of Twelve Months, to be delivered as from time to time directed, and at the expense of the Contractors, f.o.b. at Keadby or at the Pits, or at the Railway Station, Beverley, according to Terms of Contract. The Coal to be of the best kind, well Screened, free from Bats, Bind, Refuse, and Dirt, and to be weighed 20 cwt. to the Ton, upon the Corporation machine. The Seam from which the Coal is raised to be stated.

Payments will be made from time to time so long as the Contractors shall duly fulfil the Contract.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract as they think fit.

Further Information and Forms of Tender may be obtained of the Gas Manager, Mr. F. W. Oldfield, at the Gas-Works, Beverley, and Tenders, endorsed "Tender for Coals," must be delivered at my office not later than Ten a.m. on Thursday, the 24th day of June, 1909.

J. WILLIS MILLS,
Town Clerk.

Town Clerk's Office,
31, Lairgate, Beverley,
June 3, 1909.

This notice is not issued for the purpose of inviting subscriptions for Shares, but by way of information only, and no Applications will be entertained unless the same are made on the footing of and with reference to the full Prospectus.

The Subscription List will open on Thursday, the 10th day of June, 1909, and close on or before Wednesday, the 16th day of June, 1909.

Applications will be received by, and the full Prospectus and Forms of Application can be obtained at, Williams Deacons Bank Limited, Manchester, and any of its Branches, and from the Company's Solicitors, Auditors, or Engineers.

There are no Founders' Shares. No Promotion Money has been or will be paid.

THE RAINFORD GAS COMPANY, LTD.

(Incorporated under The Companies Acts, 1862 to 1907.)

CAPITAL - £8000 divided into 800 Shares of £10 each, which are now offered for Subscription at par.

The Shares are payable as follows:

£1 per Share on Application; £4 per Share on Allotment; £2 10s. per Share One Month after Allotment; and the balance of £2 10s. per Share as and when required, at not less than One Month's notice.

Directors:

EDWARD HENTHORNE, "Norwood," Poulton le-Fylde, Merchant.
JAMES LONGTON BOLTON, "Dial House," Rainford, Manager.
WILLIAM KAY, "Standish House," Stretford, Manchester, Engineer.

Bankers:

WILLIAMS DEACONS BANK LIMITED, St. Ann's Street Branch, Manchester.

Solicitors: DOUGHTY & FRASER, 17, Market Street, Manchester.

Auditors:

BOWMAN & GRIMSHAW, 26, Birley Street, Blackpool, Chartered Accountants.

Engineers: BRIERLEY, HOLT, & CO., Richmond Terrace, Blackburn.

Secretary and Registered Offices (pro tem.):

CHRISTOPHER CHRYSTAL, 17, Market Street, Manchester.

This Company has been formed for the purpose of acquiring The Rainford Gas Order, 1908 (as confirmed by the Gas Orders Confirmation Act, 1908), which is an Order authorizing the construction and maintenance of Gas-Works and the Supply of Gas in the Parish and Urban District of Rainford, in the County Palatine of Lancaster, and for other purposes, and pursuant to such order To CONSTRUCT AND MAINTAIN GAS-WORKS FOR THE SUPPLY OF GAS TO RAINFORD ACCORDINGLY.

The Parish and Urban District of Rainford comprises some 3500 inhabitants. There is no Public System of Lighting in the District.

There are, in the Area of Supply, the Parish Church of All Saints; the Roman Catholic Chapel and Presbytery; the Congregational Church; the Primitive Methodist Chapel; the Schools attached to these places of Worship; the new Rainford Urban District Council Offices, Reading and Recreation Rooms; the L. & N. W. and L. & Y. Railway Stations.

The Directors intend to provide and fix Services, Cookers, and Fittings. It is also intended to make provision for those Consumers who desire to take their Supply through Prepayment or Slot Meters.

The Plot of Land forming the Site of the proposed Gas-Works adjoins the London and North Western Railway (Rainford Junction to St. Helens). It is freehold, and centrally situated for convenient distribution, and provides ample space, not only for the erection of the proposed Works, but for future extensions.

The Vendors have Contracted to Purchase this Plot of Land, together with One Half of the Siding, Points, Crossings and Workings as at present existing, and extending from the St. Helens Branch of the L. & N. W. Railway to and on to the Land referred to, for the sum of £1045 (plus Vendors' costs), which will be paid for in cash out of the proceeds of this issue. This Siding will be of considerable importance in economically dealing with Coal and Residuals.

It is estimated that the cost of constructing the proposed Gas-Works Plant, and the laying of the Mains will amount to £5300. The Supply and Erection of the Gas-Producing Plant has been entrusted to Messrs. Newton, Chambers, and Co., Ltd., Thorncliffe Iron Works, Sheffield.

It is anticipated that the necessary works will take some Six Months to complete, and such works will be able to produce a minimum of 8,000,000 cubic feet of Gas per Annum, with Plant to deal with double this quantity.

The Remunerative Nature of similar Gas Undertakings is shown by the following, extracted from *The Gas Works Directory and Statistics, 1908-9*.

Name of Town.	Population Supplied	Share Capital paid up	Loan Capital.	Dividend.	Interest on Loan.
Bolsover, Derbyshire .	3,748	£12,000	£1,250	13%, 10%, & 10%	4%
Burton-Latimer, Northants. . . .	3,500	£5,100	£1,000	8½%	4%
Chepstow, Mon. . . .	4,500	£7,000	£1,750	5%	3½% & 4%
Connahs Quay, Flint .	4,000	£7,770	£3,400	8%	4%
Dronfield, Derbyshire .	4,000	£13,800	Nil	5½%	—
Hollingworth, Cheshire	3,500	£4,792	£1,100	7½% & 5½%	4%
Huyton & Roby, Lancs.	5,500	£19,575	£1,800	10% & 7%	3½% & 4%
Oakham, Rutland . .	3,900	£11,600	£2,900	(5% Pref. 10% Original Shares 7% New Ordinary)	4%
Ormskirk	6,298	£25,836	£2,000	10% & 7%	3½% & 4%
Prescot, Lancs. . . .	10,000	£23,588	£5,100	9%, 7%, 5%, 4½%, & 4%	3½%

It is to be noted that by the Rainford Gas Order, 1908, above mentioned, there shall not be declared or made in any One Year out of the Profits of the Company, any larger dividend than £10 in respect of every £100 actually paid up of the Capital, unless a larger Dividend be at any time necessary to make up the Deficiency of any previous Dividend which shall have fallen short of the said Yearly rate.

Attention is called to the fact that the Vendors do not make any Profit out of the Sale, as by Section 6 of the Rainford Gas Order, 1908, it is provided that the consideration payable by the Company to the Vendors or their Executors, Administrators, or Assigns for the Transfer of the Undertaking, shall not exceed the aggregate amount of the Costs, Charges, and Expenses preliminary to, and of and incidental to the Applying for, Preparing, and Confirming the said Order, and otherwise in relation thereto. Such Costs, Charges, and Expenses have been taxed by the Board of Trade at £938 6s. 11d.; and the Board of Trade has assented to the Transfer to the Company and has fixed the consideration payable in respect thereof at £1000, which will be paid by this Company in cash, or Shares, at the option of the Vendors.

A Commission of 2½ per cent. will be paid to Brokers on all Allotments upon Applications bearing their stamp.

The full Prospectus contains Particulars of Contracts and other Information to satisfy the requirements of the Companies (Consolidation) Act, 1908.

Copies of the above-mentioned Rainford Gas Order, 1908, Agreements, Memorandum, and Articles of Association may be inspected at the Offices of the Company's Solicitors, between the hours of 10 a.m. and 4 p.m. (Saturdays 10 to 12) while the Subscription List is open.

Applications for Shares should be made on the proper Form and forwarded, with a Cheque for the amount payable on Application, to the Company's Bankers. If no Allotment is made, the deposit will be returned in full. Where a less number of Shares is allotted than is applied for, the Surplus paid on Application will be credited in reduction of the amount to be paid on Allotment. Should default be made in payment of the amount of any instalment when due, the amount previously paid will be liable to forfeiture.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1910.

Full Particulars and printed Form of Tender may be had on Application to the undersigned.

Tenders, endorsed "Coal," are to be sent in addressed to the Chairman, by Thursday, June 10, 1909.

SAM. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the Surplus TAR to be produced at their different Gas Stations for a period of One Year, commencing the 1st of July next.

The Yearly make of Tar is about 8000 Tons.

Particulars and Forms of Tender can be obtained on Application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, June 22, 1909.

J. H. HALLSWORTH,
Town Clerk.

Oldham, June 3, 1909.

HINDLEY URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the Supply of, Delivered at their Gas-Works, about 8000 Tons of Best Screened Arley GAS NUTS, ENGINE SLACK, and LIME, for the Twelve Months ending June 30, 1910.

Particulars and Forms of Tender may be obtained from H. O. Timmins, Gas Engineer.

Tenders must be on the Council's Form, and must be delivered to the undersigned, endorsed "Gas Coal," on or before Monday, June 14, 1909.

The Committee reserve to themselves the right to accept the whole or any portion of any Quantity offered, and do not bind themselves to accept the lowest or any Tender.

THOS. ROBEY,
Clerk to the Council.

BOROUGH OF EVESHAM.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Evesham Corporation invite TENDERS for the Supply of from 1000 to 3000 Tons (or less if required) of Best Screened GAS COAL, during the Year ending the 30th day of June, 1910, to be delivered on rail at Evesham.

Tenders, to be marked "Tender for Gas Coal," to be sent to me not later than the 26th day of June inst., and to include full description as to Coal and price.

No Form of Tender supplied.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS A. COX,
Town Clerk.

Town Clerk's Office,
Evesham, June 2, 1909.

BOROUGH OF NEWBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the Newbury Corporation invite TENDERS for the Supply of 5500 Tons of GAS COAL or NUTS, during the period of Twelve Months between July 1 next and the 30th of June, 1910, to be delivered free to Newbury Station on the Great Western Railway, in such Quantities as may be agreed.

Tenders, to be endorsed "Tenders for Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Newbury, and delivered not later than June 11 next.

The Committee do not bind themselves to accept the lowest or any Tender.

Form of Tender from the undersigned.

WM. RD. DAVEY,
Manager.

Gas-Works, Newbury,
May 29, 1909.

WHITEHAVEN HARBOUR.

TENDERS FOR LIGHTING.

THE Whitehaven Harbour Commissioners are prepared to receive TENDERS for LIGHTING the HARBOUR QUAYS, &c., by Electricity, Gas, or other means, for Five Years, or such other period as may be agreed upon, from the 1st of January, 1910.

Application must be made to the Harbour Master for Particulars.

Sealed Tenders, endorsed "Lighting," addressed to the undersigned, must be delivered not later than Ten a.m. on Tuesday, the 20th of July, 1909.

The Commissioners do not bind themselves to accept the lowest or any Tender.

JOHN TYSON,
Clerk.

Harbour Office, Whitehaven,
June 1, 1909.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

TENDERS FOR SURPLUS TAR.

THE Directors invite offers for the Surplus TAR made at their Brierley Hill and Kingswinford Works, to be taken between July 1 next and June 30, 1910, delivered into Buyer's Boats.

Quotations to be based on the rate of 200 Gallons to the Ton.

The Directors do not bind themselves to accept the highest or any Tender.

Sealed Tenders, to be addressed to the Chairman and endorsed "Tender for Surplus Tar," not later than June 26 next.

HENRY M. JACKSON,
Secretary.

Board Room, Gas-Works,
Brierley Hill, May 25, 1909.

COUNTY BOROUGH OF BURY.

THE Corporation of Bury are prepared

to receive TENDERS for the Supply of about—
40,000 Tons of GAS COAL.

900 Tons of BOILER SLACK.

400 Tons of BURY.

300 Tons of HOUSE COAL.

Forms of Tender and Conditions may be obtained on Application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

Tenders to be delivered to the Town Clerk, Bury, not later than Nine a.m. on Monday, June 14, 1909.

CITY OF HEREFORD.

(GAS DEPARTMENT.)

TENDERS FOR TAR.

TENDERS are invited for the Surplus

TAR produced for the Twelve Months ending June 30, 1910.

Tenders, addressed to the Chairman of the Gas Committee, must be delivered at the Town Hall not later than the first post on the 21st inst.

W. W. TOWNSEND,
Engineer and Manager.

Gas-Works, Hereford,
June 1, 1909.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED from the 14th to the 21st of June, 1909, both days inclusive.

The Interest for the Half Year to June 30, 1909, will be payable on the 1st of July to the Proprietors Registered on the closing of the Books.

By order of the Board,

E. TOFLEY,
Secretary.

Chief Offices of the Company:
639, High Road, Tottenham,
June 3, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

GREAT YARMOUTH WATER-WORKS COMPANY.

NEW ISSUE OF £8000 NEW ORDINARY STOCK, AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 750 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, June 9, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

READING GAS COMPANY.

SALE BY TENDER OF FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

THE Directors of the Reading Gas

Company invite TENDERS for:—

£5000 FOUR PER CENT. PERPETUAL

DEBENTURE STOCK,

to be raised in Pursuance of the powers of "The Reading Gas Act, 1902."

Sealed Tenders, on the Form provided, must be delivered at the Company's Central Offices, 159, Friar Street, Reading, on or before Monday, the 14th of June, 1909.

The Stock will be allotted to the highest bidders, and will be Registered in the names of the Purchasers, or their Nominees, Free of Expense.

The Purchase Money for the Stock to be paid by the 30th of June, 1909.

The Debenture Stock ranks before the whole of the Company's Preference Shares and Ordinary Stock, and the interest on the same has priority of payment over the Dividends on the said Preference Shares and Ordinary Stock.

Particulars and Conditions of Sale and Forms of Tender may be obtained on Application to the undersigned.

By order of the Directors,
A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
May 18, 1909.

COAL.

THE Salisbury Gas and Coke Company

invite TENDERS for 1000 to 3000 Tons of GAS COAL delivered f.o.r. Salisbury as required over next Twelve Months.

Tenders (on Sender's Form) before June 12, addressed to Mr. N. H. HUMPHREYS, Gas-Works, SALISBURY.

To Close a Trust.

TO BE SOLD BY

MR. H. SAVILE JOWETT, at the Old Cock Hotel, Halifax, on Friday, the 18th day of June, at 7.20 o'clock in the Evening precisely.

FIVE DEBENTURE SHARES, OF £50 EACH, IN DRAKE'S, LIMITED.

1000 PREFERENCE SHARES, OF £1 EACH, IN DRAKE'S, LIMITED, FULLY PAID.

1000 ORDINARY SHARES, OF £1 EACH, IN DRAKE'S, LIMITED, FULLY PAID.

For further Particulars, Apply to the AUCTIONEER, at his Offices, Warwick Chambers, Southgate, HALIFAX; and for Inspection of the Special Conditions of Sale to JOHN MITCHELL, Solicitor, 11, Fountain Street HALIFAX.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT 20 & 21 VIC. CAP. XLV. (1857).

ISSUE OF £3 10s. PER CENT. PERPETUAL DEBENTURE STOCK AT PAR.

(This is an Authorized Trustee Investment Stock under the Trustee Act, 1893.)

NOTICE is Hereby Given, that the

Directors of the above Company are prepared to receive APPLICATIONS for the above STOCK at par, being PERPETUAL DEBENTURE STOCK authorized under the Provisions of the Company's Acts of Parliament and Orders. The Stock will bear Interest on and from the date of payment of the money at the rate of £3 10s. per Centum per Annum, payable Half-Yearly in respect of the Six Months ending the 31st of March and the 30th of September in each Year.

Applications to be forwarded by post, addressed to the Secretary of the Company, on or before Tuesday the 15th day of June, 1909.

In the event of Allotment, the amount must be paid within One Month from the date of the Allotment Letter. If this provision is not complied with, the Allotment will be thereby cancelled.

The Directors will endeavour to deal with Applications in the order in which they are received, subject to an option of conversion to the holders of existing Mortgage Debenture Bonds. But the Directors do not bind themselves to accept any Offer; and it is further stipulated that the determination of the Board of Directors in all matters relating to the Offer, Allotment, Issue, or otherwise in respect of the above Stock, shall be final and binding on all parties. No amount of Stock less than £50 will be allotted, and the Stock will be transferable in multiples of £1 only.

No Offer will be considered unless made on a Form of Application which can be obtained from the Secretary.

By order of the Board of Directors,

J. L. WILKINSON,
Secretary to the Company.

Offices: Commercial Road,
Portsmouth, May 20, 1909.

AUTOMATIC STREET LIGHTING

MEANS

DR. ROSTIN'S APPARATUS.

Largest Installations in the World.

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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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Above the Average in Weight and Quality of Coke.

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Manufacturers of GAS RETORTS, GLASSHOUSE
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Special Lumps, Tiles, and Bricks for Regenerative
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ALL OTHER GAS APPARATUS.

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MIRFIELD GAS COAL.
UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

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Makers of Cast-Iron PIPES and CONNEC-
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COLUMNS of every description, Hydraulic,
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CALORIMETER

for determining the calorific
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IS MADE BY

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For Pressure Scales in One Length up to 4 feet.

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ALEXANDER WRIGHT & CO., LD.
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ALFRETON IRONWORKS, DERBYSHIRE,
AND

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Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
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GIRDERS, SPECIAL CASTINGS, &c., re-
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NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
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and rendering Leakage impossible.

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29,000 feet and 10,000 Fasteners sold.

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STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not
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Top Quality FIRE-BRICKS, QUARRIES, &c.

High Grade Silica Bricks and Blocks for Com-
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The New Smokeless Fuel.

Why Gas Companies should adopt the above Process:—

- (1) Because no extra Capital is required.
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be used by MALTSTERS.
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- (4) Coalexld finds a readier Sale than Coke.
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For further Particulars, apply to—

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,
also VALVES of all descriptions.
R. LAIDLAW & SON, LTD.,
ALLIANCE FOUNDRY, 147, MILTON STREET, GLASGOW,
And LAMBHILL FOUNDRY, GLASGOW.
OFFICE: 147, MILTON STREET, GLASGOW.

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GAS MANTLES.

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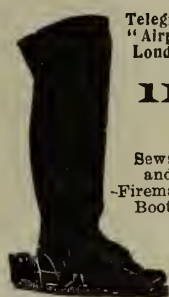
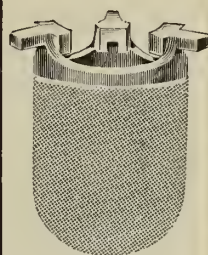
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and are specially suitable for **STREET LIGHTING**
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Largest Manufacturers of Gas
Main Bags.

Patentees of the DENMAR BAG,

Impervious to Main Liquor and
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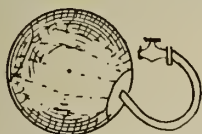
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Gas Bags for repairing
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Stitched and Taped.



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LARGE CAST IRON
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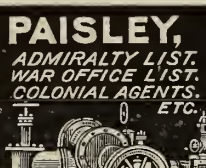
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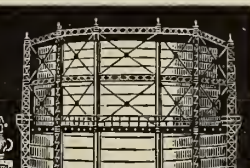
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ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Spermin, 820'20.

VERY FREE FROM IMPURITIES.

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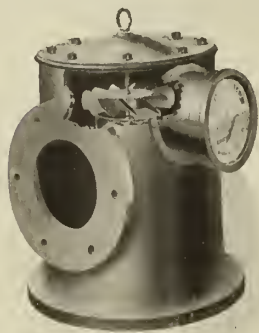
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OF THE

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For Coke Oven Gas.
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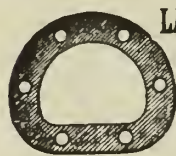
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LARGEST MANUFACTURERS in the UNITED KINGDOM
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Large Stocks of Bricks of all sizes,
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Retorts and other Fire-Clay
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THE MANIFEST SUPERIORITY OF THE "OMAR"



Contrast for a moment a burner with a
solid casing and one with a perforated casing
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With the former you have a dark,
unattractive piece of metal—the only use of
which is to cover the still more unattractive
burner parts.

Look at the casing of the "OMAR!"
It gives to the whole burner a light and
artistic appearance, and the light passing
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minates the upper portions of the room in
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Result: Superior appearance; no waste
light; whole burner luminous.

"OMAR" burners give perfect satisfac-
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GENTLEMEN,

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We have an Exhibition of Modern Gas-Fittings which is probably the most Artistic in London; in addition, our new Dreadnought Outside Lamps will be on view, and also the "Hands" Cool Burner, the "Norwich" Switch and other Specialities. *All of British Manufacture.*

An inspection of the "Norwich" System installed will convince you of its great value when in the keenest competition with Electricity.

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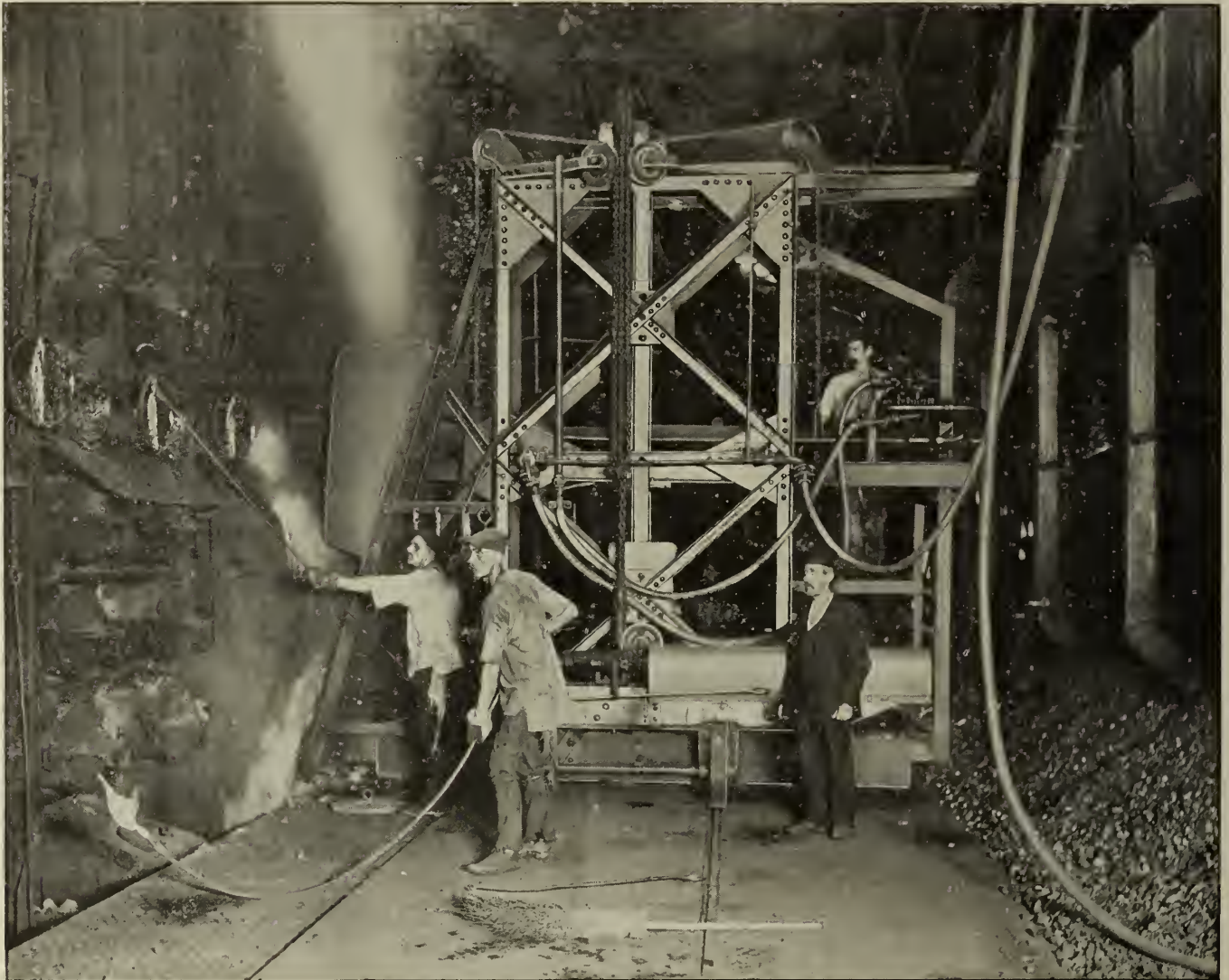
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FOR

CHARGING AND DRAWING GAS-RETORTS.



Photograph of New Hydraulic **COKE PUSHER** at work (Hunter and Barnett's Patent).

THE ABOVE MACHINE WILL DISCHARGE A RETORT IN ONE OPERATION.

BY USING IT, THE "LIFE" OF YOUR RETORTS WILL BE MATERIALLY INCREASED; AND THE DESTRUCTIVE "HAMMER-ACTION" INSEPARABLE FROM THE ORDINARY RAKE ENTIRELY DONE AWAY WITH.

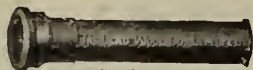
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For Modern Gas Distribution
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Excellent results obtained on HIGH-PRESSURE MAINS
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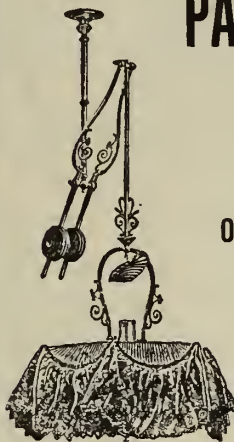
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OVER 65,000 NOW IN DAILY USE.



The ONLY GAS-PENDANT
suitable for Domestic Lighting;
a room 18 ft. by 14 ft. being
beautifully illuminated with
one Incandescent Burner.

*Used in the private apartments of their
Majesties the King and Queen
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SIMPLE AND INEXPENSIVE.



"RAPID" MANUAL CHARGER AND SCOOP CARRIAGE WORKING AT
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INCREASED
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REDUCTION
OF FUEL
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Also for name of Works where you
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MAXIMUM EFFICIENCY GUARANTEED.

Inspection of Working Plants Invited.

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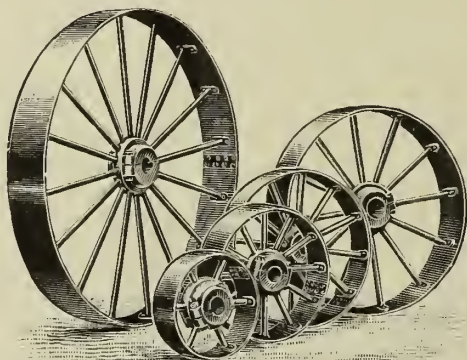
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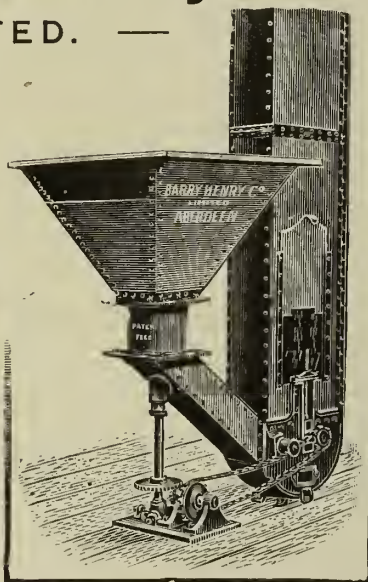
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AND

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LONDON. E.C.

RETORT HOUSE GOVERNORS.

THESE Governors are made to prevent fluctuation in the Pressure of Exhaust in the Hydraulic Main by controlling the Gas entering the Governor, notwithstanding the constant varying quantity of Gas coming from the Retorts. This enables the Seal of the Dip Pipes to be reduced to a minimum with perfect safety, and an increase in the make of Gas per Ton of Coal is thereby assured.

There is absolutely no possibility of any sticking, due to deposits of Tar or Pitch, with this Governor, as the Cone is quite free to pass through the Seat. The Regulation by means of a long Parabolic Cone is recognized as the most exact method that can be employed. A great improvement, first introduced by Messrs. JAMES MILNE & SON, LIMITED, is the simple arrangement by which a smaller Cone and Seat can be easily fitted, thus ensuring delicate adjustment during a period of small makes.

PRICES AND SIZES ON APPLICATION.

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Welsbach

LIGHT

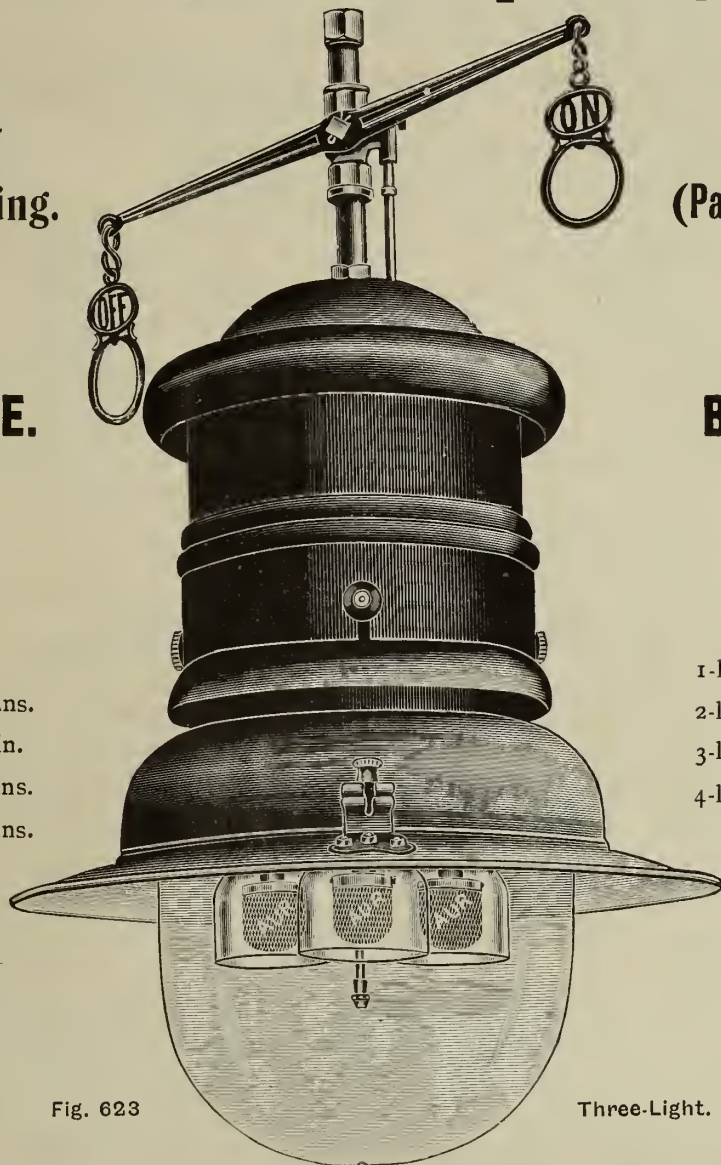
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.



Height over all.

1-light	. . .	1 ft. 8 ins.
2-light	. . .	2 ft. 1 in.
3-light	. . .	2 ft. 4 ins.
4-light	. . .	2 ft. 7 ins.

Width over all.

1-light	. . .	1 ft. 1 in.
2-light	. . .	1 ft. 4 ins.
3-light	. . .	1 ft. 6 ins.
4-light	. . .	1 ft. 8 ins.

Fig. 623

Three-Light.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.		Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	30/-	5/- extra.	3-light	12 feet	400	52/6	6/- extra.
2-light	8 feet	260	47/6	6/- extra.	4-light	16 feet	550	72/6	9/- extra.

All on or off, or One light on and the rest off, 7/6 per Lamp extra. Cup and Ball, 3/6 per Lamp extra.

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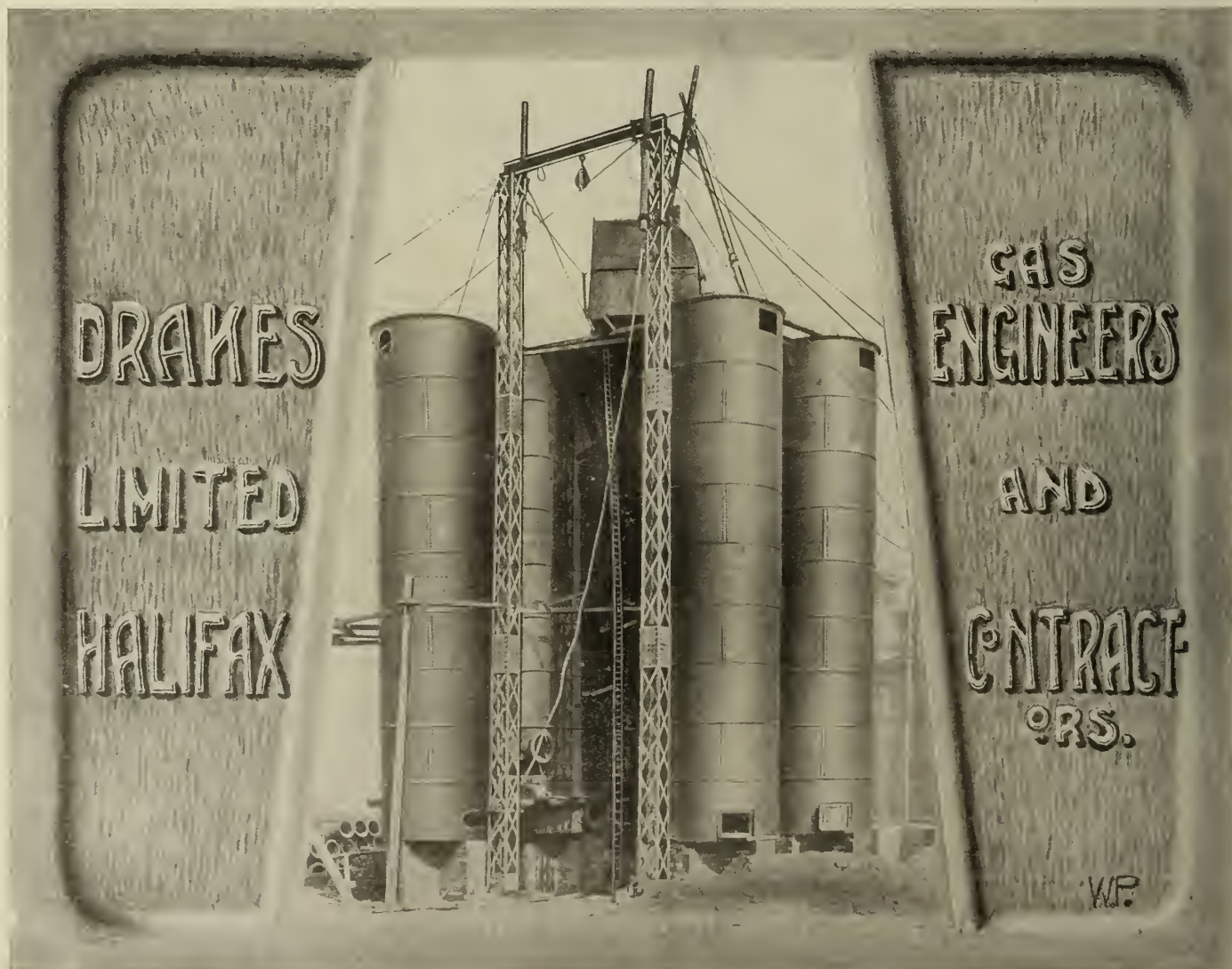
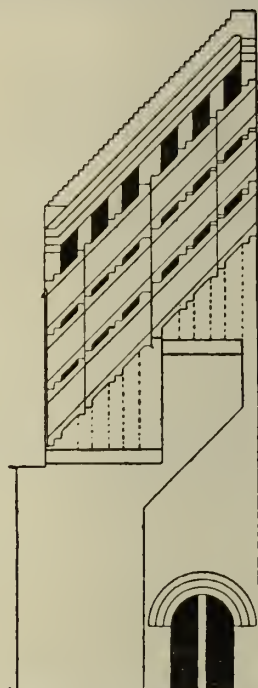
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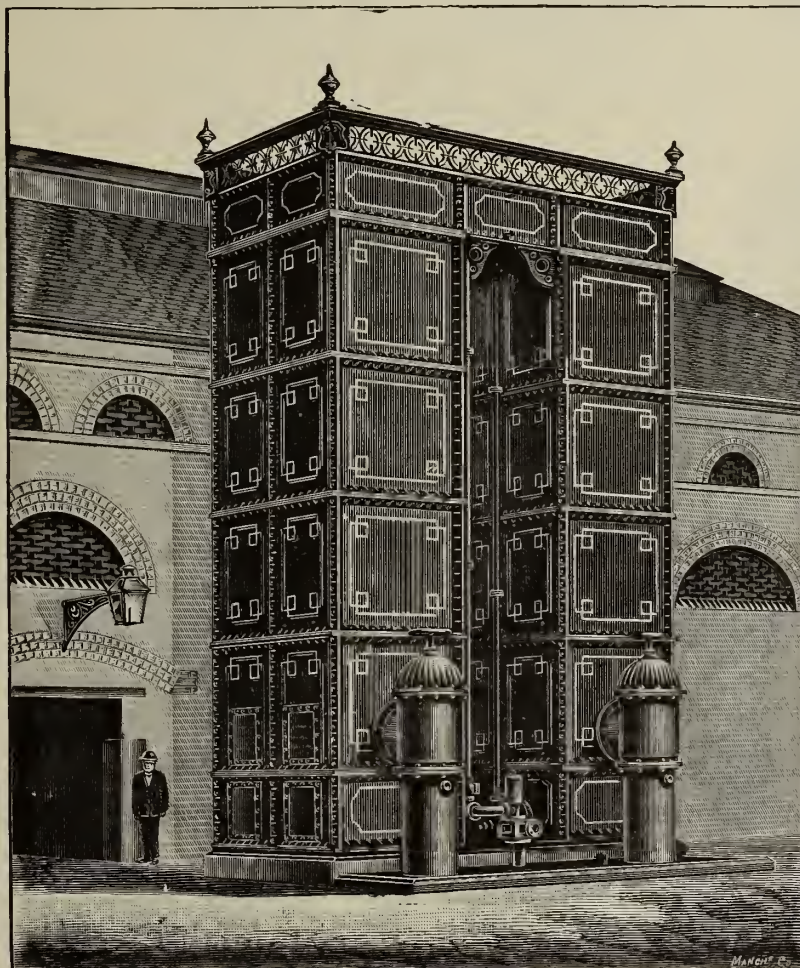
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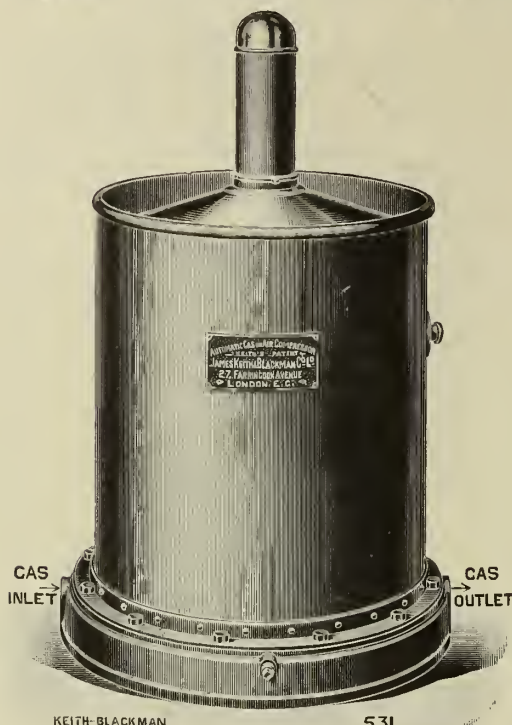


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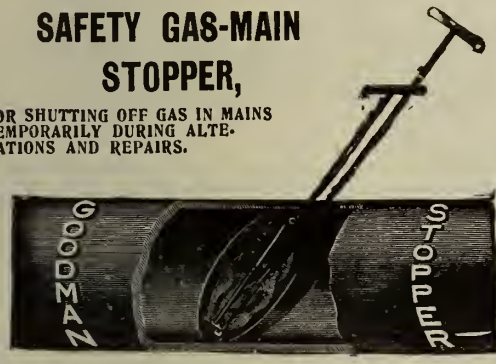
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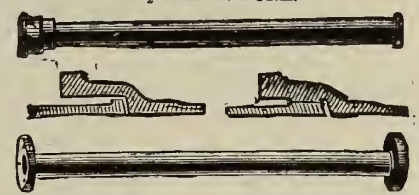
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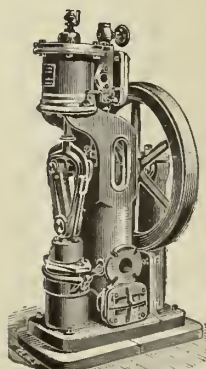


Fig. 703. "SINGLE RAM" STEAM-PUMP.

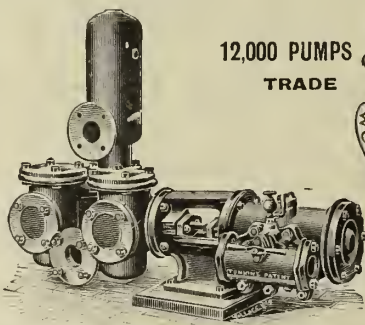


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

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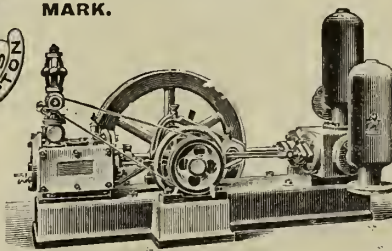


Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

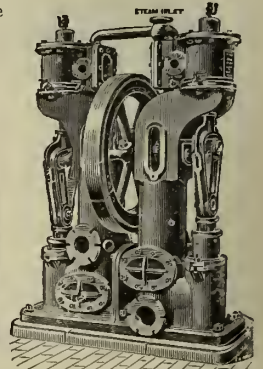


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.



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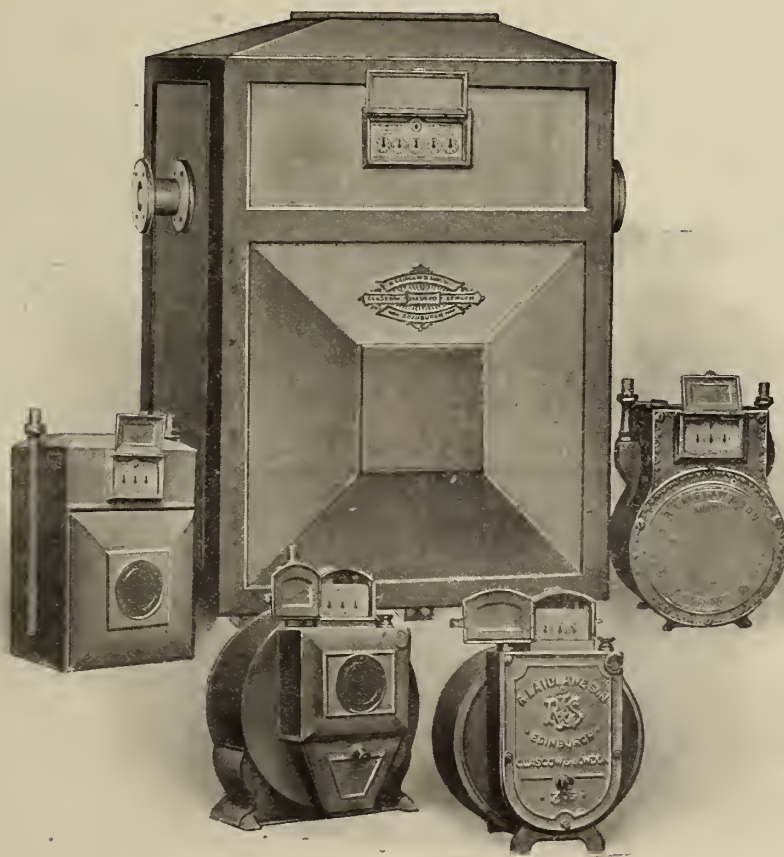
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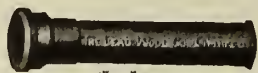
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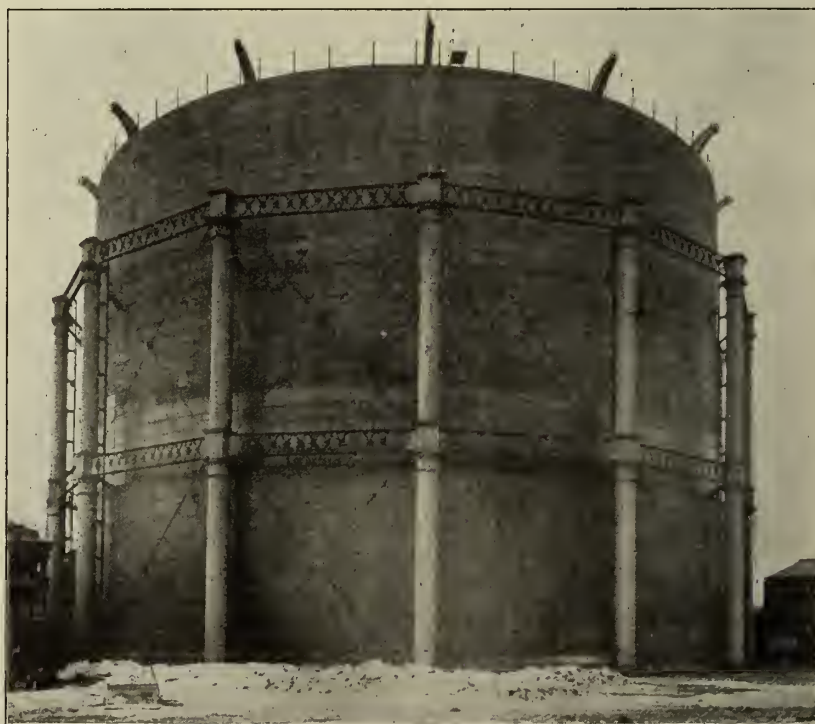
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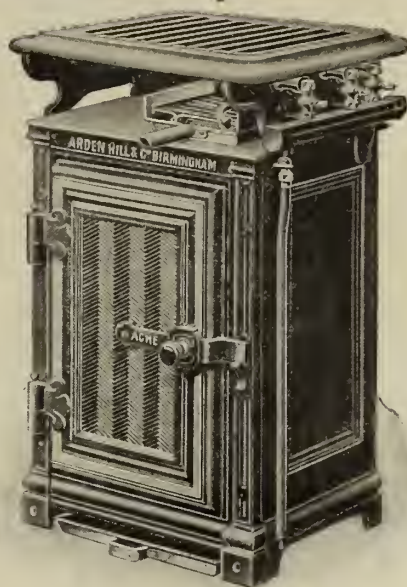
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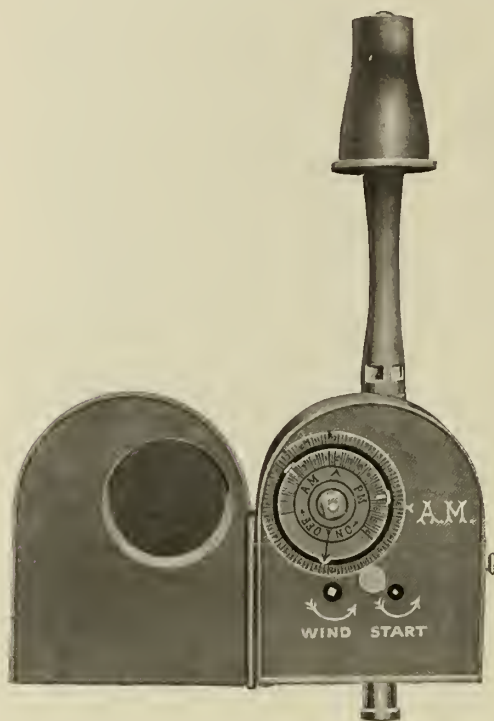
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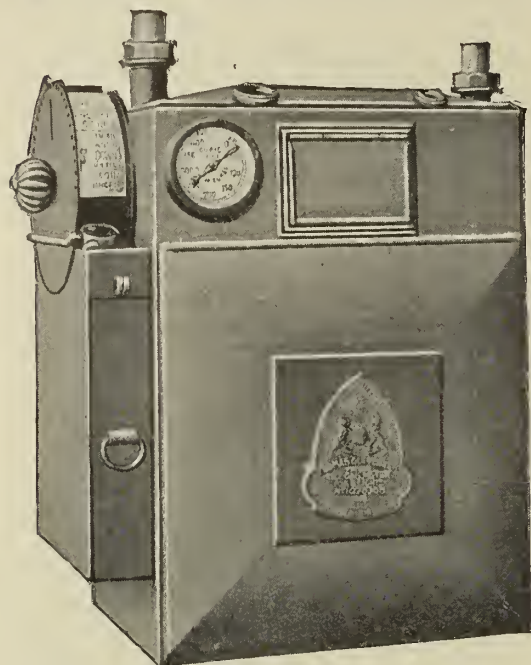
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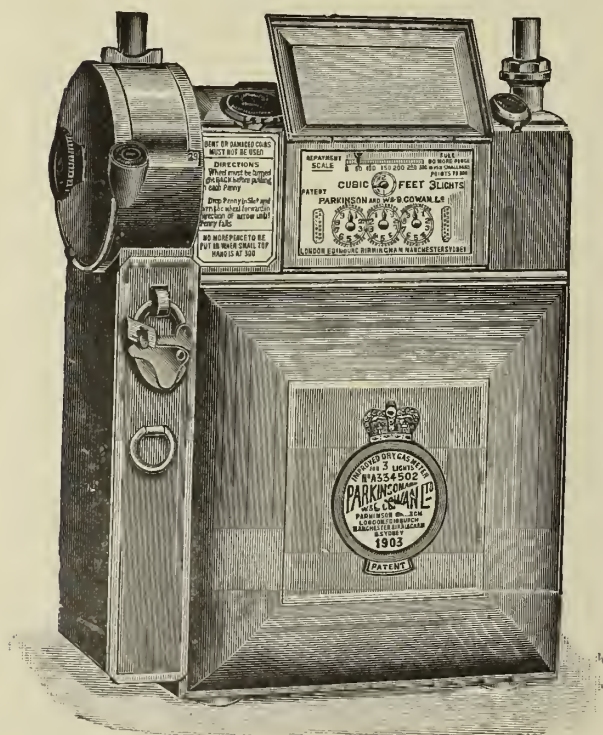
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EDITORIAL NOTES—GAS, &c.

The Sequel to the Gas Section.

RATHER late in the day, but unavoidably so, the Committee of the Gas Engineering Section of the Franco-British Exhibition of 1908, have rendered the final account of their stewardship. Now that the so-called International Exhibition at Shepherd's Bush is in as full swing as it can ever hope to be, the demonstration to which the report and accounts of the Committee refer seems somewhat remote from the present. But as a matter of fact, it is not a great while ago. The Franco-British Exhibition only closed last October; and the Committee have found that a considerable amount of final adjustment, in which several parties were concerned, has had to be made. But it has now come to an end; and the Committee are no doubt extremely glad, no matter how much their hearts were in the work, to see the close of it. Unquestionably, the satisfactory thing about it, from their point of view, is that they have come out of the enterprise with an account in which the receipts balance expenditure. Had, however, the Committee been better supported, the work would have been easier and far more pleasant; and they would have been in a position to have accomplished something still more effective. In point of fact, of a revenue of £4327, with which the Committee had to work, £4057 was subscribed by only 148 gas undertakings; and after all the payments incidental to space, building, furnishing, &c., had been made, the Committee had considerably less than £1000 for the running of the exhibition for six months, including gas, salaries, fees, &c. That they did so much on so little during the exhibition is due to management and the friendly assistance that was at hand; but more might have been effected in the way of solid work had the funds flowed in a little more freely. The experiences gained on the occasion will be exceedingly valuable in the future organization of demonstrations of the advances of the gas industry, as well as their general conduct. But we will not here go into matters that are historical; simply leaving this final piece of evidence of the interesting and instructive demonstration of 1908, with a repetition of our congratulation of some months ago to the Committee, and especially to Mr. J. W. Helps, the Hon. Secretary, and Mr. D. Milne Watson, the Vice-Chairman, for the signal services they rendered. Acknowledgments of these are placed on record in the report, signed, on behalf of the Committee, by the Chairman (Mr. H. E. Jones).

The Art of the Gas Engineer.

By distant comparison, progress is accentuated. Many of us can look back to the time when the processes of gas manufacture, distribution, and uses were comparatively simple, and displayed an amount of scientific modesty that would be treated with scant courtesy by the unthinking section of the gas novitiates of to-day. Let them turn, however, to one of the gas text-books of many years ago, and read, mark, learn, and inwardly digest (with due consideration for the variation of position) the story of the gas practices of the time, and then read a descriptive account of some modern gas-works on the large scale; and the exercise will strengthen their respect for the gas engineers of a long dead past, and heighten their admiration for the immense advances in the art of gas engineering that have been registered during (say) the last thirty years or so. Let it be remembered by them that, comparatively plain though the work of the gas engineer was in a bygone period, those earlier workers in the profession of which any man should be proud to belong in these days laid truly and well the foundations on which the more elaborate work of the present is constructed. Those earlier workers had not the same opportunities that the workers of to-day can command. They were circumscribed in what they did by the relatively small amount of business

that they could gain through the at one time single application of gas (and a dear application it was in comparison with modern method), the smaller communities and limited areas supplied, and the then almost unthought-of uses of gas in industry and for domestic purposes other than lighting. The major part of the undertakings were of too small a character for the application of mechanical operation; and the incentive was not of the character that it is to-day. Moreover, in the development of structure and processes, progress along the untrodden ways had to be accompanied by severe caution. Science, too, had not come so handsomely to their aid as it has to their successors in later years, opening up fresh avenues in which to exercise ingenuity.

The art of the gas engineer has largely changed by circumstances. The extensiveness of the gas industry in these later years has given—particularly in the centres where works of considerable character and feature can be erected—scope for new conception and application, and for adaptation of known principles to new purposes. Where an engineer has the coveted opportunity of building a large complete gas-works on a new site, he has clear ground before him over which to show that gas engineering is an art that holds position with any other of the main branches of engineering. It is not in undue elaboration that the gas engineer asserts his skill, but in taking the ground before him, and laying it out in manner that will permit of free and economical working, future economical extension, and enable him to realize from the site the greatest productivity at the smallest working cost, consistent with the capital he has expended. Upon the first plotting of the ground, the working of a long future depends; and therefore upon the originator a responsibility of a no mean order rests. In the buildings and plant put on the site, there can be no hard-and-fast rules regarding the capital expenditure. A proportion of the capital expenditure may be justified by the economies it will thereafter produce; and therefore the investment, though increasing the capital per million cubic feet of production, and the capital charges per 1000 cubic feet sold, may be a perfectly good one.

Reflections such as these, and illustration of the broadened opportunities of the times for gas engineers in the exercise of their polyhedral art, are produced and presented by the description of such new works as Mr. Fletcher Stevenson has designed and constructed on an entirely new site at Foleshill for the city of Coventry, and which were inaugurated with due ceremony last Thursday. The father of the son did much splendid work in his time; and much of it is standing to testify to his skill as an engineer. But with all he did, he had not such opportunity for producing, on a single site, a combination of plant such as has fallen to the lot of one of his own sons. But there is no need to go outside Coventry to compare the past of gas engineering with the present scope that it presents. The old cramped gas-works, with many ancient parts that have done good service for Coventry, were only closed down at Whitsuntide; and it would not be unprofitable to many a young gas engineer to go and look upon the old picture and then upon the new, for the material illustration of the progress of the art which he has adopted. Something of what he would observe was sketched by us in the "JOURNAL" columns about three years since; and from what he would see now in the old works and embodied in the new, he would be able to appreciate the substantial character of the progress effected more than the totally uninitiated in these matters. Part of a gas engineer's work is invisible by being underground; and therefore it does not appeal, the same as large visible structure, to the eye of the layman in such matters. And, again, the processes and products of the gas engineer's work are now so diversified that their very extent prevents them from coming within the comprehension of any but those who live in the industry.

Singling out the new retort-house, we have there an illustration of vast changes compared with the past. The structure itself is representative of change in such buildings, and,

in the main, of similar structures of modern build, in its steel framing, and simple brick panelling, with light galvanized iron roof. Yet in it the engineer introduces a novel feature in that the main stanchions starting from the yard-level finish at the level of the body part of the overhead coal-hoppers, and act as buckstays for every alternate retort-bed. Each stanchion, too, carries the end of a main cross girder—open lattice in the centre, and plate webs at the ends, which run through the hoppers forming the side thereof. The coal delivery methods, the coke quenching and removal, the settings themselves in their several details, the simultaneous charging and discharging of the retorts—common enough to-day—are all representative of immense departures from the old order of gas-engineering practices. Then carburetted water-gas plant supplements the coal gas manufacture. The chemical works and the sulphate works on the same site are types of the varied modern requirement in knowledge of the gas engineer. In addition to gas and steam, electricity and water under pressure are employed for power, showing the need for an overlapping of the accomplishments of the gas engineer into those of the electrical and the hydraulic engineer. The provision of a well and water-tower for an independent water supply, takes the gas engineer into the realms of the specialist water-supply engineer. And the large adoption of mechanical appliances about gas-works, renders more necessary than ever the fittings shops, well-equipped with machine and other tools. With such a variety of machinery under his care, the gas engineer must, to be equal to his duty and trust, be a thoroughly good mechanical engineer.

Such general considerations as these instance the high position to which the art of the gas engineer has attained. But let it not be imagined by the young engineer that the qualified men of the profession to-day are better than the qualified men of a long past. Opportunities, as much as the growth of knowledge and the revelations of science, have produced much of what is now seen about us. Given the opportunities, the qualified gas engineers of a deep-down past—they were men of calibre as now—would have risen to the occasion, and would have answered the calls for an expanded application of their abilities.

Fuel and Other Costs of Suction-Gas Plants.

In other columns, we print a paper, and in due course shall be publishing the discussion, on the subject of the working results of water pumping-engines operated by producer gas. The author is Mr. D. Hastings Irwin; and the communication was made at the annual meeting of the Association of Water Engineers last week. The paper embraces some instructive detailed costs in connection with suction-gas plants—particularly the plant at the New Arrol-Johnston Car Company's works for generating electrical current—which will be exceedingly useful to gas engineers in compiling complete comparisons of such plants with gas-engines driven by town gas, in which later case much of the expenditure on the former, with several of the items of cost, have to be entirely cancelled. At the end of the tabulation specially mentioned, the costs per kilowatt-hour at the switchboard are given, and they amount to 0·35d. Manufacturers of suction-gas plant are frequently advertising, and dazzling manufacturers with, the low fuel costs per brake horse power by the use of such plants; but it will be seen from this table that of the 0·35d. no less than 0·2229d. represent expenses other than fuel. That is to say, the cost of the anthracite per kilowatt-hour only amounts to 0·127d.; while the other expenses—coal gas for starting and for burner, wages, water, lubricating oil, depreciation and interest, and repairs and renewals—total to 0·2229d. per kilowatt-hour. The running costs are stated by Mr. Irwin to be derived from the power-house records; the anthracite doubles used being booked up at 15s. 6d. per ton. At this figure, taking into account market vagaries in respect of prices as well as situation of the point of delivery, it can be seen how easily the item of anthracite per kilowatt-hour might be appreciably altered for the worse, and make a marked difference in the total costs.

With water engineers suction-gas plant is obtaining a considerable vogue on account of the fact that many of the situations in which pumping has to be done are somewhat away from the customary haunts of men; and therefore there has to be self-reliance in the matter of power. And it is being very generally conceded by water engineers that, with all its faults, the suction-gas plant in its costs per brake horse power is preferable in such places to steam plant. But

in calculating the costs it must be done, as Mr. Emerson Dowson has recently pointed out, in a very comprehensive manner; and every case must be considered on its own merits. While on this point, there is another that has relation; and it is that where a gas-main runs past a pumping-station, the water engineer should give very careful consideration—if the gas suppliers are progressive sort of people—to the relative costs, reliability, and trouble involved of running a gas-engine on clean town gas, and a gas-engine having appended to it a suction-gas plant, with its variable quality of gas—both in respect of calorific power and cleanliness. Attention should also be given by water engineers to the points emphasized by the Inspectors under the Factory Acts in the last report of the Chief Inspector (*ante*, p. 627), as to the additional peril that suction-gas plants introduce; and this cannot be an unimportant matter for consideration at isolated pumping-stations, when perhaps only a single man is on duty. This, however, by the way. The question of costs will probably be considered the more important. For small powers, water engineers will find no particular value in the working figures for town gas given at the end of the paper. The engines here referred to are 510 brake horse power ones; and they are only worked intermittently, and then not at their full capacity, for emptying the Queen's Dock of the Mersey Docks and Harbour Board. For such emergency work, suction-gas plant cannot hope to contest for supremacy with coal gas. In the case of this dock, it may have to be emptied at a moment's notice; and, as Mr. Irwin says, the saving of the time necessary to get gas-producers into working condition is an important consideration. While the author includes for coal gas this example of working for 510 brake horse power engines, running under peculiarly disadvantageous circumstances, he only deals with 8, 40, 90, 100, and 140 horse power engines working with anthracite-fed suction-gas plant, under much more advantageous circumstances in respect of time and load, and, incidentally, with 300-horse power engines with gas-coke fed suction-gas plants. It would be more to the point if actual costs were given for engines of corresponding power and working loads, in the same detail as the particulars in the paper, from capital expenditure onwards, for the Arrol-Johnston Car Company's plant.

Passing from that, the author does one good turn for gas makers. Six years ago anthracite coal was about the only fuel capable of being used in producer-gas plants; but owing to improvements almost any fuel can nowadays be utilized. Witness is borne by Mr. Irwin that ordinary gas-works coke is perhaps the cheapest fuel at the present time, and the most readily obtained. He quotes the records of the working expenses of a 300-horse power gas-engine driving a cotton mill, and using gas coke in the producer. The fuel consumption, taken over a whole year's working, and including all stand-by losses, only averaged 1½ lbs. per horse-power-hour, with coke costing 11s. 6d. per ton delivered. This is a decided testimonial for gas coke. We make out that this represents an outlay for fuel of only 0·093d. per horse-power-hour. Where anthracite is used, the makers guarantee that the consumption shall not exceed 1 lb. per brake-horse-power-hour; and, at 30s. per ton, this would represent 0·16d., as against the 0·093d. The 30s. is not an extravagant figure to take, in view of the fact that, in the examples of water-works' use of suction-gas plant, the paper quotes 30s., 34s., and (in a test even as late as January last) 37s. 10d. per ton for anthracite delivered. This last-named price for anthracite—it is the highest mentioned in the paper—refers to a test at the Skegness Water-Works; and though the dearest fuel, the cost for fuel per 1000 gallons of water raised is said to be the lowest—viz., 0·25d.—lifting the water 210 feet. In the Alford example, with fuel at 30s. per ton (7s. 10d. less), lifting the water 235 feet, the fuel cost worked out to 0·38d. per 1000 gallons; while at Spilsby the fuel consumption (also at 30s. per ton) per 1000 gallons, lifted 145 feet, worked out to 0·33d. per 1000 gallons. If there are no mistakes, suction-gas plant working shows some considerable fuel discrepancies, in face of the 37s. 10d. and 0·25d., and the 30s. and the 0·38d. and 0·33d. In other words, the fuel used (according to our calculation) for lifting 1000 gallons of water in the Skegness trials only amounted to 1·23 lbs. per 1000 gallons; while in the Alford and Spilsby trials, which are about comparable with those made at Skegness, the fuel worked out respectively to 2·33 lbs. and 2·08 lbs. One cannot avoid, with such divergent consumptions for practically the same work, a little suspicion as to accuracy.

The Alkali Works Inspector's Annual Report.

In another part of the "JOURNAL" will be found some extracts from the forty-fifth annual report of the Chief Inspector under the Alkali Works Act (Mr. R. Forbes Carpenter). It contains, as usual, statistics in regard to the production of sulphate of ammonia; and it is gratifying to find that the gas industry still remains the chief contributor. The marked increase in 1907 over 1906 was not maintained last year, according to the figures. Mr. Carpenter believes, however, there really was quite a substantial increase; but it was necessary to review more closely the quantities of ammoniacal liquor used in the ammonia-soda industry, as errors of method were found to exist in arriving at these figures in past years. This materially affected the total recorded from gas-works for 1908, which is 165,218 tons, compared with 165,474 tons and 157,160 tons respectively in the two preceding years. An exceedingly interesting and important section of the report is that devoted to the results of Mr. Carpenter's further experiments on the carbonization of coal, in carrying out which he had the collaboration of his able Assistant (Mr. S. E. Linder, B.Sc.). Their attention was more specially directed to the investigation of some of the reactions producing hydrocyanic acid, as one of the bodies resulting from the carbonization of coal at high temperature; and, pending a fuller notice of this portion of the report which we hope to give shortly, attention may be directed to the summary of the conclusions arrived at. Investigations of this nature are almost beyond the resources of the laboratory at Mr. Carpenter's disposal; and he considers that only in technological institutions such as those at Carlsruhe and at the Leeds University can such work be properly undertaken. He and his colleague have entered upon a wide field of research; it is to be hoped that future work in the same direction may be carried out under more suitable conditions. It cannot but be helpful to the gas industry.

Honest New Gas Investments.

It would be a great pity if the operations of certain company promoters had the effect of shattering confidence and drying up the sources of capital supply for the starting of new gas enterprises. Spread about the country there are many small districts in which the populations and local industries are growing, and in which a supply of gas would be welcomed as a convenience. But such districts can only be supplied, with advantage to the residents and those who invest capital in providing the means of supply, by care in spending capital, and in planning and providing plant, and by subsequent prudent administration. Several such undertakings have come under notice during the last two or three years, in connection with which the prospectuses have been privately circulated, and the money obtained from a limited circle of friends. Genuineness has been endorsed by the appearance on the prospectuses in one capacity or another of the names of men of recognized position in the gas industry; and such concerns are sound and legitimate for capital investment. It is not in the immediate stages of investment in concerns of the kind that the full return on the capital can be secured. There must, as every business man knows, be a period of development, before the plant is utilized to an extent enabling the payment of a dividend. But history shows the original shareholders in legitimate gas concerns established under proper auspices have nothing to complain about either as to return on, or value of, their investment.

And an Example.

Just as an illustration of the character of Company in view, mention may be made of the most recent prospectus that has reached us. It is from the Directors of the Stanford-le-Hope Gas Company, Limited; and they are inviting applications for 2130 ordinary shares of £1 each, with dividend limited to 10 per cent. per annum. The present capital is only £3330, of which merely £460 represents debentures. The Directors of this Company are men bearing such well-known names as Mr. William Surridge, Mr. James Cloudsley, J.P., and Mr. Frederick R. Smith. The Secretary is Mr. William Cash, F.C.A.; and the Board are being advised, in the capacity of Consulting Engineers, by Messrs. Corbet Woodall and Son. The Company have a Provisional Order dated 1905; but nothing was done with it until last year, when the Directors and a few of their friends found a sum of money which has been applied towards the payment of the cost of the works and laying mains. The area of supply has a frontage

to the River Thames of about 5 miles; and there are some considerable manufacturing undertakings in the district. In Stanford alone, a preliminary canvass has resulted in provisional applications for a supply by 130 consumers; and after the supply is given in August next, then, as opportunity offers, the Directors will be considering the supply of the other parishes within the Company's limits. Negotiations are also in progress for the public lighting. This Company is quoted as an example of an honest gas investment, as distinguished from company promoters' over-capitalized concerns.

High-Power Graetzin Lamp on View.

Members of the Institution in London this week should not fail to inspect after dark the high-pressure inverted lamps now being used for lighting Fleet Street. Temporarily one of them has been displaced—the one on the pavement column under the Law Courts clock—and its position is now occupied by a high-pressure, and extraordinarily high candle power, Graetzin inverted lamp, such as is used for the lighting of the streets of Berlin. The members of the deputation of the City Corporation who went to the Continent recently to study the systems of street lighting in the principal cities, saw these lamps in Berlin; and a desire was expressed to have one fixed in a street of the City, so that the Lighting Committee might inspect it. Messrs. J. & W. B. Smith, agents for the lamp, of Farringdon Road, were asked to fit one up. This has been done; and Mr. W. J. Liberty, the Lighting Inspector of the City, has decided to let the lamp remain in position during this week, so as to give members of the Institution who desire to do so an opportunity of viewing it. The lamp is a triple-burner one; and the consumption per hour per burner is approximately 28 cubic feet, or 84 feet the three burners. Two of the burners are turned off at midnight, and only one is left alight. Professor Drehschmidt, of Berlin, accords to the lamp, as the result of photometrical tests, an illuminating power (using Berlin gas) of 5000 Hefner units, or 4500 British standard candles, which would represent an efficiency of about 52 candles per cubic foot of gas. There is one point we ought to emphasize. The lamp for the purpose of inspection by the Lighting Committee of the City Corporation had to be erected in a hurry; and it certainly would have been an advantage to have had it on a higher column, so as to have obtained a better diffusion of the light. The standard within the harp head of which the lamp is fixed was erected of a height suitable for carrying a 1500-candle power lamp; while in Berlin these higher total candle-power lamps are on standards of greater height.

The Lesson of Salford.

Whatever may be the result to the Salford Corporation Bill of the recent decision arrived at by the House of Lords with reference to the gas clauses, it seems that the decision will not have been given in vain. Already some members of the Belfast Gas Committee have taken heed of the lesson conveyed by the views to which the Lords Committee gave expression. A proposal of the Gas Committee to increase the discount allowed to smaller consumers, so as to bring it into line with that granted to large users of gas, was referred back to them some weeks ago for further consideration; but at their last meeting they brought before the Council practically the same recommendation again—the Chairman remarking that the decision which the Lords Committee had meanwhile given on the Salford Bill had induced the members of the Gas Committee who were formerly opposed to the increased discount to change their minds, so that now the Committee were unanimous on the subject. While pointing to the decision of the Lords Committee, that 1 per cent. on outstanding capital might be contributed in aid of the rates, he added that they hoped to do better than this in Belfast, by continuing to pay the dividends and sinking fund on stock issued for the new City Hall, which would amount to between 3 and 4 per cent. on the outstanding liabilities. This is a nice little relief for the rate-payers, and one with which they ought to be more than satisfied. At any rate, it is certain they cannot longer look to the gas undertaking for the huge sums in rate-relief which have been contributed in the past. In so far as it may strengthen the hands of the Committee in enforcing this altered policy, the decision of the Lords Committee in the Salford case will certainly have accomplished good.

Municipal Gas-Works Results.

Among the instalment of municipal gas-works results for the past financial year which is recorded in the present issue, it will be seen that both increases and decreases in consumption figure. There is a profit at Bury of £5689, of which one-half is carried to the credit of the general rate, while the other half goes to the credit of the gas consumers. In the past ten years the make of gas has increased from 340 million to 427 million cubic feet. The amount available for the relief of the rates at Carlisle is £463, compared with £3634 last year; but the difference is accounted for by various items of extraordinary expenditure, a reduction in price to prepayment consumers, and a falling off in the receipts from residuals. From Colwyn Bay comes the report of a "loss" of £1900; but as apparently £1000 of this is due to the expense of lighting the streets, the situation is not so bad as this "free lighting" paints it. There will be general agreement with the opinion of the Chairman of the Committee that "it is time the Council began to pay for the lighting of the town, instead of putting this expense on the gas and electric light concerns." A good deal of money has lately been spent on the works, which naturally necessitates greater provision for interest and sinking fund; and efforts will no doubt be successfully made to reduce the 14 per cent. of unaccounted-for gas. The final balance of profit for the year at Coventry, including the amount brought forward, is £3248, which, considering the state of trade during the twelve months, the Committee think may be regarded as very satisfactory. The intention of the Committee is to pay £2000 over to the district fund, and to carry forward the balance. Depression in trade and competition by electricity have led to a less satisfactory result than in previous years at Loughborough. There has been a 10 per cent. diminution in the output of gas; and the extent to which the profit has been reduced has had the effect of placing the profit and loss account £286 to the bad, which was unanticipated at the beginning of the financial year. There is a net profit of £672 at Oldbury; and the report is—considering that during the year the price of gas was reduced 2d. per 1000 cubic feet, and that trade has been bad—regarded as a satisfactory one. The make of gas per ton of coal carbonized comes out at 12,202 cubic feet; and the quantity unaccounted for, at 4.95 per cent. Stafford is able to show an increased output of 6½ million cubic feet, on a make of nearly 204 million cubic feet; and this is accompanied by the remarkably satisfactory leakage figure of 1.29 per cent. Of the net profit of £5660, £3000 has been transferred in relief of the rates; while a sum of £393 has been ordered to be distributed among the employees under the profit-sharing scheme. The figures quoted at the meeting of the Council show that the Stafford gas undertaking has had a highly successful career.

The Brockenhurst Promotion.

During last week the Brockenhurst Gas Company prospectus reached shareholders in certain prosperous gas undertakings. Invitation is made by the Brockenhurst Directors for applications for the respectable amount of £9500 in shares and £3000 in first mortgage debentures. A condition attached to this issue is one of the old baits of both the gas and water company promoting groups in the City. "Under an agreement entered into to construct the Company's gas-works, and lay mains, &c., 6 per cent. interest is guaranteed on the present issue of ordinary shares for a period of two years;" and "the first full six months' interest will be paid on the 31st October next on all shares then fully paid up." We should like to know whether the agreement referred to is with the Finance and Construction Company, Limited. At the top of the prospectus, the Engineer reports that he estimates the revenue of the Company will, within a reasonable time of the establishment of the undertaking, be more than sufficient to pay 8 per cent. dividend on the present issue. Turning to the next page of the prospectus, it is seen that A. F. Painter is the "Consulting Engineer" referred to; and the address at the top of his report is St. Stephen's Chambers, Telegraph Street. At this address there is a fairly big nest of gas and water companies that have been hatched there. We have a substantial list of these Companies in connection with which the name of A. F. Painter appears as Engineer. Grateful indeed should we be to Mr. Painter if he would furnish us with the printed accounts for last year of all the Companies upon which he has reported, to satisfy ourselves as to whether his predictions have been fulfilled.

We see that the Directors of this Brockenhurst Company are Frederick Cullimore Philpott, George Capes, and Arthur Henry Brown. Frederick Cullimore Philpott was one of the Directors of the Mid-Oxfordshire Gas Company, about the finances of which a Parliamentary Committee thought so little that, on grounds of public policy, they unanimously refused the Bill promoted to give the concern statutory standing. Messrs. E. O. Preston and Co. had a finger in that particular pie; and they were at the time (we suppose still are) holders of the founders' shares in the Finance and Construction Company. A Mr. Painter was (perhaps is) a holder of shares in the Finance and Construction Company. The Water and Gas Securities Exchange, Limited, of Victoria Street, S.W., were active movers (as correspondence by us shows) in trying to get capital for the Mid-Oxfordshire promotion. George Capes was (perhaps is still) a Director of the Bude Company, about the promotion of which we had a little to say some time since. What a strange thing that Brockenhurst has been neglected so long, when now "not less than 8 per cent. may be anticipated within a reasonable time." It ought, if this be so, to have been good for 5 per cent. some time ago.

Burden of the Rates.

Salford finds itself faced with an increase of no less than 6d. in the pound on its rates; and the prospect is one that does not prove exhilarating to the citizens. The cause is stated to be the over-spending of Committees and the decreased contributions from the various trading departments; the over-spending having amounted to £11,598, and the falling off to £5204—a deficiency of no less than £16,802. The progress that has been made on this unpleasant path of rate increase will be seen from a remark by the Mayor that seventeen years ago—the first complete year after the amalgamation of the three districts of the borough—the total municipal rates were 3s. 11d. in the pound; whereas now they have "touched the record figure" of 7s. The citizens will be likely to heartily agree with the Mayor's exclamation—"Surely we cannot go on at this pace!" The increasing of the rates is obviously a course that cannot, in Salford or in any other place, go on indefinitely. There must be a limit beyond which the rate-payers cannot go in their contributions; but it is to be hoped that some means of checking ever-growing expenditure will be found before this limit is reached. It has only been by vigorous cutting down by a Special Committee of the new estimates at Salford that an increase of 9d., instead of 6d., in the rates has been avoided. Naturally, the Committees concerned complain of this pruning. But the feeling of the Council appears to be that the knife has not even yet been sharply enough applied; for an amendment has been carried referring the estimates back for further consideration. Whether the threatened sixpenny addition to the rates will in this way be obviated, remains to be seen; but some members do not seem to be very hopeful on the point. If they feel that they must go on a little longer increasing the levies, the only thing left for the Council to do is to prove to themselves and to the citizens that they are getting value for their money.

Church Lighting.

A fortnight ago in a leaderette, and again last week in the "Electric Supply Memoranda," reference was made to the question of church lighting, and the simple plan that electricians have of showing a saving on gas by substituting metallic filament lamps for flat-flame burners. Church lighting, from the point of view of profit, is not a "line" to be particularly sought after; but, if we may be excused for associating commerce with more sacred things, it is well to remember that there is an advertising value about the lighting of places of worship. A writer in one of our electrical contemporaries was the other day asking for more examples of cheap church lighting—it may be supposed, in comparison with gas lighting. The "Co-Partnership Journal" of the South Metropolitan Company quotes the lighting costs of two neighbouring parish churches in one part of their supply area. The seating capacity of one church is 800; and there are daily services. The edifice is electrically lighted throughout. The cost of illumination for the year ended Lady-day (including renewals of lamps, &c.) was, in round figures, £44. The contrast is a church with a seating capacity of 1080, also with daily services. The building is lighted by incandescent burners, and fitted with

two gas-fires, which are used on most Sundays in winter. The total cost of lighting and fires during the year (including new mantles, &c.) is about £15. The services at both churches are about the same in number and length. At the second one, the day service is a little earlier in the morning and later at night than in the first instance. A good many sixpences and smaller valued coins of the realm are required to make up the difference between these two lighting accounts. Not many churches can afford to squander £30 a year.

Some Nottingham Figures.

Supplementing the report presented to the Nottingham Corporation last week announcing a record profit for the year in connection with the gas undertaking, some figures are now available in relation to the general progress attained during the thirty-five years over which this branch of municipal enterprise has extended. In that period, no less than £691,750 has been paid in relief of the rates; £127,860 represents the amount of annuity redemption and sinking funds; £34,300 has been devoted to the repurchase of gas annuities; £24,760 has been applied to the depreciation fund; and £20,000 to gas-stove depreciation. Besides this, £107,716 has been placed to the reserve fund, £62,447 to the trading capital account, and £16,656 to renewals. Putting the matter in another way, since the gas supply has been in the hands of the Council, the total which has been forthcoming in aid of municipal burdens and in making provision for annuity redemptions and sinking fund, renewals, &c., is equal to the capital of the whole undertaking, which now stands at £1,160,382, or £10,282 more than last year. The results, when looked at in regard to the diminution in the proportion of capital to the gas sold, are of a striking character. In 1874, the capital was represented relatively as being £743 to each million cubic feet of gas sold; whereas the amount now stands at £586. Significant, also, of careful administration is the fact that the reserve fund has been increased from £23,653 to £104,515 after transferring £61,931 to renewals and £44,000 to capital.

Revocation of Patents.

In the "JOURNAL" for April 6, comment was made on recent proceedings in connection with the revocation of patents held by foreign inventors that are not adequately worked in this country. Among those revoked by the Comptroller, and mentioned in the article, were certain arc-lamp patents in which the British Westinghouse Company and Messrs. Körting and Mathiesen were concerned. The sequel has come through the Law Courts. The Company and the firm appealed; and after hearing their evidence, Mr. Justice Parker has reversed the decision of the Comptroller. There are some features about these cases that are rather peculiar; so that they cannot be taken as fair and square precedents. But his Lordship, in delivering judgment, was plain on the point that patentees must make it quite clear they are manufacturing to an adequate extent, or supply clear reasons for their failure to do so, as well as proof that no preference is being given to foreign as opposed to British industry.

The Trouble in the Coal Fields.

In referring to this matter last week, it was remarked that temporarily, at any rate, the centre of interest in the question of coal miners *v.* colliery owners seemed to have shifted from South Wales to Scotland, and this still sums up roughly the position of affairs. In spite of all doubts that had been entertained on the subject, it is now an ascertained fact that the coalmasters in Scotland are almost unanimously in favour of insisting on the claim for a reduction in the wages of the miners. In fact, with one or two small exceptions, they have all signed the agreement to this effect which will have the result of putting an end to the Conciliation Board. Should a strike or lock-out take place in South Wales, however, the price of coal will in all probability be largely affected; and this may render unnecessary the forcing of the demand for lower wages in other fields. In this event, the misfortune of Wales would be the gain of Scotland—that is, unless the somewhat improbable "national strike" became an accomplished fact. In these circumstances, it appears most probable that the Scotch owners and men may wait before taking any irretrievable step until they learn definitely what is going to happen in South Wales. There is, we learn, a great

deal of confidence that a strike in the North will be averted. Meanwhile, it is reported that efforts are continuing to be made in South Wales to find a way out of the serious difficulties that have arisen upon the passing of the Eight-Hours Act. It has been arranged that the meeting of the Joint Conciliation Board which would in the ordinary course be held next Saturday, for the consideration of disputes, will now be adjourned until Monday, when, after disputes have been disposed of, the Board will further consider the position in reference to the Eight-Hours Act and the new conditions required for the working of the collieries under it. It has also been arranged that, if necessary, the Board will continue its sittings next Tuesday.

Reissued.

The prospectus about which we had a few pertinent remarks to make last week, in which applications for shares were invited in the Water and Gas Debenture and Share Investment Trust, Limited, was reissued last week. Of course, this was not done because two Baronets on the Board had failed to attract money, or because people had recognized an old concern with a past, though with a new address printed at the head of its notepaper; or because the public have any doubts as to the future of the Company—no, nothing of the kind; the prospectus was only reissued because the Directors were desirous that the public should not be disappointed by making application too late. They therefore had printed near the top of the prospectus: "KINDLY NOTE: Further applications for allotments must be received on or before Monday, the 14th of June, by the first post." That is to say, any morning up to yesterday, on the condition that they were delivered by the first post—other deliveries would not do. What eagerness there must have been to open the 2, Budge Row, letter-box yesterday morning to see how the little bit of finesse had worked. The public need not be in a hurry or be alarmed at the thought that they will be shut out of this delectable speculation. If there is any desire to share in the financing of this offspring of the 99, Cannon Street promoters, there will be ample opportunity for doing so, though application did not reach the office by the first post yesterday.

Sulphate of Ammonia in India.—Mineral oil companies and iron manufacturers who use the recovery process will be interested to learn, says the "Chemical Trade Journal," that India is likely to become a considerable consumer of sulphate of ammonia. This is in connection with the cultivation of the sugarcane, which is being encouraged in the Bombay Presidency, where experiments for the improvement of the cultivation are in progress. The use of sulphate of ammonia as a fertilizer on cane fields has been established in the West Indies and in Japan. A statement is made that sulphate of ammonia is likely ere long to be manufactured on a considerable scale in India itself. This must presumably be from what few gas-works and blast-furnaces there are.

Endless Screen for a Water-Works Intake.—To overcome the disadvantages of the usual sliding type of screen, there has been installed in the intake chamber of the New Bedford (Mass.) water-works a screen of unusual design. According to "Engineering Record," it may be generally described as an endless belt of wire cloth passing over four rollers so placed as to cause the upper portion of the screen to travel in a horizontal direction. These rollers are of skeleton type, consisting of heads or discs carried on shafts. The upper and outer one is fitted with a ratchet, a pinion, and a gear at either end of its shaft; the ratchet being used to prevent rotation except in one direction. The intermediate rollers do not call for description. The lower roller is covered with a perforated sheet of metal forming a cylinder; the screen moves between this roller and a perforated plate on the inflow side. To keep the screen from bending or sagging, its edges are carried in endless chains of phosphor bronze. The links have split projections at right angles to the body of the link, into which projections the gauze is riveted. The links are so shaped as to form small openings between each adjacent pair; and pins on the circumference of the working roller fit into these openings—thus imparting positive motion to the screen. The chain travels in slides bolted to the original screen frames; these slides being of such shape as to hold the screen tightly in two directions. To clean the screen, it is only necessary to raise the submerged portion by means of the ratchets, and knock the detritus into a pan placed for the purpose beneath the horizontal portion. The outer or working roller is 24 inches diameter, the intermediate rollers are 12 and 9 inches, and the perforated lower one is 14 inches. The total length of the cloth is 50 feet, and its width is 64 inches. The screen was designed by Mr. A. S. Neagus, the Chief Engineer of the station, and was built by him and his assistants. He states that since its installation in December, 1908, it has given no cause whatever for complaint.

THE INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING, JUNE 15 to 17, 1909.

PRESIDENTIAL ADDRESS

OF

MR. THOMAS GLOVER, of Norwich.

Gentlemen,—The honour you have conferred upon me in electing me to fill this chair is one I deeply appreciate; and I take this opportunity of thanking you most sincerely for the confidence you have shown, and to express the earnest hope that the work of the Institution may not suffer through your choice of a President having fallen upon me.

THE LATE SIR GEORGE LIVESY.

No President in rising to address the members of this Institution at the annual meeting could proceed without, in the first place, paying a tribute to the memory of its most distinguished member, whose passing from our midst, in October last, made such a profound impression, and left a gap it is impossible to conceive can ever be filled. His personality was unique. Although Sir George Livesey had, by the great natural gifts with which he was endowed and by strenuous toil, attained to so distinguished a position, and though he had so strong an individuality and independence of character, he was a consistent supporter of associations of gas engineers formed for the advancement and consolidation of the gas industry. He was almost invariably present at the opening meeting of our annual session, and was a frequent contributor to the proceedings of this Institution and those which preceded it. He did a great deal to raise the status of the engineer, both in the engineer's relation to his Board or Committee and in his relationship to the general public.

Having graduated through the workshops and various departments of a gas-works to the chief engineership, and afterwards to the honourable position of Chairman of his Company, he never lost touch or sympathy with those classes of employees with whom he had been associated, and never failed to inspire self-respect or to endeavour to raise the standard of life among all classes of employees. The later years of his life were chiefly devoted to advocating that "way of peace" in the relation of employer and employed which he had found to have such beneficial results in the experience of his own Companies. Although progress was slow for a time, he had the gratification before he passed away of witnessing its adoption by a number of companies, and one or two corporations; and since his death there has been a flowing tide in its favour. It may safely be assumed that Sir George Livesey would wish for no more suitable memorial than that his life's work should be remembered through the wide adoption of a co-partnership system by gas undertakings. In this connection it is gratifying to know that the Governor of the largest Gas Company in the world, the Gaslight and Coke Company, has given an influential lead, by securing the adoption of the system whereby 11,000 employees will be linked more closely in their interest and efforts with the administration and with the ordinary shareholders.

CO-PARTNERSHIP SYSTEMS.

Some of the reasons for the adoption of the co-partnership system in gas-works which might have been of importance twenty years ago, it is pleasant to feel, have less weight to-day. At that time there was what might be called a "prevalent mania" on the part of gas-works employees to agitate, to threaten, and to strike. If there is a greatly reduced tendency to unrest among our employees, even at this time when other industries have been suffering severely, let us be thankful, whatever be the cause, that the public service for which we are responsible has not in recent years been disturbed or threatened by great labour agitations. There are now other reasons, however, equally weighty, for securing the hearty and unstinted co-operation of all employees. In the face of competition, which is assuming a serious aspect in some districts, a more exacting service will be demanded from us than has hitherto been the case. Improved conditions of retort-house labour, the influence of

automatic and mechanical devices on the quality of men employed, together with reasonable pay and various methods adopted in some works for rewarding men for improved results, have all had their effect in raising the tone and increasing the feeling of security in that part of a works which at one time gave the greatest amount of anxiety. The exacting service of the future requires the most economical retorting practice which can be secured; but an equally imperative requirement is an alert, intelligent, and thoroughly up-to-date outdoor staff and administration. The two great facts which press with more urgency than ever in the history of our industry are the necessity for reducing the cost of manufacture without unduly raising capital charges, and, in the application of gas, increasing the efficiency by investigating and meeting the requirements of modern town life. If the co-partnership system, or any system akin to it, will have the effect of welding together all the interests necessary for harmonious working towards the success that we are all anxious to secure—and those who have experience of it heartily affirm that it does—if, in addition, it increases self-respect among our employees and gives a sense of responsibility and a feeling that they have something at stake, let us by all the means at our command support the movement first initiated on a large scale and carried to a great and successful issue by a leader in our own particular industry.

Speaking on the serious question of competition in ship-building, a captain of industry, and one who has become an apostle of the co-partnership system (Sir Christopher Furness), recently said: "If we wish to sustain our supremacy, to lead the lives of self-respecting Englishmen, we must doff the garb of frivolity, cease to view life as a piece of play, we must throw off our personal self-conceit and rational complacency, become earnest students of our industrial environment, we must manifest as never before initiative, zeal, energy, care, ability, industry. The best available instrument for overcoming this crisis is co-partnership. No Englishman would manifest his patriotism more profitably to his country than by securing a national conference of the leading employers in the hope that an examination of co-partnership would result in a decision to adopt it."

THE LIVESY MEMORIAL FUND.

A national movement of this kind would indeed be a lasting memorial to Sir George Livesey's memory; but may we not to-day view with satisfaction the desire to establish another form of memorial which manifested itself immediately after his death? For the first time practically the whole British Gas Industry has been moved to a united effort which naturally took the form of perpetuating an endowment initiated for the development of the gas industry by the one whose memory it was desired to honour. Municipalities owning gas undertakings, some of them having their own Universities, have realized in some degree their sense of stewardship, and have joined hands with Metropolitan and Provincial gas companies. Directors of gas companies have in many cases subscribed privately. Officials of gas companies and of corporations have responded to the call, as have also gas contractors. All who have taken part will be gratified that the amount of £10,000 (the sum we set out to raise) has been almost subscribed, and they will not regret the effort has been made. What is to be the outcome of all this effort? Subscribers to the fund, by the act of subscribing, have expressed a belief in some gain to the gas industry to be derived by the co-operation of a University Department devoting itself to the investigation of problems affecting the methods of manufacture and the applications of gas, and to the teaching of applied science to students whose careers are intended to be spent in the service of the industry.

Time alone will show if that belief be well founded; and its realization will depend not only upon the University authorities, its teaching staff, and its advisory committee, but

upon the parents and guardians of students and of the students themselves making use to the full extent of the opportunities which this special department of the University will present. Can anyone doubt that the industry will gain by the better scientific equipment of those intended to take responsible positions in its service? Does not the work of our Junior Associations give distinct evidence that the better technical training now given by our schools and colleges is having a beneficial effect in developing young men of scientific attainments, whose services to the undertakings to which they are attached are, by that training, raised in value and usefulness? The endowed professorship devoting its energies to carrying out research, and to the teaching of applied sciences, should greatly benefit all young men who are privileged to take the course of instruction specially adapted to the needs of the gas industry; and, in addition, the University will, we hope, from time to time, turn out men of exceptional ability, who will be trained to the highest pitch in the special knowledge relating to their future calling.

There may not be at present a demand for many experts on the scientific side of the industry; but there are evidences of an increasing disposition to call in the help of those who, by their special training, are able to unravel mysteries and to give advice upon questions connected with new methods of manufacture. But the greatest value to be derived from the new University Department will probably be through an indirect influence upon the whole industry rather than by direct and visible productivity. Those who have a knowledge of such institutions expect the more lasting and permanent results to be created by way of an atmosphere of scientific principles in the industry; the fact of its "being there" making itself felt in all departments concerned. There will be, we trust, a constant interchange of scientific knowledge and practical experience between the University and the factory. The scientist and the practical engineer being brought together, their frequent contact cannot fail to be mutually beneficial. The scientist will become acquainted with the demands of the industry, and can turn his researches in the direction of probable utility; the technical man will gather knowledge that may enable him to steer a clearer course than the winding ways of unscientific procedure would afford him. In various ways, therefore, we hope and believe the new venture will bear fruit. But it may not be seen immediately; subscribers may need to wait patiently for visible results. They may, however, cherish the comfortable feeling that good foundations have been laid on which a worthy superstructure will ultimately arise.

TRAINING OF GAS ENGINEERS.

In this connection, I have a contribution from the pen of Dr. Bunte, who has kindly sent some valuable information from his experience in the training of gas engineers in the Technical School at Karlsruhe. The course of training is three-fold: (1) The complete chemical training of gas engineers. (2) The continued training of mechanical engineers directed towards the chemistry and physics of gas manufacture and supply. (3) The continued training, by means of holiday courses, of older gas engineers who are already in practice. Dr. Bunte believes that the development of the gas industry undoubtedly requires that greater emphasis should be placed on the chemical and physical training of those intended to take responsible positions.

A scheme has been embodied in the curriculum of the Technical School at Karlsruhe which includes lectures and practical work. To obtain the honour of an Engineering Diploma, the students attend a regular course of lectures, and not only pass a *viva voce* examination in the main branches of their study, but also submit a thesis on the simple investigation of a question which has been put to them by the Director of the Laboratory. By this means an opportunity is given of training the students in the habit of independent thought and of examining their readiness in the handling of scientific problems of a technical nature.

This more or less independent analysis or working at a given question, Dr. Bunte goes on to say, is carried to a still greater extent in a more advanced course of study, where the student wishes to obtain the honour of a Doctor's Degree in Engineering, an experience which frequently occurs in their chemical division. By this organization of instruction, abundant opportunities are given both to the teacher and student for working at technically important questions, and as in the later professional life of the practical man, with the rapid progress of technical knowledge, more or less the same problems of independent solution of technical questions

present themselves, this training by the teacher is of special value for the future member of a technical profession.

We have Dr. Bunte's testimony that in the last ten years a number of students have continuously taken part in this training, and these students have been very readily accepted as assistants in gas-works and in establishments for the manufacture of coke.

While we thus magnify—and under the circumstances it may be excusable to do so—the importance of the part which scientific training will in the future hold in the preparation of men for controlling and guiding the manufacturing processes connected with gas manufacture, it would be foolish to think that the University course will supplant, or even diminish, the importance of the practical training in the industry itself. The man who is likely to take charge of even a moderately large concern should be equipped with all knowledge and ability modern teaching can give; but the power to organize, and the delicate tact required for controlling employees, as well as the wisdom which directs means to right ends, can only be learned under the guidance of an experienced engineer and manager, directing the various departments of a modern gas undertaking. After all, college training is a means to an end; and it may be of little value if the student is not blessed with a fair measure of native British shrewdness, a sense of proportion, and high personal qualities which make up what we designate as "character."

CARBONIZATION.

It is time, however, to get away from these tempting topics and briefly examine the questions of the day now uppermost in our minds. First of all comes carbonization—a subject which is in such a condition of flux that it is difficult to touch upon it under the limitations of an address from the chair without trespassing unduly on controversial ground. The rapid development of the Dessau system of vertical retorts, together with the significant adaptation of the coke-oven system of carbonization now being installed in many Continental gas-works, shows at least a determination on the part of gas engineers to break with the older systems. In this country, progress has not been so rapid; but there are no doubt good reasons to explain our comparative slowness. The revival of the idea of using retorts set vertically appears to have been linked, in this country, from the commencement of the revival with the high ideal of accomplishing by their means continuous carbonization. This was so with the Settle-Padfield arrangement; and although its development was arrested, the germ of continuous carbonization was there, and it was sufficient to inspire latent ambitions and hopes in several directions.

The existence of magnificent installations of continuously worked vertical shale retorts in Scotland, the conception of British chemists and engineers, is quite sufficient to account for the determination of British gas engineers not to be content with intermittently worked verticals, but to go at one stroke for the more perfect system. High ideals are usually difficult of attainment; but evidence is not wanting to show that substantial progress has been made, and the pioneers who are now successfully emerging from their difficult tasks are deserving of our sincere appreciation and congratulations. Provided there are no unforeseen collateral disadvantages to outweigh the many obvious advantages attached to the continuous system, the outcome promises to be not unworthy of the best traditions of British conception and initiative. Much of our knowledge is only gained by empirical procedure; but the chemist will come to the aid of the engineer, and together they will reason from the results obtained in any new form of plant whether the conditions are favourable or unfavourable for the conversion of coal into the greatest value of products.

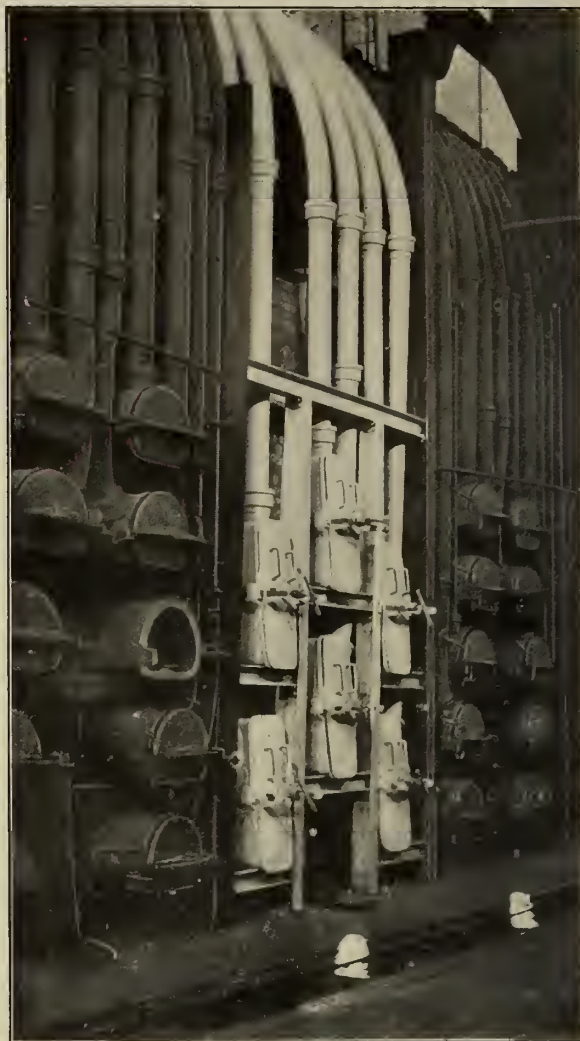
The forms of plant which will ultimately survive are those which will give the greatest value in products, of the quality to suit local conditions, accompanied by the lowest total expenditure on fuel for heating, labour for operating, and interest on capital expended. The large number of engineers who have adopted the Dessau vertical system on the Continent must have assured themselves that this system is able to give better returns, after providing for the additional outlay, than the older systems either displaced or supplemented; and those British engineers who had the privilege of witnessing the perfection of detail in construction, and the smoothness of the operations, at the Oberspreewerks of the Imperial Continental Gas Association last summer, and who likewise have read the able contributions made to our technical literature on the subject by Herr Körting and

others, will have no hesitation in agreeing that the assurance is well founded.

But side by side with the rapid adoption of the Dessau vertical system there has been the adoption, in other Continental works, of the carbonizing chamber system; and the engineers who have installed chambers in preference to verticals must have some good reason for believing that chambers, for their local conditions, would yield the better return. However much doubt there may have been in the past as to the feasibility of advantageously carbonizing in bulk where gas is the primary product, those doubts must give way to faith when we hear not only of the Munich chambers being installed in various works, but also that notable constructing firms have installed the chamber system in Königsberg, Bochum, Vienna, Rotterdam, Padua, Zwickau, Rixdorf, Berlin, and Frankenthal.

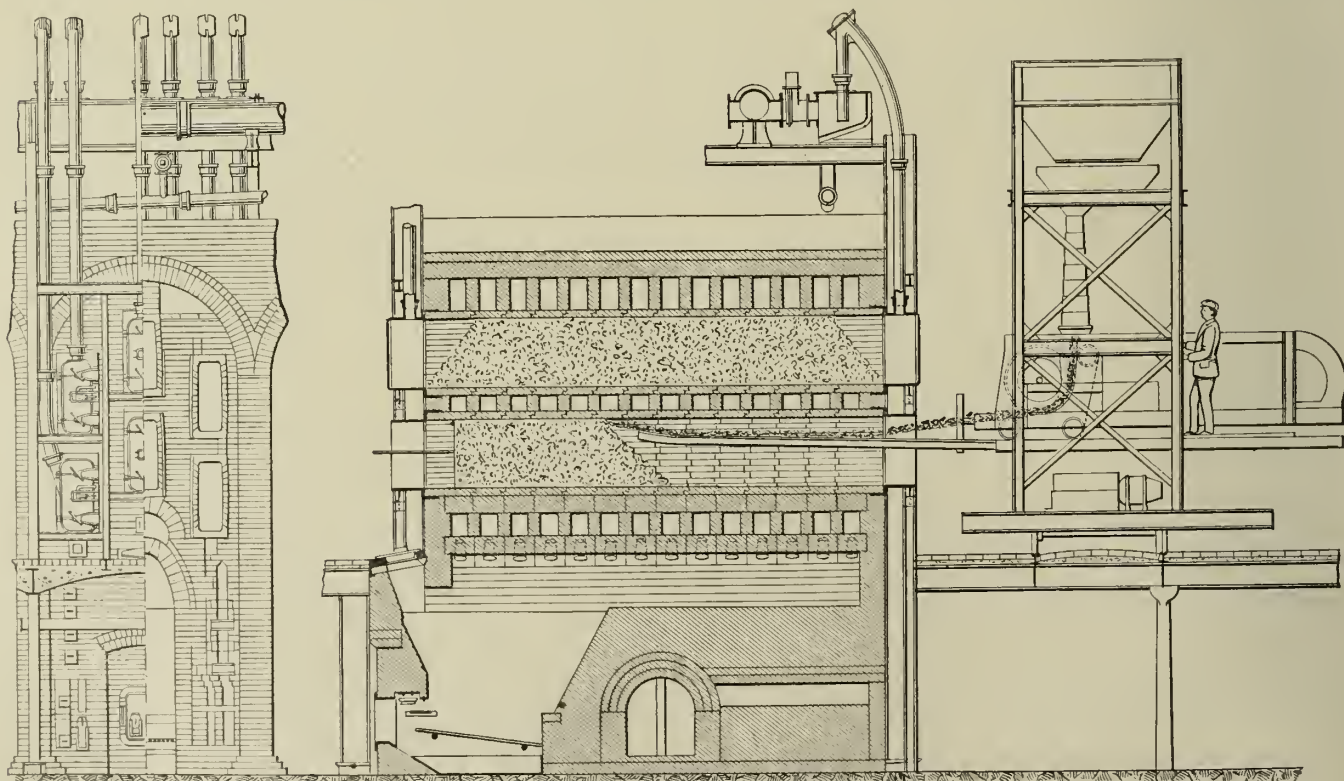
There is a significance about the newest departure in carbonizing in Continental gas-works which can only be understood in connection with an equally significant movement among the coke-makers of the coal and iron districts of this country. For the production of metallurgical coke, about 18 million tons of coal are annually used, as against 15 millions in British gas-works. Of this 18 million tons used in coke-works, only $3\frac{1}{2}$ million tons are at present carbonized in recovery ovens. But the prejudice against the recovery oven coke is rapidly passing away; and it is suggested that the construction of recovery ovens will go on at an accelerated rate until the old, wasteful bee-hive ovens are finally superseded. We may therefore look forward to the tar and ammonia products from an additional $14\frac{1}{2}$ million tons of coal being put on the market to compete with the increasing output from gas-works. It is difficult to imagine this being done without its having a disastrous effect on the markets for these products; and this effect will be felt in the revenue account of all gas undertakings. But besides the tar and ammonia products, the whole of the patent oven coke does not find its way to the iron-works. For some purposes, even in the Eastern Counties, gas coke is being displaced by oven coke; and in the coal and iron districts the surplus gas is being used for the production of electric energy, and this, in its turn, competes with the form of energy our works are established to supply.

The use of carbonizing chambers in our large gas-works similar in size and shape to the recovery ovens, constructed on the inclined principle like the Munich chambers or horizontally as at Rotterdam, will do something to check this undesirable competition. The promoters of the carbonizing chamber system claim that by their use, as compared with ordinary retorts, there is a higher yield of both gas and bye-products, a great reduction in operating costs (which we can readily understand), and the production of

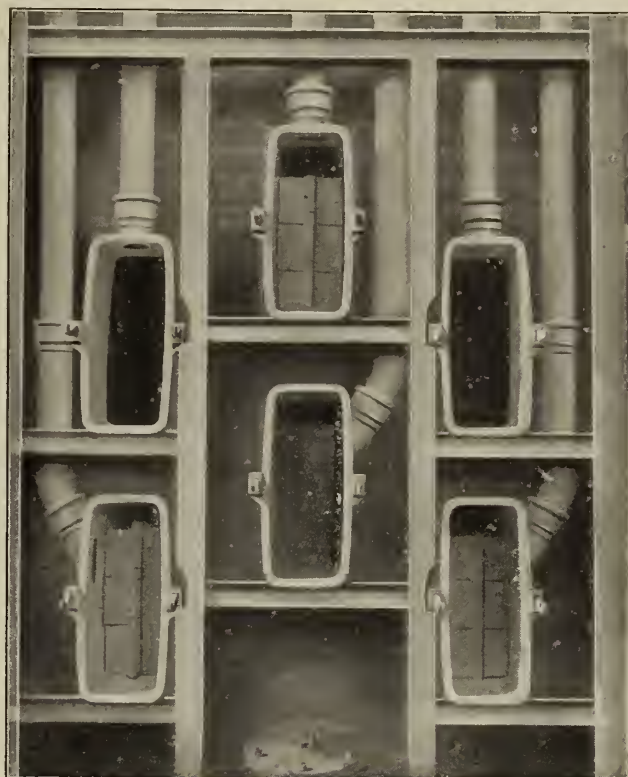


The Glover Three-Foot Deep Retorts at Norwich.

high-class coke suitable for all metallurgical purposes. If these claims are confirmed by the Continental undertakings now using them, if the chambers are good gas makers, as well as good coke makers, will it not be a wise policy for our large works—particularly in the coal and iron districts—to discontinue making great quantities of ordinary low-priced gas coke? To make a better article and realize a higher price, to do something to prevent the threatened flooding



The Charging Arrangements for the Glover Three-Foot Retort-Setting at the Norwich Gas-Works.



The Glover Three-Foot Deep Retorts at Norwich.

of the market with surplus products for which there is no present prospect of an adequate outlet, to conduct the carbonizing operations at a low cost and obtain good gas results—these things seem worthy of the attention of our great gas undertakings. Hitherto coke making in gas-works has not received the attention the return it can be made to yield deserves.

The improved methods of carbonizing now coming into use, together with a commercial awakening in the methods adopted for advantageously disposing of it, will result, I venture to think, in making us give more attention to adapting our methods of manufacture to the production of a quality or qualities to meet the local demand for various purposes. Mention has been made of the fact that recovery oven coke is displacing gas coke in the Eastern Counties. This refers particularly to the coke used for forcing fruit. A good proportion of the Norwich make, besides a considerable quantity brought by rail from the Midlands, is used for this purpose. The fruit growers have found that, by providing somewhat larger furnaces and using a keener draught, hard coke can be employed to greater advantage than ordinary gas coke. The desired temperature is kept up with greater reliability, particularly during the cold nights of early spring.

THE THREE-FOOT DEEP RETORTS AT NORWICH.

To enable the Norwich works to meet this demand for a harder and denser coke, the Board under whom I have the privilege to serve sanctioned the trial of a setting of small chambers; and this was worked with such promising results that two additional settings are now being constructed. The setting has been adapted to suit existing arches ordinarily used for ten \square retorts. A somewhat better disposition of the chambers can be made when the main arches are built for the chamber settings. Each chamber measures 36 in. high by 12 in. to 13 in. wide and 21 ft. long. The sides, when built, are slightly cambered, to allow for lateral expansion of the brickwork and to prevent the expansion narrowing the inside measurements between the walls. The tops and bottoms are formed of rebated tiles 4 inches thick, and the sides are built of specially-shaped tongued bricks breaking-joint on the supporting walls. The sides exposed to the highest temperature in the setting are protected with silica shields. All the fire-brick material was carefully selected. Each chamber was fitted with a socket mouthpiece, and luted doors were used in the first trial setting. Specially designed self-sealing mouthpieces and doors are fitted to the additional settings.

To charge these chambers it was necessary to make an

addition to the De Brouwer projector. This was carefully worked out by Messrs. W. J. Jenkins and Co., and consists of a mechanically driven plate, which is inserted into the chamber for 15 feet at a distance of about 2 feet from the bottom. The plate is slightly curved upward at the end. The projected coal skids along the surface of the plate, takes a leap upward, piles up against the temporary stopper, and completely fills the chamber except at the ends, where it is allowed to assume its own angle of repose. The plate is slowly withdrawn as the chamber is filled. Each chamber holds 21 cwt.; and the coke from this quantity of coal is pushed out with the same ease as the coke from an 8 cwt. charge. We find twelve-hour periods are best suited to the working of the chambers. The coke fractures vertically down the centre, and when it falls on to the conveyor, is in large pieces having the appearance of the coke from the recovery ovens. Particulars of the results obtained from these and other chamber settings will be found in the Carbonizing Committee's report, and in the paper to be presented by Dr. Lessing.

The construction and working of these small chamber settings may seem a puny effort compared with the bold constructions and operations in Germany; but it has to be remembered that where the plant is sufficient for some years to come, as is the case in the Norwich works, it would not be prudent, even if it were possible, to embark on a large expenditure on additional plant. No British gas engineer is likely to overlook the importance of keeping down capital expenditure. It is sometimes possible to modernize on a moderate scale out of revenue. This was the object in adopting the chamber system to an existing bench; and the size of the chambers has proved to be quite suited to the requirements of the works, and they produce the quality of coke needed to meet the local demand.

The gas results confirm those claimed for the larger chambers used on the Continent. Makes of over 12,000 cubic feet per ton are obtained without difficulty, using South Yorkshire washed pea nuts. Only when excessive temperatures are used is there any trouble with stopped pipes; the free carbon appears to be filtered out by the coke. The number of operations in charging and discharging being much reduced as compared with ordinary retorts, the labour costs in working this system will be low. Sufficient has been learned from the use of these small chambers to encourage the belief that there is nothing to fear in adopting larger chambers where massive coke would fetch a high price, and where the size of the units would correspond with the capacity of the works, and not be unwieldy for meeting a varying demand for gas. It is very interesting to observe that the rate of

carbonization proceeds more rapidly with narrow than with wide ovens.

- With ovens 12 inches wide carbonization proceeds at an average rate of 0'500 inch per hour from each side.
- With ovens 16 inches wide carbonization proceeds at an average rate of 0'470 inch per hour from each side.
- With ovens 17 inches wide carbonization proceeds at an average rate of 0'425 inch per hour from each side.
- With ovens 20½ inches wide carbonization proceeds at an average rate of 0'305 inch per hour from each side.

It would be bad practice to force the speed by the use of excessive temperatures. The percentage of fuel used rises when this is attempted.

If it is a rational ambition that, as far as possible, all high-temperature coke, even that used in the metal industries, should be produced by the works owned by the gas undertakings of this country, it cannot be foolish to suggest that if there is to be a demand for a homogeneous, low temperature coke, like the "Coalite" Company's brand, gas-works are the only fit and proper works for the production of such an article. Gas undertakings can distribute and sell to best advantage the gas made during the production of either hard metallic coke, freed from volatile matter, or porous material suited for the domestic hearth and containing 10 per cent. of volatile matter.

THE PROVISION OF SMOKELESS FUEL.

It will be readily conceded, I think, that one result of our meeting together annually, as we do to-day, is to give members of the Institution broader views of the work the gas industry has to do in the service of the public. In the past, as in the present, its chief service has been to provide light; and we hope that this may be so for many years to come. The importance of that part of our business and work must not be underestimated; but is it not apparent that in the future we shall be called upon to take no mean part in providing smokeless fuel both gaseous and solid?

The movement for the abolition of the smoke nuisance, as it is called, is gathering strength; and the part the domestic chimney plays in creating the nuisance has now begun to be recognized. It is unbelievable that the inhabitants of our large towns and cities will go on for ever using rich bituminous coal in such a way as to heavily charge the atmosphere they have to breathe with the products of distillation. I do not hesitate to say that it would be a blessing to our people from a sanitary point of view, which might come to be appreciated, if a courageous Chancellor of the Exchequer, casting round for a new basis of taxation, were to seize upon bituminous coal, and so tax all consumers of it (except gas undertakings) as to compel a preference for smokeless fuel. A too plentiful supply of the mineral has resulted in its use by methods truly described as "barbaric," both for manufacturing and domestic purposes. Manufacturers are rapidly reforming and finding that complete combustion pays. The domestic fire-place is a more difficult question.

Taking London as the greatest city, and the one most plagued with smoke fogs, we find that it is estimated that there are nearly half-a-million gas cooking-stoves in use; but the relief to the smoke-charged atmosphere by their use on a late autumn or winter morning is unappreciable, because of the millions of apartments which must be warmed by having fires lighted by unscientific hands, in cold grates, and by the use of bituminous coal. Look from a hotel window, or from an elevated railway over London, and gauge the extent of the problem. It will be obvious that, when public opinion has become educated sufficiently and the remedy is at hand, the demand for a smokeless fuel must be enormous. What is true of London is true also of the Provincial cities and towns.

The City of Norwich is fondly called by its inhabitants the "City of Gardens." It is provided with numerous open-air spaces and has an abundance of trees and gardens. The factories obtain their power, for the most part, from gas-engines and electric motors. In the 25,000 inhabited houses are fixed close on 20,000 cooking-stoves. Gas-fires and other heating appliances are being fixed at about the rate of 800 to 1000 per year. In the summer, the city is comparatively free from smoke; but on an autumn or a winter morning, the smoke may be met at a distance of three miles from the city boundary, and in the lower parts of the city the atmosphere would be so charged with the products of distillation as to be almost unbreathable.

The loss of sunlight, the ill-effects on health, the damage

to buildings, both ancient and modern, the dirt and squalor of our towns constitute part only of the price the public have to pay for using fuel the wrong way. If a remedy is to be found, it will be through our gas undertakings which already, by their enterprise, have done much more than has been given credit for by those who are taking a prominent part in the smoke abolition movement. Taking the estimated quantity of gas used for fuel purposes, together with the quantity of coke produced for sale, the gas undertakings of the United Kingdom are providing the public with smokeless fuel equal to about 7¾ million tons of coal per annum. By the help of an educated public opinion, the quantity of both kinds of fuel to be supplied from gas-works will be greatly increased.

From some interesting tables recently published by Mr. W. J. Carpenter, of Great Yarmouth, I find that the ratio of day consumption in that town to the total annual consumption in the year 1887 was 27·85 per cent., against 45·01 per cent. in 1907. For the summer months, the increased ratio is still more striking.

In June,	1887,	the ratio was	20·54	per cent.	against	50·42	per cent.	in 1907.
In July,	"	"	19·98	"	"	50·96	"	"
In August,	"	"	16·07	"	"	47·53	"	"
In September,	"	"	14·78	"	"	41·24	"	"

This is interesting evidence, from a seaside resort, of the growing use of gas for fuel purposes. I am unable to make a similar comparison for Norwich over the same period; but as it may have been observed that an unusually high proportion of the gas consumers of Norwich are provided with cooking-stoves, and as everything is done to popularize the use of gas for lighting purposes, the ratios of day consumption to the total are of interest.

Monthly and Yearly Ratios of Day Consumption to Total Consumption.

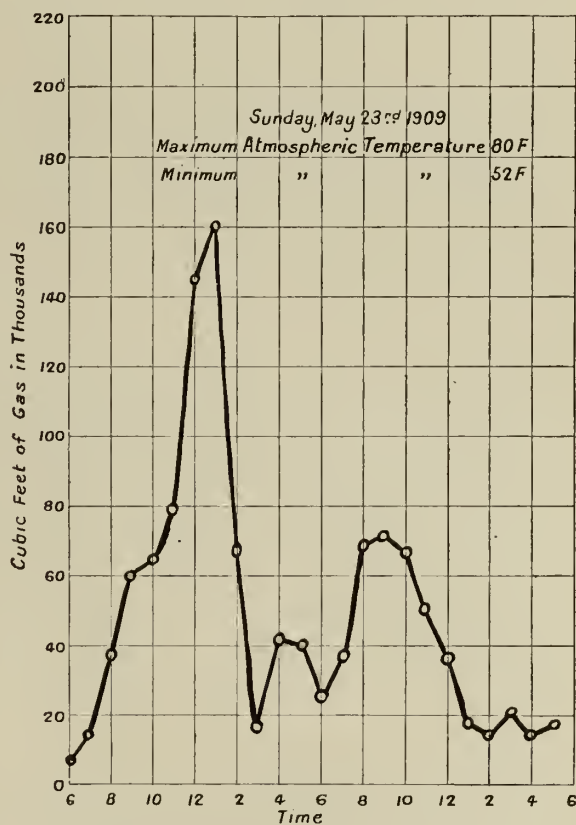
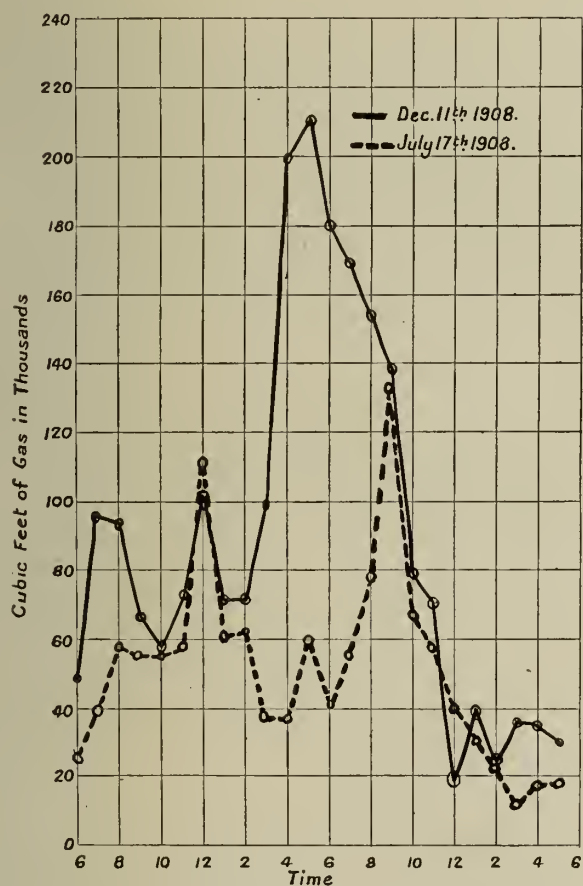
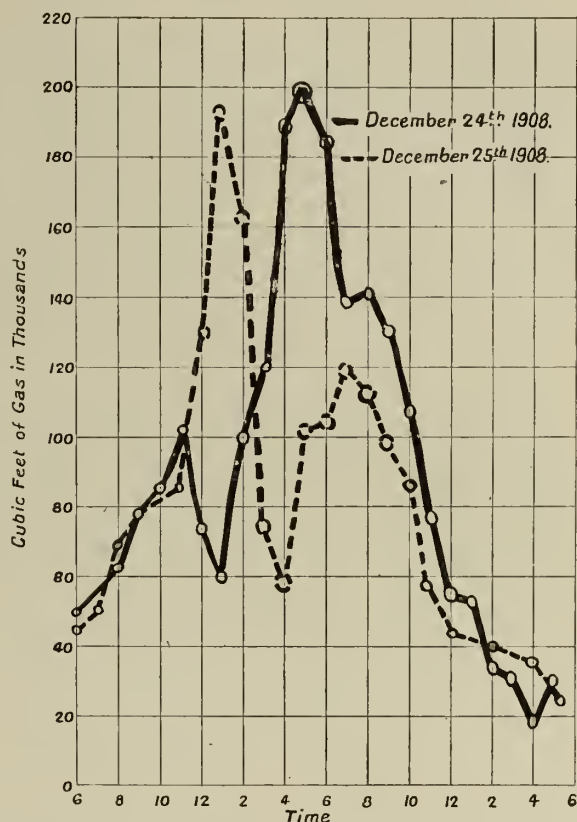
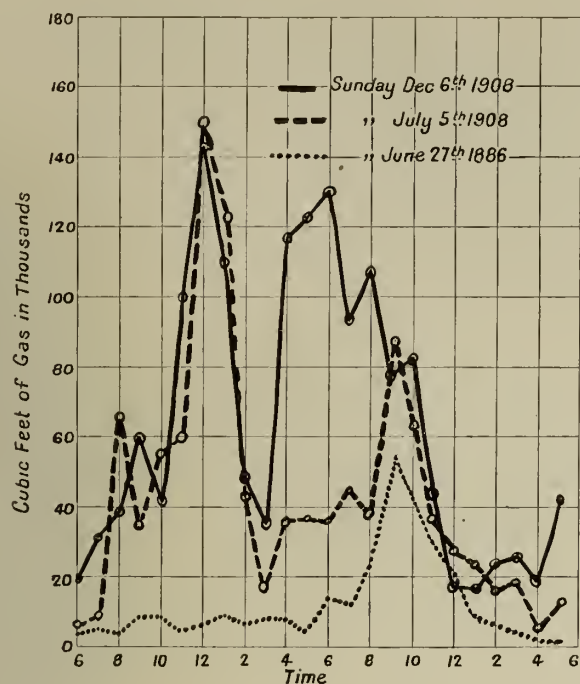
	1905.	1906.	1907.	1908.
Total gas sold and	473,204	499,846	528,490	542,866
Day ratios to same	49·9	49·5	49·9	50·8
January	50·2	51·4	52·4	53·2
February	47·6	47·8	48·1	48·4
March	42·3	43·7	41·9	45·5
April	45·1	44·6	45·36	46·5
May	50·4	51·7	50·82	52·7
June	55·1	54·6	55·4	54·9
July	55·7	55·3	55·3	55·2
August	52·1	50·3	51·1	51·9
September	45·8	46·4	47·1	46·9
October	45·5	43·4	46·9	47·5
November	51·1	50·4	51·2	51·8
December	52·7	52·5	53·5	54·6

We may safely assume from the above figures that, so far as Norwich is representative, only about 50 per cent. of the gas is used for producing light; and of this 50 per cent. only about 10 per cent. is now used in luminous flames. Hence the declining importance of the photometer for ascertaining the value of a gas to the average consumer.

The disparity in the illuminating power and calorific tests made on gas produced in vertical retorts also points to the necessity for a change in the authorized standards. The freedom from photometrical testing enjoyed by German gas undertakings has favoured the adoption of the vertical retort and chamber systems of carbonization. The retention in this country of tests, the value of which is now rapidly becoming nil, will hinder developments in carbonizing. We may, therefore, regard with satisfaction the acceptance by the Gaslight and Coke Company of a clause in their new Bill imposing a calorific test, and look forward with hope to the time when tests for illuminating power will be entirely superseded.

As to the limits imposed and accepted by the calorific test, it has since been stated that 125 calories per foot of gas would constitute a standard higher than can be maintained where the illuminating power is 14 candles tested with a No. 2 "Metropolitan" burner, and where a mixture of coal gas and carburetted water gas is supplied. In most works, however, there will be no difficulty in complying with such a standard; and the freedom allowed by such a test would be welcomed by many gas engineers who are now obliged to comply with stringent illuminating power regulations.

The diagrams further illustrate the important place the fuel business is taking; and the lessons to be drawn from them need little amplification to a body of gas engineers.



They simply indicate what is taking place in a greater or less degree in the experience of every progressive gas undertaking.

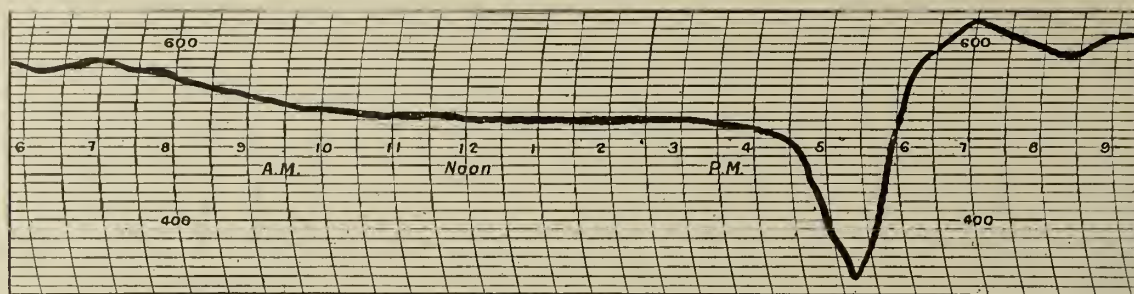
The Institution has recognized the important place gas for heating is capable of taking by appointing a Committee to conduct investigation and research in conjunction with a Department of the Leeds University. The report to be presented during the present meetings will indicate the progress already made. It is to be hoped that the financial support of boards of directors and committees of municipal undertakings may be continued, so as to enable this and other investigation work for the good of the industry to be pursued. It must be remembered that anything which contributes to the success of gas-heating is contributing materially to the reduction of the smoke nuisance.

HOUSEHOLD HEATING.

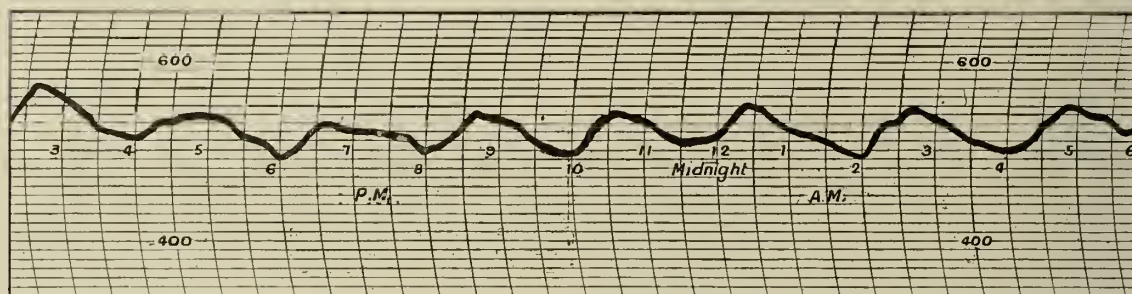
Although we may legitimately claim that the gas industry

is adapting itself to the new service required of it, and is showing its faith in the future use of gas as a fuel by spending capital freely on appliances which consumers can either hire or acquire on easy terms, and although we believe that in so doing a substantial advance has been made in the solution of the smoke nuisance problem, few gas men are so sanguine as Sir Oliver Lodge, who, from a recent address delivered at Sheffield, appears to anticipate that the whole of the fuel requirements of a model town can be supplied through gas-mains.

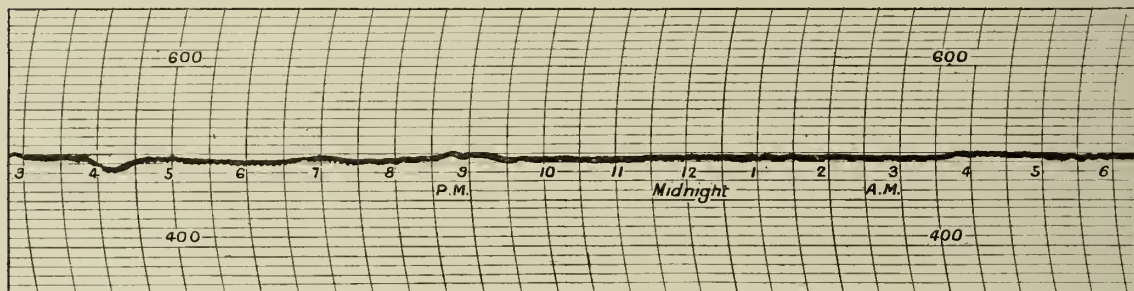
For many purposes coke will remain the cheaper and the better fuel; but with coke the conditions have to be fitted to the fuel, and something more can be done in this direction than has been done in this country in the past. The Coalite Company's scheme, however, recognizes that the suppression of the open fire-grate will be a slow process; and they therefore propose to fit the fuel to existing conditions retained with such tenacity by the British householder. Along these lines



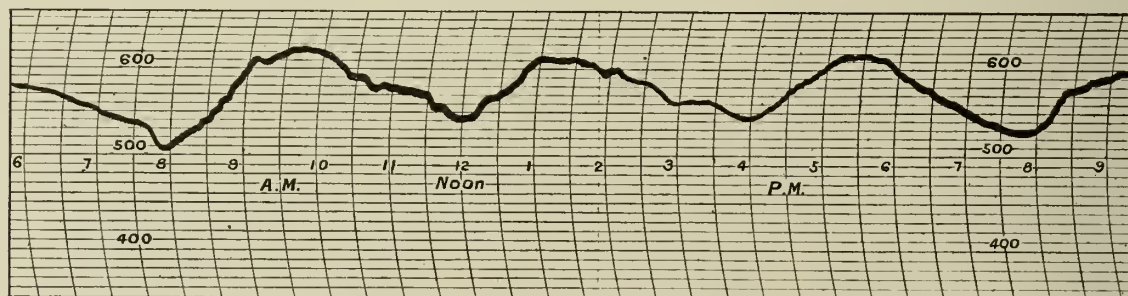
Recording Calorimeter Chart—Coal Gas. Outlet of Purifiers.
Showing the Effect of Stopping on Sunday Morning and Starting on Sunday Evening, Nov. 16, 1908.



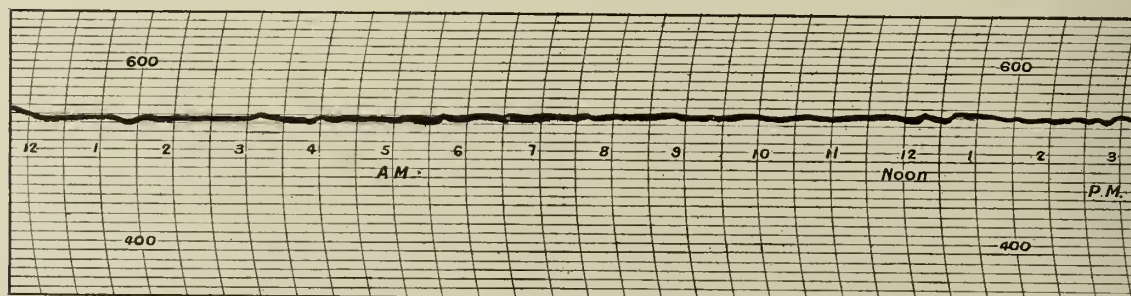
Recording Calorimeter Chart—Coal Gas. Outlet of Purifiers.
Six-Hour Charges. Normal Working. April 1 to 2, 1909.



Recording Calorimeter Chart—Carburetted Water Gas. Outlet of Purifiers. May 13 to 14, 1909.



Recording Calorimeter Chart—Coal Gas. Outlet of Purifiers.
Showing Eight-Hour Charges. Normal Working. April 21 to 22, 1909.



Recording Calorimeter Chart—Outlet of District Governors—June 5, 1909.

lies abundance of scope for the gas engineer of the present and the future.

THE COALITE PROCESS.

It is claimed by the promoters of "Coalite" that it is a free burning, smokeless fuel which will compete in the market, not with gas coke, but with high-class coal for use in open fire-grates. The coal for its manufacture is distilled

in groups of iron tubes, tapering from $5\frac{1}{4}$ in. to $4\frac{1}{2}$ in., set vertically, at a temperature of 800° Fahr. During distillation about 5000 cubic feet of gas, 20 gallons of tar, and liquor equivalent to 15 lbs. of sulphate are produced. The plant erected on land adjoining the Plymouth Gas Company's works appears to be a marvel of completeness for carrying on the process economically. The distilling vessels being

so small and the temperature required for the process being so low, compared with our practice, the fuel used is said to be only about 6 per cent. of the weight of the "Coalite" produced, and the wear and tear on the settings is reduced to a minimum.

By distilling the coal at the temperature used, the gases evolved are not subject to secondary reactions, the sulphur contents in the purified gas is favourably affected, the thin tars, when distilled, give an unusually large proportion of light spirit (said to be valuable for internal combustion engines), heavy oils free from naphthalene, and pitch innocent of free carbon. In a comparison of manufacturing costs published in "The Times," the gas into the holder from the process is figured out at 4.66d. per 1000 cubic feet. The gas is said to have a heating value of 750 B.Th.U., and to have an illuminating power of 20 candles.

The departure from our ordinary retorting practice is so revolutionary, and the methods of exploiting have been so bold, it is not to be wondered at if the claims have been received with a certain amount of scepticism. The working of the plant at Plymouth, however, puts the proposition on to a different footing; and it is evident that, as gas-makers no less than as smokeless fuel providers, we cannot afford to neglect an examination of its claims. It may be that the Coalite process will become an auxiliary to the older system, and that it is destined to extend the sphere of public usefulness rendered by gas undertakings.

TAR FOR ROADS.

If an improvement of the atmosphere brought about by extended enterprise on our part be a matter of agreeable reflection and anticipation, we may view with similar satisfaction the use of tar in the construction of more sanitary roads. The benefits derived from the painting of road surfaces with suitably prepared tar are now well understood by most road engineers and surveyors. Not only is the dust nuisance overcome, but the life of the road is prolonged. Mr. Maybury, the Kent County Surveyor, estimates that the main roads of England and Wales, if painted annually, will absorb about one-fourth of the present production of tar in the United Kingdom. This new outlet will have a beneficial effect on the receipts for this bye-product; and its use should be encouraged.

The tar best suited for road-painting must be freed by distillation from water, naphthas, and light oils. The plant required consists of a still of a capacity to suit the size of the works, a condensing worm proportioned to the size of the still, a separating tank, and storage tanks for the condensed products. It is advisable to provide a tank also for the storage of the prepared tar, as it is not always either convenient or safe to run the tar direct from the still into the contractor's tanks or barrels. The uncondensable products from the condensing worm must be passed through a purifier, and the plant must be registered with the Alkali Inspector. Tar prepared in a plant recently erected for the purpose is now being used on a large scale in Norwich, and, mixed with certain ingredients is also being used for making "Tarvia" matrix in connection with the Gladwell system of road construction.

SULPHATE OF AMMONIA PRODUCTION.

In an earlier part of this address I have drawn attention to an expected increase in the quantity of products from the distillation of coal due to the adoption of recovery ovens for the production of metallurgical coke. The new outlet for tar will do something to neutralize the effect so far as this product is concerned; and it is a fortunate circumstance at this juncture that so much tar is likely to be diverted to the improvement of roads. There is, however, no immediate promise of an equally good outlet for the anticipated increased yield of ammonia products; but the position is not entirely without its hopeful side. The annual production in Germany has grown since 1896 from 35,000 tons to 313,000 tons in 1908—an increase in twelve years of 278,000 tons. In the United Kingdom during the same period, the increase in the annual production has been 123,000 tons. The demand for home consumption during the twelve years has increased from 45,000 to 80,000 tons per annum; so that while our own country has absorbed an additional 35,000 tons per annum, foreign countries are taking an additional 366,000 tons of British and German made sulphate.

The Sulphate of Ammonia Committee, of London, have done much useful and effective work in the British Isles among agriculturists and horticulturists, and have, no doubt,

stimulated the home demand. The Committee now propose to join hands with a Continental combination of producers with a view to propaganda work in countries such as Egypt, South Africa, India, and China, where as yet little or no sulphate is used. By such extended work, as well as by the efforts of individual traders, it is expected that something may be done to make the demand keep pace with the increasing production, and so prevent prices from dropping to a low level. To enable British-made sulphate to hold its own in foreign markets, it would appear necessary for more care to be bestowed in getting the sulphate into condition, and for bags of a better quality to be used. The warning issued by the Board of Trade, if heeded in time, may prevent the loss of a valuable market to British producers.

THE COMPETITION OF ELECTRICITY.

Before bringing this address to a conclusion, I should like to revert to the diagrams of hourly gas consumption. If they reveal an important demand for other purposes than that of producing light, they also show how much we run the risk of losing if every care is not taken to satisfy the requirements of consumers as to their lighting arrangements. Hitherto convenience and cleanliness have favoured electricity; while relative cheapness has weighed with the prudent in favour of gas. The metallic filament lamp has done something to reduce the costliness of electricity; but corresponding improvements have enabled us to supply a greatly improved light with better facilities for turning on and off, and at the same time stained ceilings and over-heated rooms are practically things of the past where well-made and properly adjusted inverted burners are used.

With a duty of 20 to 30 candles per foot of gas for ordinary pressure, and 60 candles upwards per foot for high pressure supply, the days of gas lighting are not yet over. But our competitors are vigorous and active, and their artistic fittings place our unattractive brackets and chandeliers, the heritage of a hundred years of gas lighting, at a great disadvantage. To satisfy the educated taste of consumers, is it not important that artistic fittings should be supplied on easy terms, and so give our new forms of gas lighting a real chance? In the same way I believe that all better-class slot installations should be made models and examples to be copied by others. In such an installation the supply will be governed at the meter; the piping of the house will be sound and good; and the fittings will be light and artistic in design. Inverted burners will be used in the best rooms; and, if possible, maintenance of the mantles and burners, under certain conditions, will be undertaken.

Our electrical competitors have led the way in devising new and ingenious methods of charging for the energy they supply, and have frequently the advantage where rigid methods of charging for gas are adhered to. To compete for outside shop lighting it has been found necessary to quote an inclusive annual charge for a given candle power over a number of lighting hours. The annual charge includes the hire of lamps, maintenance, cleaning, lighting, and extinguishing. The cost of the latter may be obviated by the use of an hourly meter to register the number of hours the lamps are in use. This class of lighting business is well worth cultivating, as it keeps the capabilities of gas lighting before the public.

CONCLUSION.

The interests of gas engineering are manifold. There are many subjects of interest that I have not attempted to discuss. As far as possible I have endeavoured to review some of the larger questions destined to shape the future of the industry and have avoided the small concerns and duties which go to make up the daily round. When the time returns for these, we will (in the words of Robert Louis Stevenson) ask the help to perform them with laughter and kind faces, and try to let cheerfulness abound with industry. May we go blithely to our business all the day, and come to our resting-places weary and contented and undishonoured.

Gas Undertakings Returns for 1907-8.—The returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1907, in the case of the companies, and March 31, 1908, in that of the local authorities, which were ordered on the 31st of July last, were presented to the House of Commons on Friday, and ordered to be printed. Unless, however, there is greater expedition in their production than has been displayed of late years, it will be some months before the returns will be issued as Parliamentary Papers.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 746.)

THERE was immense activity in the Stock Exchange last week; but it was nearly all concentrated in one market. While some of the leading departments were persistently quiet, with a dull, or at best uneven, tendency, the South African Market was enjoying a boom; and many mines in other lands were in great favour. It was settlement week, and the operation was extremely heavy, finding full employment for all available hands. After a quiet opening on Monday, things took a firm tone generally; but Railways were quite out of it, and the Foreign Market was heavy. On Tuesday, the tendency was mostly rather dull, excluding the popular lines already noted above; but Consols held on unchanged. Wednesday was worse for the gilt-edged class. Consols fell $\frac{5}{16}$; while realizations administered a check to South Africans. Railways had a welcome turn for the better. Thursday was an in-and-out sort of day, with irregular movements past classifying; but things looked firmer at the close. It was not a good day for gas; the two chief issues having a fall. On Friday, the tendency was again uneven; but Railways continued to improve. Consols went down and then up again; and the Foreign Market was weak. On Saturday, there was a calm after the turmoil of the settlement. The speculative lines were not quite so buoyant, but the less emotional markets were pretty good. In the Money Market, there was a strong demand, the requirements of the Stock Exchange being very heavy; and rates rose accordingly. Terms for discount were firm. Business in the Gas Market was fairly abundant on the whole; but it was concentrated in fewer issues than ordinarily. Movements were somewhat irregular; for while Gaslight and Coke and South Metropolitan both had slight falls, many other issues had rises, reaching in some instances to 3 and 4 per cent. Gaslight ordinary opened at $104\frac{1}{4}$, and afterwards touched $104\frac{1}{2}$; but the closing transaction was at $103\frac{3}{4}$ —a fall of $\frac{1}{2}$. In the secured issues, the maximum realized from $88\frac{1}{4}$ to 89, the preference from 105 to $105\frac{3}{4}$, and the debenture 86 and $86\frac{1}{4}$ *cum div.*, and $84\frac{3}{4}$ *ex div.* South Metropolitan was quiet, and changed hands at from $122\frac{1}{2}$ to $123\frac{1}{2}$ (a fall of 1); and the debenture made from 85 to $85\frac{3}{4}$. In Commercial, the 4 per cent. was done at $100\frac{1}{2}$, and the 3½ per cent. at $103\frac{1}{4}$ and $103\frac{1}{2}$ —a rise of 1. In the Suburban and Provincial group, Alliance and Dublin old marked 18, British from $42\frac{1}{4}$ special to $43\frac{1}{2}$, Southampton $110\frac{1}{2}$ and 111, Wandsworth "B" 140 free, and West Ham $121\frac{3}{4}$ and 122. Brentford new rose 4, and East Hull 3. In the Continental companies, Imperial was rather weaker at from 179 to $180\frac{1}{2}$, ditto debenture realized 97, and Union $99\frac{1}{2}$ special and $100\frac{3}{4}$ *cum div.* Among the undertakings of the remoter world, Bombay fully-paid changed hands at $5\frac{5}{8}$ and $5\frac{3}{4}$, Buenos Ayres at $13\frac{1}{2}$, Monte Video at from $12\frac{1}{2}$ to $12\frac{3}{4}$, Primitiva at $6\frac{7}{8}$, ditto debenture at $94\frac{1}{4}$ and 95, River Plate at from $14\frac{3}{4}$ to $15\frac{1}{8}$, ditto debenture at 97, and San Paulo at $13\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Aggrieved Electricians—Public Lighting Tests—Popular Preference—Contemporary's Misstatements—Beaten at 1d. per Unit—Electrical Accidents—Losses on Metropolitan Municipal Undertakings.

THE beatings that electricity has been getting in fairly conducted competitive demonstrations of lighting by incandescent gas burners and electric lamps are causing some of our electrical contemporaries to feel rather sore and vindictive, and to show their resentment in misrepresentation. That is unworthy of the cause. An article, headed "Street Lighting," recently appeared in the "Electrician;" and there is in it so much perversion that it is difficult to disentangle it from that which might be allowed to pass as fair comment from a rival. The main part of the article deals with the recent contest at Bradford between incandescent gas lighting and electricity, from which contest the former issued with flying colours. But in the introductory paragraph of the article, in a reference to comparative tests, our contemporary does itself much credit by the display of a great depth of faith in the virtues of electricity as a street-lighting agent. Referring to the subject of comparative tests generally, it is remarked: "Where such tests are carried out on scientific lines, and due attention is paid to securing a fair and equitable basis of comparison, electrical engineers have little to fear as to the results obtained." We have been labouring under the impression that, where tests are conducted on scientific and practical lines, electrical engineers have something to fear, and that it is only when a municipal electricity department is eager for the street lighting and is unduly favoured, that electricity has any chance of success. We should like to know how it was (assuming our contemporary is correct) that after a straightforward contest—in the same road, all the surroundings being equal—between inverted gas-lamps at ordinary pressure and Osram metallic filament lamps, the South Suburban Gas Company secured the Beckenham public lighting contract for a number of years. Our contemporary presumably does not know the reason. It was because trial of the competing systems was carried out on both scientific and practical lines.

Turning, however, to Bradford, our contemporary admits that "popular feeling in Bradford is at present favourable to incandescent gas lighting;" and this after the special lighting demonstration! In this case our contemporary tries to explain away

the popular favour by stating that the gas-lamps were placed at a height of only $11\frac{1}{2}$ feet, while the arc lamps against which they had to compete were at a height of 25 feet; and we are to deduce from this that the gas-lamps dazzled and deluded the people of Bradford. Very well; they must have been good ones to have had this effect. The contention of our contemporary is absurd. It so happens that at Beckenham popular feeling was also favourable to incandescent gas lighting; but there the inverted gas-burners and the metallic filament lamps were placed in the ordinary street lamps all at the same height, so that one was not favoured by height to the disadvantage of the other. The fact of the matter is that the public decide their preferences in this matter in a very practical manner. They do not go crawling about the streets with illumination photometers, and make tests on the surfaces of the roadways or kerbs, or a foot or two above, and obtain curves and results that in any two sets of tests by different experimenters never by any chance agree (*vide* back issues of the "Electrician"); but they take a stretch of street, and are fully competent to judge the efficiency of the illumination. It is a far cry from Bradford to Beckenham; and, we repeat: How is it that popular feeling in both places should be favourable to incandescent gas lighting at the same time, if our electrical friends are right as to the ease with which electricity can administer a drubbing to gas?

Our electrical contemporary is not respectful to the Sub-Committee of the Bradford Corporation who had the matter of the trial in hand. The Sub-Committee, it asserts, "arrived at their decision without troubling to consider any figures as to the comparative amount of illumination provided in the two cases, apparently forming their conclusions from an inspection of the lamps, and from extraneous considerations." A little farther on in the article it is said: "Careful investigation of the details of the experimental trial appears to show that the decision arrived at in favour of gas lighting was practically a foregone conclusion, and this view may be considered as supported by the fact that the financial results of the municipal gas undertaking have recently shown unmistakable signs of the progress made by the electricity undertaking; while instructions have actually been issued that all canvassing of gas consumers by the electricity department is to cease, except in the case of an extension of mains." The writer in our contemporary has manifestly been drawing conclusions from inadequate information. That the decision could not have been a foregone conclusion is shown by the fact that the experiment was originally suggested by a member of the Council, in order to secure the lighting for electricity; and many of the members were in favour of electricity until they saw the results for themselves. Nor had the financial position of the Gas Department anything whatever to do with the decision. Again, the matter of canvassing did not enter into the discussion of the question at all; as a fact, it did not come before the Finance Committee (who had the settlement of the lighting question) until the very week that our contemporary's article appeared. The point only relates to the exceedingly unfair canvassing of the customers of the Gas Department by the Electricity Department, and the misrepresentation of which use has been freely made; and this is what is to be stopped.

Our contemporary has also something to say on the question of costs; but not all that might have been said. In what is said there is a decent bit of nonsense. It is remarked that "as soon as the electrical engineer issued his report, giving the cost of the arc lighting as 6s. 5d. per yard of street, it was followed by the report of the Gas Manager, in which the cost of incandescent gas lighting was stated as 6s. 4½d. per yard. Further comment is unnecessary, except to point out that electricity gave more than double the amount of light at about the same cost. . . . Much has recently been heard of the wonderful results obtained with high-pressure gas lighting. After an inspection of many existing installations, the Gas Manager at Bradford had to report that such lighting would cost no less than about 18s. per yard of street, as compared with the figure of 6s. 5d. for flame arc lamps every 40 yards." These statements as to relative costs are misleading. The Gas Department were told that 6s. or 7s. per yard was the utmost expenditure the Council would sanction; and the Electricity Department in consequence brought down their price to 1d. per unit, although they are being paid over 2d. for their other street-lamps! The costs for the gas-lamps were based on actual expenses, including gas at 1s. 5d.—the price that has been paid for street lighting during the past three years. Then again we emphatically assert that the Gas Engineer of Bradford did not report any such nonsense as that high-pressure gas lighting would cost 18s. per yard. We cannot imagine who has been "enlightening" our contemporary on this subject.

Gas won in the trial in a fair and square manner. Public opinion, as our contemporary confesses, was strongly in favour of gas as being the better light; and the Sub-Committee (including the Chairman of the Electricity Committee) were so unanimous that the decision was not disputed when it came before the City Council for confirmation. It is true that not much notice was taken of illumination curves, or even of the—may we venture to say obviously faked?—photographs that were shown to bolster up the claims of arc lighting. There is one other denial to be made of our contemporary's statements. It is suggested that mantles were carefully renewed immediately before the Sub-Committee's inspections. This is an absolute fabrication. We cannot think that articles such as the one here reviewed, interlined as it is by misrepresentation and misstatement, will do much to forward the cause of electricity for public lighting.

As usual the report of Mr. G. Scott Ram, His Majesty's Electrical Inspector of Factories, is an instructive document; and it shows the thoroughness with which the work of the department is performed, and whatis more the necessity for it. There is all too much careless installation in factories, inadequate supervision, employment of incompetent men, employment of skilled men when systems are alive while the work might be done when the systems are dead, and there is still a good deal of unsafe machinery put on to the market which gets installed in factories—by incompetent judges. The impression left upon one's mind after reading the report is that there is, one way or the other, a fair amount of incompetence abroad in the electrical industry. With regard to the accidents at electrical generating stations and sub-stations during 1908, Mr. Scott Ram reports that, at company and local authority stations, there were of non-electrical accidents 311 that were non-fatal, and 3 that were fatal; and at private stations 35 that were non-fatal. Of electrical accidents, there were at company and local authority stations, 74 that were non-fatal, and 2 that were fatal; while at private stations there were 16 that were non-fatal. These accidents show a slight increase over those of the previous year; but this is partly accounted for by the inclusion of accidents occurring in generating stations and sub-stations of certain electric railways, which were not embraced in previous tables. In the non-fatal accidents, there are some that were so severe as to have probably caused permanent disablement. Regarding the reported electrical accidents in factories, engineering works, &c., there were 222 non-fatal and 12 fatal. The number of accidents in such places is somewhat less than for the preceding year; but the number of fatalities is greater. The number of accidents in the use of portable apparatus is considerable—42 of the total of non-fatal accidents. In three, the main injuries were shock due to the use of hand lamps; in the remainder, the injuries were burns due to short-circuits. The Chief Inspector makes some comment on the unsatisfactory design of plug connectors. Some remarks are made in the report upon the exhibits at the Manchester Exhibition last year. The exhibits generally indicated that much more attention is paid by manufacturers to questions of safety than was the case a few years ago; but Mr. Scott Ram points out that there were nevertheless examples showing that this point of view is still frequently overlooked by the designers of apparatus. There is ground for the Chief Inspector characterizing as the "most important work" accomplished during the year the establishment of the new Home Office regulations in respect of electrical installations in factories, generating-stations, &c. These come into force on the 1st prox.; and it is hoped they will have the effect, by improving the standard of work generally, of reducing the number of preventable accidents.

Attention has been drawn by the "Municipal Gazette" to the London County Council's summary of the returns of the metropolitan municipal electricity undertakings for the year ending March, 1908, which shows that the losses are increasing. This will be seen from the following table showing the amounts by which three of these municipal concerns were subsidized out of the rates in the years 1906-7 and 1907-8:—

	1906-7.	1907-8.
Battersea	£9380 ..	£14,700
Woolwich	9794 ..	29,561
Fulham	— ..	1,317

It is wondered by our contemporary how the ratepayers in these boroughs relish paying such large sums for the privilege of having a municipal electricity supply. A tilt at the Battersea Progressives follows. About four years ago they were boldly announcing that their undertaking had turned the corner, and would soon be showing large profits. As a matter of fact, the losses have been increasing year by year ever since. Municipal trading advocates, it is remarked, are welcome to any comfort they can extract out of a sum of £5130 contributed to the rates by the Hammersmith and Hampstead undertakings in 1907-8. This is a very poor set-off against the losses in other boroughs; and, what is more, the returns do not show to what extent the ratepayers all over London have been called upon to contribute indirectly through the public lighting accounts towards the upkeep of this form of municipal enterprise. Another table in the return indicates that since municipal electricity was started in London, five of the boroughs have had to bolster up their undertakings by contributions out of the rates totalling up to £121,459; while only four boroughs have been able to make any attempt to relieve the rates, and that to the extent of only £36,695. If it were possible, observes our contemporary, to estimate the indirect subsidies, it would probably be found that in no case has there been any genuine profit.

Use of Gas for Inflating Balloons.—Were it necessary to have another proof of the development of aerial navigation during late years, it could be found in the statistics in regard to the quantities of gas utilized to inflate balloons. According to "La Technique Moderne," it is estimated that in the year 1907, no less than 70½ million cubic feet of gas were employed for the purpose. In this total, Germany and France are represented by about 17½ and 17¼ million cubic feet, England by 8¼, Belgium by 7¼, Italy by 3¼, and the United States by 2½ millions respectively. Then follow Switzerland, Austria-Hungary, and Sweden with smaller quantities making up the total.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

THE Forty-Fifth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued on Saturday. It embodies the results of the work of Mr. R. Forbes Carpenter and of the several District Inspectors during the past year, and, as usual, contains various matters of special interest to our readers. To-day we can do very little more than epitomize Mr. Carpenter's report, leaving for subsequent issues a fuller notice of it, as well as of the reports of his colleagues.

The number of works registered under the Act in England, Ireland, and Wales on Dec. 31 last was 1261. Of these, 72 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder (1189) carried on processes which were scheduled or were subject to registration under the Act of 1906. These numbers show an increase of 30 scheduled and registered works compared with 1907. There are also 163 works registered in Scotland, which, as usual, are dealt with in a separate report—bringing the total number of works registered in the United Kingdom to 1424. The number of separate scheduled and registered processes under inspection last year was 1839, compared with 1821 in 1907. These numbers show a slight net increase in 1908 over the corresponding figures, but not so great as the number of new works registered. There is a noticeable increase in the works manufacturing sulphate and muriate of ammonia; these, with gas liquor works, accounting for upwards of 31 per cent. of the processes under inspection. The Inspectors paid 4860 visits to works, and carried out 5170 tests, compared with 4269 visits and 5266 tests in 1907. It is gratifying to find that no proceedings were taken against the owners of registered works in 1908; but at the close of the previous year the question was under consideration in four cases. In one of these a fine of £20 was imposed for non-observance of the "best practicable means" in the manufacture of sulphate of ammonia.

SULPHATE OF AMMONIA AND GAS LIQUOR WORKS.

Mr. Carpenter reports that the number of works in this class continues to increase—having risen from 554 in 1907 to 578 last year. No notable alteration in the method of dealing with the foul gases evolved during manufacture stands to be recorded during the year. Where purification by oxide of iron is used, an increasing number of works have adopted the form of oxide heap in place of the box purifier constructed of brick and cement. In either case an impervious bottom has to be prepared; previous experiences having shown to what unexpected extent the noxious gases can make their way through ordinary made-ground to cause their effects to be felt at quite a considerable distance from the purifying apparatus. This subject was mentioned in the Chief Inspector's reports for 1905 and 1906. He says it is necessary to emphasize the points that the arrangements for the distribution of the noxious gases among the purifying heap or heaps call for the observance of the same precautions as if box purifiers were being used, and that no modification can be made in the requirements constituting observance of the "best practicable means" that were most explicitly stated in his 37th report. These remarks are followed by a further memorandum by Mr. Carpenter's Assistant (Mr. S. E. Linder, B.Sc.) on the results of his analysis of ammoniacal liquors.

RECOVERY AND PRODUCTION OF AMMONIA.

Mr. Carpenter gives his customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. The figures—which, he remarks, again present features of interest—are as follows:

	1908.	1907.	1906.
Gas-works	165,218	165,474	157,160
Iron-works	18,131	21,024	21,284
Shale-works	53,628	51,338	48,534
Coke-oven works	64,227	53,572	43,677
Producer gas and carbonizing works (bone and coal)	24,024	21,873	18,736
Total	325,228	313,281	289,391

For the sake of convenience, these figures are expressed in terms of sulphate of ammonia—the form in which ammonia is usually presented to the market. Mr. Carpenter points out, however, that ammonia is worked up into many other commercial products, and, in addition, a not inconsiderable amount of ammoniacal liquor is used as a reagent in the manufacture of alkali by the ammonia-soda process; and as such operations are subject to loss of the circulating reagents, a certain amount of ammonia has continually to be purchased to replace this loss. The figures, therefore, do not, he says, represent the produce of sulphate of ammonia.

As will be seen, the most important contributor still remains the gas industry, but Mr. Carpenter points out that the marked increase of produce in 1907 over 1906 was not maintained in 1908. He has reason to believe there has been, in reality, quite a substantial increase; but it has been necessary to review more closely

this year the amounts of ammoniacal liquor used in the ammonia-soda industry, as errors of method were found to exist in arriving at these figures in past years which have materially affected the total for 1908 from gas-works. Commenting upon the figures, the Chief Inspector makes the following remarks:

The decrease in ammonia recovery in iron-works is principally due to depression in the blast-furnace industry; works recovering ammonia from blast-furnace gases being almost entirely confined to Scotland. Only in special districts is coal possessed of sufficient hardness to stand in the blast-furnace without crushing. The English works are confined to Staffordshire. In 1906, the maximum figure of recovery of ammonia was attained in this industry. In the opinion of competent judges, moreover, who are acquainted with the details of coal supply in Scotland possessing the necessary physical properties, it is a figure that may not again be reached. Shale-works produce again exhibits a substantial increase; showing the great excellence in working of the modern large shale-retort, variants of which are now in operation at all the Scotch oil-works, to which industry this important contributor—nearly one-sixth of the production of the United Kingdom—owes its existence. Again, too, a very substantial increase—over 10,000 tons—is shown by the coke-oven works. To the rapid development of this industry I gave special attention in the last annual report, and am able to state that further increase may be expected for some years to come; there being several large plants now in course of construction. The increase in producer-gas plants with recovery of ammonia is also a matter for satisfaction. To the successful operation of these the increase recorded in the last sub-head of the table is entirely due, as the produce in carbonizing works (coal and bone) does not show tendency to increase, but rather to decline.

Operations on a large scale for the recovery of ammonia from peat in Ireland, to which reference was made in the last report, had not commenced at the date of the one under notice (March 18).

FURTHER STUDIES IN COAL CARBONIZATION.

A further contribution to the studies in coal carbonizing, which, it may be remembered, was a specially interesting feature of Mr. Carpenter's report for 1907, and more particularly to the study of some of the reactions producing hydrocyanic acid, as one of the bodies resulting from the carbonization of coal at high temperature, is given towards the close of the present report. It is only possible now to indicate briefly the scope of these important and elaborate investigations. The influence of moisture on the decomposition of methane in presence of carbon was found to be a subject on which knowledge had to be gained; and the experiments undertaken included the comparison of dry and moist methane upon porcelain and carbon respectively. The results are tabulated, as are those of similar treatment of diluted methane saturated with aqueous vapour at different temperatures, and the behaviour of the same two contact substances. The yield of ammonia is recorded in experiments bearing upon contact with wood charcoal, the results of which are also tabulated. The variable in those at 935° C., the latest in order of time, and made with all the experience gained during the research, is "rate of flow," other conditions being kept as constant as possible. Mr. Carpenter says it is manifest, from consideration of the tabulated results, that, in applying the knowledge of the facts ascertained to large-scale operations in gas-works and coke-ovens, the consideration of what has been described as "rate of flow" has an enormous influence on the products obtained in the carbonization of coal. "Temperature," he says, "is by no means the only factor of importance." This was emphasized by Professor Bone in his lecture to the Institution of Gas Engineers last year.*

Having stated the results of the simpler problems presented for study, Mr. Carpenter proceeds to consider the more intricate and complex conditions surrounding the next portion of the subject—viz., the interaction of methane and ammonia. Here the volumes of gas dealt with were larger, not only by reason of the presence of the ammonia, but because of the necessity for employing a large volume of coal gas deprived of illuminants as protecting diluent. Moreover, a fair proportion of the latter was required for sweeping forward products of reaction when the supply of ammonia was cut off. Referring to these experiments, Mr. Carpenter says:

Again endeavouring to translate results and apply them to large-scale conditions, in the continuous vertical retort a zone of maximum and continuous heat exists perhaps at about three-fifths of the depth of the retort, measuring from the top. Here the coal has thoroughly coked; the horizontal section will, under normal condition, be well filled with incandescent solid, with absence of any central gas channel such as characterizes the horizontal section of an intermittent vertical retort. Here also the gas pressure, small as this is on the continuous vertical retort, will be at a maximum, while the rate of flow of gas from its diminishing evolution will be much lessened as compared with higher zones in the retort—conditions all favouring decomposition of methane and any accompanying ammonia, and formation of hydrocyanic acid from its elements. It is in this zone, also, and somewhat lower, that it seems reasonable to look for formation of ammonia, if the reactions of hydrogen on the nitrogen existing on the still not completely carbonized coal have any actual existence, since the ammonia, if formed, has better chance of survival in the higher zones of the retort.

Mr. Carpenter requested Mr. Linder to prepare a short account of the apparatus used, the procedure, the methods observed in making the calculations for presenting the results of the experiments, and analytical notes on the tables; and this is given in the report. Following it and the tables are the conclusions arrived at, which may be very briefly summarized as follows: Wood

charcoal has a marked thermal effect on dry coal gas below 750° C.; but it rapidly increases with rise of temperature. Traces of ammonia are produced, but no hydrocyanic acid below 835° C. Porcelain at 770° C. has no effect, either oxidizing or thermal, on dry coal gas. Above 850° C., both effects were strongly marked. Methane suffers thermal decomposition at temperatures below that at which carbon is capable of reacting with nitrogen to form hydrocyanic acid. Porcelain below 765° C. has no appreciable effect on moist coal gas. In addition to the marked thermal effect which characterizes the action of wood charcoal on dry coal gas, an oxidizing effect is noticeable with the moist gas; the product of such action being mainly carbonic oxide. Hydrocyanic acid is stable at 935° C. in presence of wood charcoal and with moist gas as diluent. Ammonia is produced at all temperatures between 720° C. and 935° C.; its formation being favoured by high temperature and reduced rate of flow. Hydrocyanic acid, on the other hand, is not produced in appreciable amount, under the conditions of the experiment, by direct interaction of nitrogen and carbon below 835° C. Its formation is favoured by high temperature and reduced rate of flow. Below 800° C., the oxidation and thermal effects of porcelain on methane are insignificant. Hydrocyanic acid is produced, but in small amount; but ammonia survives in large proportion. Above 900° C., the effects are more marked. Hydrocyanic acid, if produced at a slow rate of flow, is entirely destroyed; and ammonia is practically completely dissociated into its elements. With wood charcoal, the critical temperature for the formation of hydrocyanic acid is considered to lie between 755° C. and 805° C. So far as the interests of the Chief Inspector's department are affected, he says the chief difference that appeared in the gas liquor analyses of 1907-8 lay in the increased ratio of hydrocyanic acid to ammonia in the liquors from the continuous vertical retort.

Mr. Carpenter says it became increasingly evident, during the progress of the work he has been describing, that, in order to arrive at satisfactory and adequate conclusions, its scope needs extending. To continue it, therefore, in his laboratory is felt to be impossible, since to carry out such experimental work satisfactorily great and continuous devotion of thought and energy is required. The conditions imposed by the claims of administrative official duties prevent this. He believes the results he has presented are as accurate as were possible of attainment under the disadvantages existing. He considers that only in a technological institution like that at Carlsruhe, for so long under Dr. Bunte's able direction, or in the more recently established technical laboratory at the University of Leeds, under the guidance of Professor Bone, F.R.S., "whose researches into the decomposition of gaseous hydrocarbons at high temperatures have placed him in such an exceptionally advantageous position for contributing data of value towards the scientific advancement of the gas industry," can such experimental work as this be properly undertaken. In conclusion, Mr. Carpenter recognizes most warmly the zealous devotion of Mr. Linder throughout the research, for without his most able collaboration nothing would have been accomplished. He says that "if the work possesses value, the credit is really due to him."

AMMONIACAL LIQUORS FROM LOW-TEMPERATURE CARBONIZATION.

In a postscript written last month, Mr. Carpenter states that, during the passing of his report through the press, opportunity occurred of examining ammoniacal liquors from coal partially carbonized at exceptionally low temperatures (800° to 850° Fahr.) in the preparation of coalite at three new works which have very recently commenced operations. The samples were derived from coals from very varied localities. Analysis of the liquors was rendered extremely difficult on account of the nature of the organic bodies present, and the standard method for estimating thiocyanate (described in a previous report) had to be substantially modified to enable this constituent to be determined with accuracy. Mr. Carpenter says that in samples from all three works undoubted evidence of the presence of cyanogen compounds was obtained; and he presents the following figures with confidence as being substantially accurate:—

Liquor.	Total Ammonia.	Cyanogen in Terms of HCN.				Per Cent. Total Cyanogen to Ammonia.
		Cyanide.	Thio-cyanate.	Ferro-cyanide.	Total.	
Works A—						
Virgin liquor from main . . .	0.459	0.002	Nil	Nil	0.002	0.4
Do. from condensers . . .	5.602	Nil	0.007	0.023	0.030	0.6
Average sample from well . .	1.011	Trace	0.033	Nil	0.033	3.2
Works B—						
Virgin liquor from main and condenser . .	0.582	Nil	0.018	"	0.018	3.1
Works C—						
Average sample from well . .	1.717	"	0.119	"	0.119	6.9
Do.	3.280	"	0.384	"	0.384	11.7

Notes.—Liquor from Works B circulated by pump. Both liquors from Works C circulated to get up the strength.

Mr. Carpenter remarks that it is notable that, at the temperature of carbonization observed in the process, any cyanogen

* See "JOURNAL," Vol. CIII., p. 319.

compounds at all should be formed, even when making allowance for some access of air to the retort, since flue temperatures are kept at only 100° Fahr. above the temperatures ruling in the interior of the retort—viz., 800° to 850° Fahr. (427° to 454° C.); while the research detailed in the previous portion of his report indicates that the critical temperature for the formation of cyanogen from carbon in the form of wood charcoal and ammonia lies above 1380° Fahr. (750° C.).

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
June 7	Previously acknowledged	9874	16	1
" 8	D. T. Livesey, East Grinstead	0	10	0
	Wales and Monmouthshire District Institution of Gas Engineers and Managers	5	5	0
" 10	Thomas Hack, Swan Village, West Bromwich	1	1	0
	Vincent Hughes, Smethwick	1	1	0
	John Miles, Bolton	2	2	0
	Sunderland Gas Company	52	10	0
" 14	George Keyte, Workington	0	10	6
	Ossett Corporation Gas Committee . .	5	5	0
	T. J. Reid, Ballina, Ireland	1	1	0
	R. J. Skinner, Londonderry	0	10	0
	W. E. Walton, Bishop Auckland . . .	0	10	6
	Total	£9945	2	1

PERSONAL.

Mr. T. J. BUSH, the Engineer of the Australian Gaslight Company, of Sydney, left Australia on the 30th of April last in the s.s. *Geelong*, via the Cape, on a visit to London. Mr. Bush has not been enjoying good health of late, and it is hoped that the rest and change will prove very beneficial to him. If health permits, Mr. Bush will avail himself of the opportunity of seeing the many improvements in the gas industry that have taken place in England and on the Continent since his last visit in 1899.

At the English Consulate and All Saints' Church, Milan, on the 9th inst., the marriage was solemnized of Mr. Henry Maurice Frost, Engineer at the Bovisa Gas-Works of the Continental Union Gas Company, son of Lieut.-Gen. Frost, of the Ottoman Service, Constantinople, to Miss Marion Ethel Hadden, of Milan. There was a numerous congregation of the members of the English colony and Italian friends at the ceremony; among those present being Mr. A. Clement Hovey, Chief Engineer in Milan (who was best man), the British Consul, and Mr. E. J. Luff, the Assistant-Engineer at the Bovisa works. Mr. and Mrs. Frost are spending their holiday in Venice, and they have the best wishes of their friends in Italy and England, and especially of the residents in Milan, where both are well known and highly esteemed.

OBITUARY.

We regret to announce the death, on the 8th inst., in his 57th year, of Mr. JOHN HUTCHINSON, late Works Manager and Director of Messrs. Hutchinson Bros., Limited, Gas Engineers and Meter Makers, &c., of Barnsley. Deceased was the founder of the firm, in 1872. He was the third son of the late Mr. John Hutchinson, Secretary and Manager to the Barnsley Gas Company, and brother of Mr. Walter W. Hutchinson, the present Engineer and Manager.

The death occurred on the 1st inst., at his residence at Hampton, of Mr. WILLIAM GOLDSWORTHY, who, until about five years ago, was Superintendent of the Hampton station of the Metropolitan Water Board. In early life, he was employed in the large engineering works of Messrs. Harvey and Co., at Hayle, in Cornwall (his native town), who supplied to the Southwark and Vauxhall Water Company the beam-engines which are still in use at Hampton. He came to London in connection with the erection of the engines nearly forty years ago, and entered the Company's service.

We regret to learn, through the "Journal für Gasbeleuchtung," of the death on the 28th ult., at Wiesbaden, after much suffering, of Herr ROBERT SALM, the Manager of the gas and water works at Riga. Deceased had been for many years past a member of the German Association of Gas and Water Engineers, and a regular and much-valued attendant at its annual meetings. The same journal also reports the death, on May 22, of Herr F. HABENSTEIN, the Manager and Chief Engineer of the Thuringian Gas Company, which has its headquarters at Leipzig. Deceased was in his 62nd year, and had recently completed 25 years' service with the Company. The death also is announced, as having taken place on May 14, of Herr C. LAMB, who from 1885 to 1895 acted as assistant, and from the latter year as Manager, of the gas and water works at Würzburg. He retired from the Managership in 1906.

As the result of a trap accident which occurred last Friday week, Mr. ANDREW G. SUTHERLAND, Director of the Sutherland Meter Company (whose new works at Wilton were noticed in the "JOURNAL" about three months ago), and patentee of the Sutherland gas-meter, unhappily lost his life. The fatality took place at Erdington, very near Mr. Sutherland's home. Deceased was driving a young mare which had not been in harness for some time; while his son, Mr. W. C. Sutherland, and a groom led the animal by a rein on either side. After a short time, the mare became troublesome, with the result that the bridle broke, and the bit came out of her mouth. Being thus completely out of control she dashed away with Mr. Sutherland senior, and in negotiating a corner overturned the trap and threw her driver over a hedge into a field. When removed to his house close by, it was found that Mr. Sutherland was dead; his neck having been broken. Deceased, who was 64 years of age, had but lately recovered from a severe illness. He was a native of Orkney, and was well known and much respected in Erdington, where he had resided for some years past. At the inquest a verdict of "Accidental death" was returned; the Coroner and the Jury expressing sympathy with Mrs. Sutherland and the family in the bereavement they had sustained.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Programme of the Annual Meeting.

WE have received the programme of the annual congress of the Société Technique du Gaz en France, which will open next Tuesday in the large hall of the Hôtel de la Chanson, Lyons, under the presidency of M. Godinet, gas engineer associated with the firm of MM. de Lachomette et Villiers, of Lyons, who have in their hands a number of gas-works.

The morning of the first day will be devoted, as usual, to the routine business; and the afternoon and parts of the three following days to the delivery of the President's Address and the discussion of the 21 papers. M. Parsy will present a note on the net price of gas in the retort-house; M. Grebel will bring under notice the Parsy retort; M. Hovine will describe a regenerative furnace with an arrangement for heating by tar, the latter subject being also dealt with by MM. Echinard and Ménard; M. Bitard will describe M. Villain's retort-stoking system, and M. Teulon the method of quenching coke in use at the Marseilles Gas-Works; MM. Badon-Pascal, Aubert, Aublant, and Gaulis will furnish information in regard to the Rostin, "Alex," and other distance lighters; MM. Schrimpf and Alliroi will deal with the fixing of meters; and MM. Richarme and Laforgue will introduce the "Rolin" high-power burner and new incandescent burners on the Rabeux system. The remaining papers will describe water-heaters and other appliances. In addition to the papers, there will be discussions on the subjects of machinery for charging retorts in small gas-works, lighting and extinguishing burners at a distance, the utilization of tar, the treatment of ammoniacal products in small works, and the use of india-rubber joints for mains.

On Tuesday evening the members will be the guests of the Lyons Gas Company at a banquet at the Restaurant Berrier et Millet; the next afternoon will be devoted to visits to the gas and electricity works, and in the evening the Gas Company's show-rooms, which will be open all through the congress, will be visited. On Thursday afternoon, the members will be able to inspect the generating station of the Lyons Omnibus and Tramways Company and other works; and in the evening the subscription banquet of the Society will take place in the Salle Rameau. On Friday afternoon there will be an excursion, to which ladies are invited, to Mont Verdun and Poleymieux; and *en route* there will be a reception by the Lyons Gas Company. During the congress, a free visit to the remarkable Museum of Fabrics will be organized for the ladies.

Anti-Socialist Literature.—We have received from the Literary Secretary of the Anti-Socialist Union of Great Britain (Mr. P. S. Bridgeford) three of the useful pamphlets the Society are issuing with the view of directing attention to the dangers of Socialism, and checking its growth. In one pamphlet, Mr. J. B. Wilson deals with "The Fraud of Socialism," and exposes the Socialists' plot to capture the Trade Unions, secure control of their funds, and use them solely for the furtherance of their revolutionary political aims. In another pamphlet, the failures of Socialism in Great Britain, France, America, and other countries are concisely presented, with an introduction by Mr. Thomas Macay. The third pamphlet is by Mr. Willie Dyson, whose contributions to "The People," under the *nom de plume* of "Will Workman," may have come under the notice of some of our readers. Mr. Dyson deals with mining royalties, the appropriation of which is being constantly advocated by agitators for the confiscation of other people's property; and he shows that, on the authority of the present Prime Minister, it would have required some £150,000,000 fifteen years ago to compensate the owners of all the mines and minerals in the United Kingdom for their nationalization, and that no case whatever had been made out for such a change. The three pamphlets may be had for a few pence from the Society, whose offices are at 58 & 60, Victoria Street, S.W.

THE ASSOCIATION OF WATER ENGINEERS.

ANNUAL GENERAL MEETING IN DURHAM.

The Fourteenth Annual General Meeting of the Association was held in Durham last week. Assembling in the Town Hall at 10 a.m. on Thursday—Mr. H. E. STILGOE, M.Inst.C.E., the City Engineer and Surveyor of Birmingham, in the chair—the Association were welcomed by his Worship the Mayor (Mr. John F. Boyd, J.P.), along with whom on the platform were several Aldermen and Councillors.

The Mayor's Welcome.

The MAYOR said he had great pleasure in being present to offer the Association, on behalf of the Aldermen, Councillors, and citizens of Durham, a cordial welcome to the city. It gave him additional pleasure to find that Mr. Askwith, an old and valued friend of his late father, and one who worked with him for many years in the interests of water supply, was President for the year; and he wished him every success during his term of office. He was pleased the Association were holding their annual meeting in Durham; as it gave those of them who had not been there before an opportunity of visiting some of the places of interest in the ancient city. The supply of good, pure water for domestic purposes, especially in large towns, was a very important matter; and this had been dealt with most satisfactorily by their Water Engineers. In Durham they had, from the Weardale and Consett Water Company's reservoirs, a plentiful supply of excellent water, not only for domestic purposes, but sufficiently plentiful and at a pressure strong enough to cope with any fire that might occur in the city. Many of the old citizens would remember, not so many years ago, that their only supply was from what was known as the Pant and a few wells in different parts of the town; and the water had to be carried from these springs to the place where it was required. In his own time, it was a regular thing, if they walked through the Banks, to see a large number of people carrying water from the Banks Well for their domestic needs. This was one of the popular wells in the city, and was thought to be very pure; but, if he remembered correctly, upon analysis it turned out to be the reverse. Now all was changed, very much for the better; and, thanks to the work done by their water engineers, they had a plentiful supply of pure water brought to their doors. He would not trespass further upon their time, but would again offer them a hearty welcome to the city.

The PRESIDENT (Mr. Stilgoe) said that once more the Association were accorded a hearty welcome to the town in which their meeting was being held; and he was sure the members would agree with him that that morning they were much indebted to the Mayor of Durham for his kindness in welcoming them. It was a great matter for the Association that they should be received, as they always were, with such kindness and courtesy by the Chief Magistrates of the towns in which they assembled. It evidenced keen interest in their doings, and showed that the towns appreciated the work in which the Association of Water Engineers were engaged. He had the pleasure of proposing a hearty vote of thanks to the Mayor for his address of welcome; and he was sure the members would be gratified to know that three of the Aldermen and two or three Councillors of the city were also present to welcome them. He then formally proposed the vote of thanks, and asked the meeting to carry it by acclamation.

This having been done,

The MAYOR briefly expressed his acknowledgments, and the municipal party retired.

Minutes of the Last Meeting.

The SECRETARY (Mr. Percy Griffith, M.Inst.C.E.) then read the minutes of the winter meeting, held in London on the 11th and 12th of December last; and they were adopted.

The New and the Retiring Presidents.

The PRESIDENT said that it was now his pleasing duty to introduce to the members formally—because there was no need for an introduction otherwise—Mr. Robert Askwith, Member of the Institution of Civil Engineers, and Engineer to the Weardale and Consett Water Company, as their President for the coming year. Mr. Askwith was the Engineer to a Company having control of an area of water

supply as large as about one-third of the county of Durham. He was well known to them all; and they had chosen him as their President because of his recognized ability, and for the services which he had already rendered to the Association. He (Mr. Stilgoe) would not take up time then, as the members would have an opportunity afterwards of referring to Mr. Askwith; and he therefore vacated the chair in his favour. Addressing Mr. Askwith, the retiring President said: I present to you, on behalf of the Association, your certificate as President; and I wish you a very happy year of office.

Mr. ASKWITH took the chair amid loud expressions of appreciation, and said he accepted the certificate with some trepidation, for he already knew the amount of work entailed upon the President; and it was always a difficult thing to follow a good man. If one's predecessor had done his work badly, the members would be relieved to get rid of him, and would be glad to take almost anybody else in his place. But following a gentleman like Mr. Stilgoe was a very hard matter indeed. It fell to his lot now to propose a vote of thanks to Mr. Stilgoe for his work during his year of office as President; and he did it with a certain amount of pleasure as well as with a certain amount of sorrow. He did it with pleasure, on looking back to Mr. Stilgoe's work, all of which had been carried on so admirably. By his courtesy and by his firmness, he had always ruled the meetings of the Council fairly and well; and they were very sorry indeed to lose him as their President. He begged to propose to the members formally that they give Mr. Stilgoe their best thanks for his services during the past year—a proposal which he was sure they would carry by acclamation.

The vote was cordially agreed to.

Mr. STILGOE thanked the meeting most sincerely for the kind vote of thanks they had passed to him for his services in the chair. He assured them that his year of office had been one of great pleasure as well as one of very great instruction to him; and he took the opportunity of thanking the members of the Council and of the Association generally for their kindness and support on all occasions. Had he not felt that he had the sympathy and support of the entire Association, he would have been unable, at any rate with satisfaction, to carry out his duties. He had tried, during the year, to keep foremost the honourable and proud position to which the Association had attained. It was an Association of Water Engineers, representing the interests of the health of the community, so far as the provision of a pure water supply was concerned; and therefore it must be understood that the work of the Association was one which he might say had great responsibilities attached to it. He thanked the members very much for their kindness to him at all times, and particularly for the vote which they had accorded him.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

The Association is yet in its youth; being now only in its fourteenth year. It has survived the period of infancy; has passed the time of childhood; and is now in a fair way to attain the age of manhood in a condition of robust health combined with increasing powers of development and extending usefulness to the community.

Even in these few years, two Past-Presidents, to whom the Association owes much of its present position, have been called away by death; and we deeply deplore the absence of their ripe judgment in conducting the affairs of the Association. I allude to Mr. William Augustus Richardson, President for the year 1901-2, and Mr. Robert Henry Swindlehurst, President for the year 1903-4—the latter of whom passed away, after a very short illness, in March last.

In membership, steady progress is being made, as is shown by the following figures, which give the numbers on Jan. 1 of each of the last three years:—

	1907.		1908.		1909.
Honorary members	2	..	2	..	3
Members	208	..	206	..	207
Associate members	90	..	108	..	116
Associates	32	..	36	..	39
Totals	332	..	352	..	365

It will be noticed that, as on former occasions, the increase is chiefly under the heading of associate members;

and I agree with my immediate predecessor that this may be looked upon as a very satisfactory feature of our progress. At the same time growth in numbers is only one sign of healthy development; and it is our duty to see that the Association increases in usefulness, not only to members, but to the community at large. Let every member ask himself what can be done in future to extend the usefulness of the Association, and send any suggestions that may occur to him to the Secretary for consideration by the Council. Many such suggestions have been received, and the Council have always given them careful consideration. The offer made by our retiring President of a £10 premium for a paper entailing research work, and the decision lately come to by the Council to award two premiums of £5 each for papers selected by them, will, it is believed, produce valuable contributions to our "Transactions." I cordially invite those younger members whose time is not yet fully occupied to enter into healthy competition for these premiums. This step alone will mark the year of Mr. Stilgoe's presidency as one in which true progress was made.

It has been suggested to me that a standard form of general conditions to be attached to specifications of work for which tenders are being invited, would be of great use to our members. This, I am informed, has already been done by the Institution of Gas Engineers; and the advisability of our Association taking a similar step will be duly brought before your Council for consideration.

It would also prove useful to members if a table were prepared showing what figure should be generally accepted as a reasonable maximum consumption of water per head per day for domestic purposes by communities which are supplied under different circumstances and where constant supply is given. It is difficult to understand why the rate of domestic consumption should vary from 10 to 40 gallons or more per head per day in different districts. There are, of course, reasons for some differences. For example, where the public supply of water is hard it is often supplemented by the use of soft rain water for washing purposes; and the consumption of the public supply is in such cases lower than when this is soft and suitable for all purposes. The number of baths and water-closets relative to the population supplied must also have a great effect on the consumption. But these and other such local differences do not fully account for the great variations that exist. If, however, in the cases where the consumption is relatively high, the difference is caused by waste, the matter is worthy of our most careful consideration. If we assume that 30 million people in these isles take their water supply from public undertakings, and the waste is only a gallon per head per day, the value of the water wasted, when worked out at the very low price of 6d. per 1000 gallons, amounts to more than a quarter-of-a-million pounds sterling each year. The question of prevention of waste is thus seen to be one of great importance from a monetary point of view; but when we remember that the supply of pure water in this country is limited, and that the various sources are being rapidly appropriated, it at once becomes a question of vital national importance.

The two most important considerations to be borne in mind in endeavouring to minimize the waste of water are, firstly, to see that only the best quality of water-fittings and the highest class of plumbing are employed in connection with water undertakings, and, secondly, the adoption of an efficient system by which repairs (which in time become necessary, however good the fittings may originally have been) are carried out without loss of time. I would remind you that the first of these matters has now for some years been under the consideration of the Joint Committee on Water Regulations which has lately been incorporated, and on which this Association is largely represented. The Committee have now issued a Model Code of Regulations, which, although not perfect, is an honest attempt to improve the standard of fittings and plumbing work; and they have also appointed a Standardization Committee (with the Secretary of our Association, Mr. Percy Griffith, as Secretary) for the purpose of extending the standard specifications of water-fittings as occasion may require. This Sub-Committee will receive with pleasure any information on this subject which members may be good enough to submit.

The Incorporated Joint Committee have recently registered a standardization mark, which manufacturers of fittings will be allowed to stamp on fittings made in accordance with the standard specifications of the Committee as regards shape, dimensions, weight, material, and workmanship. The privi-

lege of using this mark will be withdrawn from any manufacturer proved to have applied it to fittings that do not comply with the Committee's requirements; and by this means the purchaser and user of water-fittings will be protected from the trouble and expense involved by the supply of inferior fittings, and the water authority from much needless waste of water. The Committee have also made arrangements by which stamped fittings can be examined and tested at various centres distributed throughout the country, at moderate fees.

I cannot better conclude my remarks on the work of the Incorporated Joint Committee than by quoting the following comment that has been made upon it: "The establishment of the Incorporated Joint Committee on Water Regulations with a legal status and a constitution representing the statutory authorities supplying the majority of consumers in the United Kingdom, marks a new era in the history of water administration and conservation. The objects of the Committee in no way conflict or interfere with the operations of any water undertakings or professional bodies, but are purely complementary and supplementary to these functions. Thus the establishment of the Committee, while it can hamper none, offers to all concerned a convenient medium for obtaining specially collected information, while it also affords them the advantages of meeting in conference and uniting in action in matters affecting their common interests, when they desire to do so." I therefore strongly recommend members to take full advantage of the work of the Incorporated Committee, and to submit all new fittings to a careful examination in regard to the nature of the metal used, the design, and the workmanship of the various parts. The testing of a water-fitting for pressure alone is no proof of its ability to stand wear and tear, as if the alloy is unsuitable (the metal being too brittle or too soft), or the threads are badly cut, the effects will be evident after a short period of regular use.

The General Council for the National Registration of Plumbers have acknowledged the influence of the water engineer and of our Association on the question they have been formed to administer, by electing Mr. Easton Devonshire (a member of our own Council) as Chairman of the Managing Committee; so that this vexed question will now be considered and dealt with on broader lines than heretofore. It is hoped that the time is not far distant when incompetent plumbers will not be allowed to carry out any work in connection with water distribution, and that by the elimination of incompetency in the plumbing trade much preventable waste of water may be checked.

As regards my second point—namely, the prompt repair of fittings found to be defective, much remains to be done. Under the usual system of water-works management, delay in carrying out repairs is only too common. A leakage is reported by an inspector, and a notice to repair is sent by post to the consumer, who sends it to his plumber, who, in his turn, may be engaged on some work which appears to him of greater importance; and thus the delay may involve enormous loss of water. In the event of the leakage being underground or in some invisible or inaccessible position, the delay will probably be more serious still.

The system adopted by the Weardale and Consett Water Company, of insurance of fittings, has been very effective in securing the prompt repair of defects. The Company contract to repair and renew, as necessity arises, all pipes and taps for a payment of 1s. per year for each draw-off tap. This system was established more than 30 years ago, and has steadily grown in favour until the Company have now over 44,000 taps under their care. A staff of plumbers, stationed at different centres in the district of supply, is engaged in visiting the houses from time to time and in carrying out repairs. Any reports of waste received either direct from consumers or through the Company's inspectors are promptly attended to. Under this system, the consumer, knowing that the cost of the repairs is covered by the insurance premium, has no inclination to delay the repairs, but rather takes a delight in pressing for immediate attention to his complaint. By this system the waste of water has been reduced to a minimum; and the consumption last year averaged only 9½ gallons per head per day for the domestic supply of a population of 360,000. This includes all water consumed by builders and for gardens, cattle, small trades, and washing out service tanks and flushing pipes—meter supplies alone being excluded from the figure quoted.

Before leaving this subject, it may be interesting to show the monetary importance of preventing waste, by quoting

some figures in connection with the Newcastle and Gateshead Water Company. Owing to the increase of population in the Company's district during the nine years from 1900 to 1908 inclusive, more than 22,000 extra houses, containing a population of about 110,000 people and having nearly 17,000 water-closets and 9000 baths, were connected to the Company's mains; the additional income from this source amounting to upwards of £20,000 per annum. In spite of this extension of the supply, the total consumption of water for domestic purposes was less in 1908 than in 1900.

It is unfortunately too often the practice to conclude that when new works are brought into use and the supply of water is abundant, it is not necessary to incur expense in preventing waste; and with a view to economy the number of inspectors is reduced, or not increased in proportion to the growth of the population supplied. The result is that during the period when efficient control is lacking, inferior fittings come into use which it may take 25 to 30 years to weed out; and until they are replaced, considerable waste occurs.

"Venturi" meters can now be obtained which do not retard the flow of water except to an inappreciable extent; and as the value of water is so great, it is advisable to go to the expense of having one of these meters fixed on each main pipe at a point where the water leaves the source of supply. If this is done, the diagram on the meter will record the maximum and minimum flows; and the quantity of water consumed each day will also be indicated. At stated times (say monthly) the manufacturing consumption can be deducted from the total consumption, and figures giving the domestic consumption obtained, which can be reduced to a quantity per head per day.

The table I have suggested—showing what figure should be generally accepted as a reasonable maximum consumption of water for domestic purposes in various districts—would be then useful in indicating what the consumption per head per day should be under the special circumstances prevailing in any district; and by this means, if the figures giving the actual consumption have been obtained, it would be at once seen whether the prevention of waste was properly carried out or not.

I do not propose to deal here with any questions relating to water engineering, as, by custom, discussion is not allowed upon a presidential address, and such matters are more usually presented by means of papers open to free discussion. I may, however, be allowed in general terms to refer to two matters which have previously been mentioned in presidential addresses, and which appear to be worthy of our careful consideration—viz., the use of reinforced concrete in the construction of reservoirs and tanks and the use of suction-gas plants for pumping water.

Reinforced concrete construction may prove satisfactory on sites where the foundation is liable to be disturbed by underground works, brine pumping, or earthquakes; also, in forming large conduits for the conveyance of water, this material certainly has advantages over iron for very soft water, which is injurious to the inside of cast-iron pipes, and in cases where acids in the subsoil cause injury to the outside. The main question, to which lapse of time alone can give an answer, is whether in some cases the deterioration, and consequent weakening, of the reinforcement may not ultimately prove a source of serious danger.

The use of suction-gas plant for pumping purposes is being dealt with by Mr. Irwin in his paper to be presented to this meeting, and will, I hope, be fully discussed. A plant of this description has been installed at the Waskerley Reservoir, which is to be visited by the members to-morrow; but time alone can prove whether the economy of working, undoubtedly secured in the first instance by these plants, will be maintained for any considerable period when the question of wear and tear is duly faced.

On these and other kindred subjects it is to be hoped that water engineers, whether members or not, will readily supply the Association with the results of their experience from time to time. The publication of such information by a representative body such as ours cannot fail to be of service to all who are interested or concerned in the work of the water engineer.

At the close of the address,

Mr. F. GRIFFITH (Leicester) proposed a hearty vote of thanks to the President for his excellent address, coupled with the request that it might be added to the "Transactions" of the Association.

Mr. WILLIAM MATTHEWS (London) seconded the vote of thanks to the President for giving the members, in so

concentrated a form, the benefit of his large and long experience on the subjects with which he had dealt.

Mr. STILGOE put the proposition to the meeting, and it was agreed to.

The PRESIDENT briefly thanked the members.

New Members and Associates.

Mr. R. B. Rigby (Bury) and Professor Henry Robinson (Westminster) were nominated by the President as Scrutineers of the ballot-papers for the admission of members and associate members; and at a later stage of the proceedings they reported that all the following candidates had been admitted:—

Members.—Mr. A. C. V. Baines, of Somerset East (S.A.); Mr. A. Cox, of Falmouth; Mr. C. F. Farrington, of Colwyn Bay; Mr. A. L. Forster, of Newcastle-on-Tyne; Mr. E. B. Martin, of Rotherham; Mr. J. H. Smethurst, of Longridge; Mr. G. Smith, of Newcastle-on-Tyne; Mr. J. R. Sutherland, of Glasgow; and Mr. G. Winter, of Darlington.

Associate Members.—Mr. U. Alexander, of Newcastle-on-Tyne; Mr. W. M. P'Anson, of Saltburn; Mr. A. J. Price, of Chesham; and Mr. F. G. Stevens, of Wakefield.

Election of Honorary Auditors.

The PRESIDENT nominated as Honorary Auditors for the current year Mr. W. Vaux Graham (Westminster), and Mr. J. C. Melliss (London); and the nominations were approved.

Papers and Discussions.

The papers prepared for the meeting were:

"Steam-Driven Pumping Plant for Deep Wells and Boreholes," by ALFRED TOWLER, M.I.Mech.E.

"Working Results of Pumping-Engines Operated by Producer Gas," by D. HASTINGS IRWIN, M.I.Mech.E.

"The Selby New Water-Works," by PERCY GRIFFITH, M.Inst.C.E., and BRUCE M'GREGOR GRAY, Assoc.M.Inst.C.E.

"Public Water Supply for Fire Extinguishing," by C. W. S. OLDHAM, Borough Water Engineer, Ipswich.

The PRESIDENT intimated that he had intended to call upon Mr. Gray to read the paper on "The Selby New Water-Works;" but, unfortunately, a telegram had been received from him, stating that he had been delayed at York, and might be late for the meeting. He proposed that the paper should be read; and he called upon Mr. Percy Griffith, the joint author, to read it.

The paper was accordingly read by Mr. Griffith and discussed. It will appear, with the papers by Mr. Towler and Mr. Oldham, and the report of all the discussions, in subsequent issues of the "JOURNAL." The paper by Mr. Irwin is given on p. 727, and is dealt with in our editorial columns.

Saturday, June 12.

On resuming on Saturday morning, the PRESIDENT, referring to the small attendance, remarked that the hall seemed to have grown larger since they met there on Thursday. He proposed that two of the papers should be taken together, so that they might have a general discussion upon the question of Steam *v.* Suction Gas. They would have the paper by Mr. Towler first, and afterwards that by Mr. Irwin.

At the close of Mr. Towler's paper, however, the PRESIDENT rose and said he was afraid they might think him a somewhat vacillating President; but he thought it would be perhaps better, after all, to have a discussion upon Mr. Towler's paper by itself. The question raised in it was more on the pumps than anything else, and in Mr. Irwin's paper it was a question of gas *v.* steam.

Mr. Towler's paper was accordingly discussed, and Mr. Irwin afterwards read his paper.

In closing the discussion upon it, the PRESIDENT said the Secretary suggested to him that he should perhaps take their opinion as to the course to be adopted by the meeting. If members were not able to come back in the afternoon, it would be a mistake to hold an afternoon meeting. They had still another paper to be read; and if members could not come back, they might take Mr. Oldham's paper as read, and have it discussed—perhaps re-read—at their winter meeting.

Mr. OLDHAM having agreed to this course, it was adopted.

Votes of Thanks.

Mr. ASHTON HILL moved that the Association pass a vote of thanks to the Chairman and Directors of the Weardale and Consett Water Company for the opportunity they gave the Association of visiting their works the previous day, and for their hospitality. In another place he had the honour of

proposing this resolution in the form of a toast; but, of course, now the proposal must be of a business character. He was sure they were all greatly indebted to the Directors of the Company for showing them over their works. At the works they observed the amicable relations which existed between the Company and their worthy President; and they could not wonder that the Company should be in a prosperous condition.

The motion was agreed to.

Mr. C. SAINTY proposed a hearty vote of thanks to the Chairman and Directors of the Newcastle and Gateshead Water Company, for their kindness in receiving the members, and also for their hospitality, which was, he was sure, most acceptable to all of them.

This was also agreed to.

Mr. EASTON DEVONSHIRE proposed a vote of thanks to the officials, including the Secretary and Treasurer, for the arduous work done by them for the Association during the past year. He knew, from experience, that they had sat a good many hours on two or three occasions in the work of the Association; and their thanks were due to them.

The motion was adopted.

The PRESIDENT proposed a vote of thanks to the authors of the papers which had been presented at the meeting. He thought they would agree with him that they had had a set of papers which were more than the average in interest of the papers which had been before the Association. The only regret they had was that Mr. Oldham's paper had not been read and discussed. When Mr. Oldham submitted the paper to them, they thought it would be a great help to them if some information were obtained as to the way in which fire-plugs were dealt with in other towns. Mr. Oldham set about and produced the sheet given in his paper. This must have taken a great deal of time and trouble; and it was because of this that he (the President) regretted so much that Mr. Oldham had not had the opportunity of reading his paper. It had occurred to him that perhaps Mr. Oldham might wish to say a word or two; and if so, they would be very glad to hear him.

Mr. OLDHAM said that his object in preparing the paper was to bring the tabulated statement forward. It was a collection of facts regarding the charges which were made in different towns. There was one suggestion at the end of the paper which might be emphasized. In some of the towns named there was rather a heavy charge made. Two guineas for one hydrant was too much. The charges for sprinklers and drenchers were in some cases too high. The object of his paper was that he suggested that exorbitant charges should not be placed on private owners for the privilege of having their fire-mains coupled on to the public water supply. There was no doubt that sprinklers and drenchers were to be much more employed than hitherto. On the Continent, and in the Colonies and in America, a very large number of sprinklers had been put in. He knew of firms who had been charged as much as £10 for the privilege of having them fitted up. He thought the charge ought to be more nominal. It should, at least, be fair both to the consumer and the water company.

The PRESIDENT then put the motion; and it was cordially agreed to.

Mr. EASTON DEVONSHIRE said that before they parted there was one more resolution to be moved, so that it might be formally entered in their minutes. It was a repetition of what they had already expressed during the past few days—their gratitude to the President for the conduct of the business of the meeting, and for his kindness, and also that of Mrs. Askwith, in the entertainment they had the previous day. There was not very much to be said, beyond the formality of asking them to approve of the resolution.

The motion having been formally adopted,

The PRESIDENT expressed his obligation to the members for the kind way in which the vote of thanks had been put; and he accepted it. He looked upon it as a very great honour, as it was a very great pleasure to him, to be acting as President; but he did not wish to hide from them that he felt the great responsibility of the office, and he hoped the members would help him to do everything he could to make the Association more powerful and more useful. As he said at the dinner on Thursday evening, he believed that the Association had a great future before it, if only they all kept before them that they must keep the Association forward in all that they did. On behalf of his wife, he had to return thanks. He knew that it was to her a great delight (after a long illness) to be able to be present with them the previous

day. He was only sorry that he had not the opportunity of introducing her to each one of them separately, but with such a large number it was not possible to do so in the time at their disposal. He could assure them, however, that their visit had been a great pleasure to her.

Mr. A. B. BLACKBURN (Sunderland) asked to be allowed to say how sorry he was the Association were spending only three days in that district, and the pleasure it would have given the Directors of the Sunderland Water Company to have shown them over some of their works.

The PRESIDENT remarked that they hoped to have Mr. Blackburn as President on some occasion not very far off; and they would then have the pleasure of visiting Sunderland.

This closed the proceedings.

SOCIAL EVENTS.

Annual Dinner.

The Annual Dinner was held in the Masonic Hall, Old Elvet, Durham, on Thursday evening. Mr. ASKWITH presided over a company of about sixty gentlemen, among whom were the Earl of Durham, K.G., Lord-Lieutenant of the County, and several of the Aldermen and Councillors of the City.

Mr. H. E. STILGOE proposed "The County of Durham." He said they were well aware that the county was very rich, on account of the mining industry which was carried on in it. He feared he might have had great difficulty in submitting the toast, but for the fact that he was permitted to refer to the nobleman who took his title from the name of the county. His Lordship had, at some personal inconvenience, been pleased to come among them, to welcome the Association to the city, and also for the purpose of supporting their President. He considered this a kindly and gracious act; and perhaps he might be permitted to say that they were not surprised at it, because his Lordship was known as a kind neighbour and friend, a good sportsman, and a true nobleman. It was always these kindly gentlemen who were most ready to do kindly acts.

The EARL OF DURHAM, who was warmly received, said he was very pleased to have had the kind invitation to be present; and he was happy that he had been able to accept it. He did not know whether they could name any profession which had done more service to the inhabitants of the country than that of the water engineers. He was delighted to think they were there, because they had selected as their President a gentleman who was so well known, and who had done so much service in the county as Mr. Askwith.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company) proposed "The Weardale and Consett Water Company;" remarking, in doing so, that he thought water companies were public benefactors. This was overlooked by the local authorities with which they had to deal. When they regarded the matter dispassionately, and considered the large area the Company supplied, the varying pressures, the engineering difficulties, and the fact that they delivered he did not know how many tons of water for a few shillings a year to a house, it must be seen what a benefit a water company conferred. He considered, therefore, that water companies who were fulfilling these ordinary functions ought not to be harassed by public authorities. He was sure the manner in which Mr. Askwith had worked bore out what he had said—that he could work much better as things were than if they were pulling different ways. They could do more with a man who had an amiable spirit, such as Mr. Askwith possessed, than if they forced things down people's throats by Act of Parliament. This was where the success of the Company largely came in.

Mr. A. F. PEASE, J.P., D.L., in response, said he quite agreed that a water company like theirs should be regarded as a public benefactor, because, if they looked back upon the past, they would find that the dividends of the Company were for a long time very small indeed.

The PRESIDENT, in calling upon Mr. Charles Hawksley to propose "The Association of Water Engineers," said that the Messrs. Hawksley had been Consulting Engineers to the Weardale Water Company since its inception, and Mr. Charles Hawksley knew more about the works than anybody else did.

Mr. HAWKSLEY, in complying with the request, said he thought perhaps the President had been stretching his conscience a little in his favour. It was true that he had known the Weardale works since their inception, and the Consett works for a great many years. It had been his pleasure, and it was the pleasure of his father before him, to be connected with both of these undertakings. He did not know why he had been asked to propose what was the most important toast of the evening, unless it was his long association with the county of Durham and its water-works, and his friendship for nearly forty years with their good President. There had been an unalloyed friendship and pleasure all this time. His first visit to Durham was when his father brought him when he came down on an engineering inspection. He was then about eight years old. In the year 1847 water was taken from the River Wear, and the City of Durham was supplied in this way for a great many years, until the undertaking was purchased by the Weardale and Shildon District Water-Works Company, as it then was. This Company was amalgamated about seven years ago with the Consett Water Company. The county of Durham was served by nine different water-works. There were the Weardale, Sunderland, and Hartlepool Companies, and the great Newcastle and Gateshead Company, which supplied a very considerable portion of Durham as well as a large part of Northumberland. There were also the Darlington Corporation Water-Works; the Tees Valley Water Board, which supplied the Stockton and Middlesbrough District; the Bishop Auckland Urban District Council;

the Cleveland Water Company; and the Tynemouth Corporation, which supplied its own and neighbouring districts. Of these nine works, he was glad to say, there were still six which were in the hands of companies. He thought that places were usually better supplied by water companies than by local authorities, because the companies were well looked after by local authorities, and were constantly being urged to do their duty; whereas if the supply were in the hands of the local authority, there was nobody to look after them. He was aware that this was not the prevalent notion at the present time; but he knew that it still held good. In water-works, the great thing was to keep down waste. The Association had as President a man who had devoted much of his time to doing this, and who had kept it down; and he thought he could boast that in the Weardale and Consett districts the quantity of water consumed for domestic purposes was lower than in most places. Of course, they must not overlook the fact that the major part of the consumers were of the coal-mining class, who, although they required a great deal of water for washing when they came out of the pits, consumed, on the whole, but little water. As they had heard, there was a good deal of trouble occasioned by colliery disturbances of the ground, which not only broke the pipes but sometimes also drained the reservoirs. Turning to the position of the Association, the speaker said that, though it was founded only thirteen years ago, it had now a membership of 365. He considered that among the many things to which the Association might well devote part of its time was an examination of those small details on which the success of a water company depended. There were numerous interesting matters, as they all knew, connected with the collection of water and the large works which were required for the purpose. But the success of a water company really depended, after all, on administration—on a careful looking after small details, some of them so small as to be considered not worthy of observation. He hoped the Association would never take this view, but would always bear in mind that these small details were of the utmost consequence to the undertakings the members represented. They had questions raised by chemists and bacteriologists—questions about things being found in the water which should kill them all at once. These gentlemen apparently could not remove their eyes from their microscopes, and look round about them. If they would do this, they would be forced to make the inquiry why, if all they believed to be true were true, there was anybody alive, or why anybody ever lived. In his opinion, their views required a certain degree of question; and he thought that a number of bacteriologists were coming to be of opinion that things were not quite so bad as they thought them. Much time might be spent on the new model code of regulations. There was no doubt that a great deal of good might be done by them, though many things he should have liked to see in them were not there. They were, however, not the laws of the Medes and Persians, but were open to improvement; and he had no doubt they would, as the result of more mature deliberations, be improved in those things in which, to his mind, they were now wanting. He wished great prosperity to the Association, and hoped it would continue to do much good work for water undertakings and for water engineers. He desired to couple with the toast the name of the President, who, he believed, knew certainly as much as, if not more than, any other man living about water-works management, and not only knew it but applied it, and applied it with success and without causing irritation among consumers and those who had to be subject to the regulations which were necessary for the well-being of water undertakings.

The PRESIDENT, after thanking the company for the way the toast had been received, said he believed that the Association had a great future; but the members must keep this point before them—that they must make the Association not only useful to themselves but also to the community. They had now brought the engineers of almost all the water undertakings in the county of Durham into the Association. Some of them had been connected with it for some time; and others had been elected that day.

Mr. W. H. HUMPHREYS (York) proposed "The Visitors;" and the toast was responded to by Alderman J. BROWNLESS, son of the Chairman of the Weardale and Consett Water Company.

During the evening, excellent vocal music was furnished by the Durham Cathedral Quartette Party; and the President conveyed to them the thanks of the company for the entertainment they had provided.

VISITS TO WORKS.

Visit to Newcastle.

After luncheon on Thursday, the members travelled by rail to Newcastle, where they spent the afternoon in a visit to the offices and workshops of the Newcastle and Gateshead Water Company. They were met by the Engineer to the Company (Mr. Alfred L. Forster, M.Inst.C.E.), and by him were conducted through the meter-repairing and other workshops. Afterwards they were shown by the President (Mr. Askwith), who is Consulting Engineer to the Company, over the fittings-testing department. In the meter-repairing shop, it was explained that the Company use the meters of Messrs. Kent, of London, in three standard sizes, passing from 400 up to 60,000 gallons of water per hour; and those of Messrs. Kennedy, of Kilmarnock, of about the same capacities. There are 2788 meters in use in the district of supply. In the fittings-testing department, it was stated that, by attention to fittings and the use of approved flush cisterns, there had been effected a great reduction in the quantity of water consumed. The gross supply amounts to about 36 gallons per day per head of the population; but of this about 18 gallons only represents the domestic consumption. This is relatively high because, for one thing, in consequence of the softness of the water, no endeavour is made by the community to utilize rain water.

Tea was served to the visitors in the office. At the close of the repast,

The PRESIDENT said he had a letter from the Secretary and General Manager of the Company (Mr. George Smith), expressing his regret at not being able to be with the members, owing to a long-standing and important engagement, and adding that Mr. Alfred Forster, the Engineer, would welcome them on behalf of the Directors.

Mr. FORSTER said it had given them great pleasure to show the members through their works; and he hoped the visit would be of some use. On behalf of the Directors, he extended to them a hearty welcome. He was sorry that none of his Directors were present with him, but they were all busy men, and could not afford the time. He expressed the wish that the Association might be able to pay another visit to Newcastle on a future occasion, when they would be pleased to show them over the other parts of their works.

Mr. C. SAINTY (Windsor) proposed a vote of thanks to the Directors of the Company for their reception of the Association, and for showing the party over their workshops and offices.

Mr. F. GRIFFITH (Leicester), in seconding the motion, said they had inspected works which were a credit to Newcastle and the Engineers of the Company; and he hoped the engineers who were present would derive benefit by what they had seen. He might say that at Leicester they established a testing-station in 1837, and they had had wonderful results from it. It guaranteed the consumers a good supply of water, and at the same time reduced the consumption from day to day. He desired to second the motion on account of what the members had seen, and also because of the hospitality of the Directors. He could assure them that the members felt very grateful, and desired Mr. Forster to convey their thanks to the Directors.

Mr. FORSTER, in a few words, acknowledged the vote.

Visit to the Reservoirs of the Weardale and Consett Water Company.

On Friday, the members and lady friends went on a visit to the reservoirs of the Weardale and Consett Water Company. They travelled by special train to Stanhope, and were driven to the Waskerley reservoir, which was inspected under the personal guidance of the President. Luncheon, provided by the Directors, was served, and the party drove twelve miles to the Tunstall reservoir, where tea, provided by the President and Mrs. Askwith, was partaken of. A description of the works, by the President, is given on p. 725.

On arrival at Waskerley, the company were received by Messrs. W. E. Pease, of Darlington, and U. A. Ritson, of Newcastle, two of the Directors of the Company. Other Directors present were Dr. Hill Drury, of Darlington, Messrs. Gledstone and Scott, of Consett, and W. E. Henderson, of Newcastle. After luncheon, Mr. W. Matthews moved, and Mr. Easton Devonshire seconded, a vote of thanks to the Directors for their hospitality. The company numbered nearly ninety. The brakes were somewhat crowded; and there was some difficulty in getting them up the steep hills. However, all were in good humour, and the journeys were accomplished up to time. At both places visited, there was—thanks to the care with which the programme had been drawn up and was adhered to—ample time to inspect all that was to be seen. The weather was cold, but it kept mostly dry; there having been only one or two slight showers in the course of the day, which were not, however, sufficient to lessen the enjoyment of the party. After tea in a little chapel at the Tunstall works, a vote of thanks was accorded to Mr. and Mrs. Askwith, on the motion of Mr. Stilgoe, seconded by Mr. Hawksley.

Oil Painting of Sir George Livesey.

The Board of the South Suburban Gas Company have purchased from Mr. Edward March an oil painting of Sir George Livesey. We have not seen the painting yet; but information assures us that the Board are delighted with the work of the artist. Members of the Institution of Gas Engineers will have an opportunity of judging of the character of the work for themselves at their meeting to-day, as Mr. Sydney Y. Shoubridge has kindly arranged for the picture to be on view in the hall of the Institution of Mechanical Engineers. Perhaps some of the Boards of other Co-Partnership Gas Companies will like to become possessed of reproductions from the brush of Mr. March. Mr. March is the eldest brother of Mr. Sydney March, whose bust of Sir George was accepted for exhibition at the Royal Academy this year, and replicas of which have been purchased by various friends of Sir George.

In other parts of the "JOURNAL," reference is made to the report of the Committee for the Gas Section of the Franco-British Exhibition. In conjunction with it they have issued a pamphlet giving particulars of some of the articles lent by the various firms to the exhibit of domestic and industrial gas appliances arranged by the Committee. The printing is on one side of the paper only, to make the illustrations more effective; and the whole is enclosed in a wrapper.

NOTES FROM WESTMINSTER.

THE Gaslight and Coke Company's Bill, at the instance of Mr. William Thorne, is still lingering at the third reading stage; and it is entered for its next periodical appearance before the House of Commons on Thursday. In other directions, there has not been much movement in connection with Gas and Water Bills.

Prestatyn Gas-Works. The Local Legislation Committee have decided that the Prestatyn Gas-Works should be transferred from the possession of Lady M'Laren to that of the District Council; and, as a consequence, the Provisional Order promoted by her Ladyship has been rejected—the Committee having had both Bill and Order referred to them. The principal allegation was that the management had been unsatisfactory; but, in giving their decision, the Committee expressed their opinion that the words as to the works being in a bad condition should be omitted from the preamble of the Council's Bill. There is, however, a prospect of Lady M'Laren making an effort to retain her possession of the concern in the House of Lords. In the event of her doing so, and succeeding, she is placed in the peculiar position of not having a Provisional Order to confer upon her the needed new capital and other powers. The whole of the proceedings, however—they could not be otherwise in connection with an undertaking of the position of this one—were of a small order, and call for no comment here. Those who are interested in them will find a substantial report in our "Parliamentary Intelligence."

Professional Promoters. We suppose that another prospectus will be shortly issued, headed Bungay Water Company. Mr. Preston, of Mid-Oxfordshire and Finance and Construction Company fame, to say nothing of identity with many other promotions, is interested in the Bungay Water Bill, which has passed the House of Lords, and has now passed the Unopposed Bills Committee of the House of Commons, but not until the Chairman had announced that the Committee were dissatisfied regarding the evidence as to Bungay and Harleston, though satisfied as to Eye. The Committee all through their brief investigation were curious as to the sources of the water supply; and commented on the deficiency of the evidence. We should like to ask how long Parliamentary Committees are going to allow Parliament to pave the way for professional company promoters. We take it that a Company will be promoted; and that, in addition to the promoters, the Finance and Construction Company will have something to do with getting a profit out of the laying down of the works. We merely put forward the suggestion, accompanied by liberty to Mr. Preston to use our columns for making a denial if the suggestion is groundless.

THE COVENTRY GAS UNDERTAKING.

By CHARLES MEIKLEJOHN.

IT seldom falls to the lot of a gas engineer to have the opportunity of demonstrating his real capacity as a constructional engineer, the soundness of his judgment in the proper use of the material at his disposal, or his ability to determine, with some regard to accuracy and precision, the amount of plant and capital expenditure required to construct a brand-new works capable of producing the whole quantity of gas required by the district over which he has control, and at the same time make ample provision for future extensions without unduly hampering the undertaking by excessive expenditure. But such an opportunity came to Mr. Fletcher W. Stevenson, M.Inst.C.E., at Coventry; and the formal opening last Thursday of the new gas-works at Foleshill,* where the whole of the gas required by this historic city and neighbourhood is now being made, gives one ample evidence of how far the completed result accords with Mr. Stevenson's own desires, or justifies the expenditure which has been incurred and the expectations of his friends.

The first impression the buildings and plant make on a visitor is their extreme neatness; and, although presenting little of an ornate character, they suggest a splendid adaptability for the purpose for which they were erected. Permanence and efficiency are the dominant features of the work. The second impression one has is in the quietude of the place. The mechanical appliances for the transport of materials to and from the works (the lack of which at the old works proved so serious a handicap), and the application of machinery for the charging and discharging of the retorts, have so reduced the number of hands employed that it was difficult to believe that the majority of the men were not still labouring away at the old site, or that the whole of the output was being made and sent out from Foleshill. [I understand that the men whose services were dispensed with as unnecessary under the new conditions received pensions or allowances satisfactory to them and no less creditable to the Corporation.]

That the works have been designed, erected, and so well equipped at a total cost of £194,000, which works out at something less than £190 per million cubic feet of capacity, surely entitles Mr. Stevenson to the entire confidence of his Committee and the Corporation (which he assuredly possesses), and to the sincere congratulations of his friends. By the kindness of his character, and a ready accessibility to his colleagues in the

Midland district, Mr. Stevenson has always stood high in their esteem; and he has done at Coventry no more than was expected of him in proving his title to the definition of a true engineer laid down in the opening address of the late Mr. James Mansergh, at the Science Congress held in Glasgow some years ago, who suggested, if he did not state it in so many words, that the true engineer was the man who made the best of the materials at his disposal, in the attainment of the desired end at the least possible cost.

I cannot, however, overlook the fact that the results of the last twenty-five years' working of the Coventry Gas Department are not likely to be cited as a proof of the desirability of municipal control. On the contrary, they are meagre and unsatisfactory, due in part, and in the first instance, to the high capital cost of £920 per million, but more to the utter unsuitability of the site of the works, which has been a constant source of increased cost and much loss. Less than £2000 per annum alone represents the surplus profits of the Department, which has now a capital value of nearly half-a-million sterling. This is surely meagre enough, but it would not have been so unsatisfactory if, instead of misappropriating £49,614 to the rates, the whole of the amount had been used to reduce the price of gas, which has been maintained at an unduly high rate. It could not have been present to the mind of his Worship the Mayor (Alderman Lee, J.P.), who, in opening the works, spoke of dividend-paying gas companies who thought well of their shareholders but did not give much consideration to the ratepayers, that there was on his doorstep, so to speak, a dividend-paying gas company, one-fifth the size of Coventry, who paid 10 per cent. dividend to the shareholders in 1882, and have paid an increasing dividend ever since, and yet are supplying gas to slot consumers and to the smaller ordinary consumers (which together in Coventry represent more than half the total output) at 5d. per 1000 cubic feet less than Coventry.

It is a matter, then, of no small concern, at the present moment, to the gas consumers of Coventry as to what the majority of the Corporation will do when the gas-works at Foleshill justify their existence by greatly enhancing the remunerative character of the Gas Department, and place at the disposal of the Council a constantly increasing surplus. After due provision is made for writing off the capital value of the disused works, will the surplus be used to relieve the unjust surtax on the smallest consumers (and therefore the most deserving of ratepayers) which they have had to bear for twenty-five years? Will the Engineer be disheartened by seeing the results of his work diverted to other than its legitimate channel? And will not the Chairman and members of the Gas Committee still be liable to have the finger of scorn pointed at them if this unjust impost is maintained to provide the spending Committees of the Corporation with something to play with?

I congratulate Mr. Stevenson on the completion of his works, and the Gas Committee on their possession of them; and I can only hope that when the results of his and their labours come to hand in improved working and greater financial success (which assuredly will follow), the policy of the majority of the Corporation will be, not to travel down the broad road which leadeth to—the misappropriation of gas profits! but to rise to the higher plane of equity and justice.

Radiation and Temperature of the Bunsen Flame.—According to a recent communication to the "Comptes Rendus," the flame of a bunsen burner made luminous and electrically conductive is not modified perceptibly from the point of view of its emissive power or of its absorbing capacity for the residual rays of fluorine, and consequently its temperature. There is no proportion between the electric conductivity of the flame and its optical properties relatively to rays with a wave length $\lambda = 25.5$ microns. Temperature seems to be the only essential factor in the emission of ray spectra by flames.

Sterilization of Water by Ozone.—At the recent International Congress of Applied Chemistry, Dr. Bermet, the Chemist to the Hygienic Bureau at Nice, contributed a paper in which he gave the results obtained at the Bon Voyage works in that city, with an installation capable of dealing with a supply of about 4 million gallons of water per 24 hours by means of an Otto apparatus. The ozonized air and the water were mixed in such a way as to produce a fine emulsion. As little as one milligramme of ozone per litre of air will produce sterilization, if a sufficiently large quantity of air be used. The organic matter present in the water paralyzes the germicidal action of the ozone. The smallest effective quantity of ozone required for every 200 gallons of water is 0.33 gramme. The water after treatment has no bactericidal properties.

The Recent Extensions at the Cologne Gas-Works.—In the course of the article on "Recent Extensions at the Cologne Gas-Works" which appeared in our issue of the 1st inst., and which was translated from the "Journal für Gasbeleuchtung," we stated (p. 581) that the coal raised from the store by grabs is either transferred to an iron band conveyor, which runs along the north wall of the store, or to an electric line on the south side of the store, which transfers it to "transverse band conveyors" which take it directly to the breakers erected in front of the coal-store. Messrs. Head, Wrightson, and Co., Limited, of Thornaby-on-Tees, write asking us to point out that these transverse conveyors are not ordinary band conveyors, but are the "Marcus" propulsion trough conveyors. They have been constantly at work since the year 1905, and give great satisfaction.

* See p. 716.

COVENTRY CORPORATION NEW FOLESHILL GAS-WORKS.

Formally Inaugurated Last Week.

THE formal inauguration took place last week of the new gas-works of the Corporation of Coventry which have been erected at Foleshill to the designs, and under the superintendence, of their Engineer, Mr. Fletcher W. Stevenson, M.Inst.C.E. The scheme was fully explained in the "JOURNAL" for May 8, 1906 (p. 365), when a number of photographs were given showing the progress that was then being made with the work. A plan of the works also accompanied that article; and to this readers may be referred, as the alterations since made in the scheme are not such as to necessitate the reproduction here of a revised plan. We are, however, in a position to supplement the information that was given at that time by the following complete particulars of the works, which were circulated, in the form of a souvenir pamphlet, among those who were present at the inauguration. And in following this description aid will be derived from the series of excellent photographs which accompany it, and for which we are indebted to Mr. Stevenson.

The gas undertaking was acquired by the Corporation in the year 1884; the purchase price being agreed with the Gas Company at £170,345. For that year the gas output was 185 million cubic feet; the capital therefore working out at the rate of about £920 per million. The growth of the undertaking is shown in the fact that for the year ended March 31 last the output of gas was 796 million cubic feet, and the capital expended £454,823; being at the rate of £572 per million. The first year after the purchase, a surplus profit was made of £309; and never at any

time has the undertaking been subsidized out of the rates. On the other hand, a total amount of £49,614 has been transferred to the credit of the general district fund from the surplus profits made by the Gas Department. The average price charged for gas in 1884 was 2s. 11½d. per 1000 cubic feet; and during the year ended March 31 last, it was 2s. 3d. per 1000 feet. The large increase in demand for gas which steadily went on after the Corporation had acquired the undertaking, necessitated more plant being laid down for its manufacture, until the site of 4½ acres upon which the works stood became so congested that it was apparent another site must be obtained. Hence the purchase was arranged of the site at Foleshill, and the Gas Act of 1898 obtained by the Corporation, giving the necessary powers for building a works thereon. Building operations were commenced on the site in the year 1902; and, with the exception of works offices, they were practically completed last year—1908. The old works were closed for the manufacture of gas at Whitsuntide of this year; and the whole supply will now be produced at the Foleshill works.

The Foleshill site is not an ideal one for a gas-works, though the best one at the time reasonably available for the designed purpose. Regarding its characteristics, it is nearly 40 acres in extent; but it is not by any means a shapely piece of land—in fact, its irregularities defy the application of any ordinary term that would adequately describe it. It has only a frontage of 120 feet for a main entrance on the Nuneaton Road. Continuing to the right hand there is a frontage of about half-mile on the Coventry Canal. Then across the site, at the farther end of it, runs the Coventry and Nuneaton branch of the London and North-Western Railway, severing the odd 7 acres or so from the



Retort-House and Coal Stores.

main 30 acres. This 7 acres is at a higher level than any other part of the site. Then, on the farther side from the canal, part of the land juts out centrally from the main body of the site. Accompanying these drawbacks, too, were considerable variations in the levels—in one part, of something like 22 feet. These differences necessitated, in levelling, the taking off and filling in of some 150,000 yards of spoil. There was, in fact, a great deal of heavy preparatory work to be performed, which, now that the site has been developed and brought to a uniform level, is apt to be lost sight of.

Immediately the works are entered, on the right hand side is a group of buildings which constitute the weighbridge office, a governor-room for dealing with the supply of gas to the immediate district, and an exhaustor-house, in which is housed the plant for sending the gas from Foleshill to the Gas Street holders. Fronting the road, with an entrance from the works, is the workmen's canteen, 60 feet by 20 feet, with a store-room below. The works being 2½ miles from the city, many of the men remain for meals, which are supplied at a fixed tariff; and a Committee of the men manage the commissariat department. On the opposite side of the entrance are the carburetted water-gas plant buildings; the plant having been removed from the old works, and erected here in an improved state. The relief gasholder, oil-tank, tar storage and overhead tar-loading tanks, and all the necessary equipment, are in the immediate neighbourhood.

Starting from the entrance, passing the front of the water-gas plant, and running the full length of the site to the railway sidings at the opposite end, is a main road, separating the part of the site devoted to the production from the purification and other processes. The road is 40 feet wide, finished in macadam, with foot-path, stone kerb, and channels, drained into an 18-inch diameter barrel sewer running down the centre alongside a 9-inch foul sewer. The surface water from the whole of the site is collected in this main sewer, carried to filter-beds, and, after filtration, is turned into the stream which crosses the site in a culvert, and passes under the canal. In the main road are laid the large mains, carrying the gas from the water-gas and the coal-gas plants to the

gasholders—the tar, liquor, gas, water, and other smaller pipes being laid under the footpath.

On the east side of the main road, between the latter and the canal, are situated the retort-house and coal-stores, with the stokers' mess-room and lavatories adjoining, and the condensers on the side of the coal-stores facing the canal. The plan provides for two more retort-houses equal in capacity to the one already completed. At the end of the retort-house nearest the main entrance, a coke-yard of ample area has been formed for the tipping, storing, crushing, screening, and loading of coke. A portion of the coke-yard, about 120 feet long by 100 feet wide, has been covered by a steel roof in three spans on cast-iron columns. Parallel with the retort-house, on either side of same, and running the full length of the coke-yard, is a sunk dock for railway waggons, to facilitate the loading-up of coke to be despatched by rail. These docks are 5 feet deep below the yard level, and have easy inclined entrances connected to the railway siding, which runs completely round the site. Crossing the main road is next seen the strongly built retaining wall, commencing at the water-gas plant end, and returned round the corner of the land extending from the main part, in the shape of a letter L. The coping of this retaining wall is at the original level of the ground. Along the shorter or south side of the retaining wall are the workshops and stores, with the workmen's conveniences in close proximity. In a line with the workshops, with one end abutting on the main road, is a block of buildings, comprising the Works Manager's office, pay and general offices, laboratory, and coal-testing works, situated practically in the centre of the works, instead of at the entrance, as is usually the case. In this block is a large office for the Engineer, which will also be used for the Committee at their periodical visits to the works. A space between the offices and retaining wall is covered with a glazed roof, to afford shelter for the workmen during inclement weather at pay times. Facing the offices and workshops, and separated from the latter by a branch road 75 feet wide, are the exhaustor, hydraulic and electric power, and boiler houses, with ample accommodation reserved for future extensions. Thus it will be noticed that

the plan provides for the whole of the machinery being concentrated near the Works Manager's office, so as to be constantly under his eyes. Continuing along this branch road, beyond the boiler-house are the washers and scrubbers, an underground liquor churning tank, and, adjoining the boiler-house, a pump-house and overhead tank for supplying liquor to the washers. At the end of the branch road stands the locomotive engine shed, and alongside the latter a water-tower, in the upper storey of which is housed the water-softening plant.

Next to the engine-houses are the water-gas and coal-gas purifiers and revivifying sheds, each section having its own meter-house abutting on the main road. Ample room adjoining is reserved for boxes and sheds for future extensions. Beyond the purifiers a branch road 30 feet wide leads to the chemical works and filter-beds, with a large underground tar and liquor storage tank at the corner. Upon the covering of this tank is built a pump-house, carrying an overhead measuring tank, for loading tar into tank-waggons and barrels. Here are housed the tar-pumps and pumps for delivering liquor to the various positions required on the works. Following the main road to the railway, and crossing to the opposite side, the gasholder station is reached. Here are two four-lift gasholders, each of a capacity of $1\frac{3}{4}$ million cubic feet. Between the gasholder ground (for the intention is to use this 7 acres for storage only) and the main works, a subway for gas-mains has been constructed under the railway. A valve-house, commodious enough for the valves of all future holders, has been built; also a cottage for the gasholder attendant. At

the far end of the site, alongside the railway, is a piece of land having an area of about $2\frac{1}{2}$ acres, which in the Corporation's Act is not scheduled for the manufacture or storage of gas, and so has been reserved for workmen's cottages.

DESCRIPTIVE PARTICULARS OF BUILDINGS AND PLANT.

RAILWAY SIDINGS AND CANAL WHARF.

There is a siding off the Coventry and Nuneaton branch line of the London and North-Western Railway Company, which has been constructed by them, at the expense of the Corporation, especially for these works. From this the works sidings make a complete circuit of the site—giving upwards of a mile of main sidings—with branches leading to various parts of the works, making, for the first section only, about 2 miles of sidings. There is a weighbridge with weigh-office for waggons entering the works, and another for out-going traffic. Alongside the canal, a wharf has been constructed giving accommodation for four boats; and near this it is proposed to erect measuring tanks for loading tar into boats. A branch siding, with an inclined way at each end, runs alongside the wharf; and the side-tipping waggons used for moving coke, ashes, &c., on the works deliver direct into the boats. At the present time, the one locomotive on the works is fully employed.

RETORT-HOUSE.

The retort-house has a capacity of 4 million cubic feet of gas per diem, and is practically a steel building with galvanized iron



Interior of the Retort-House, Showing the Stoking Machinery.

roofs, only the outside walls and gable ends being of brickwork. It has a total length of 220 feet, and is 130 feet wide, in three bays; the central bay between the settings being 50 feet wide and 69 feet high to the apex of the roof. The side bays covering the retort-benches and coke-floors are 40 feet span and 47 feet high to the apex of the roofs. From the measurements given, it will be seen that generous working space is provided for the men. Along the apex of each roof is a wide, open ventilator on the side bays, being immediately over the discharging side mouthpieces; thus ensuring cool and airy working stages. A novel feature of the house is that the main stanchions starting from the basement (yard level) finish at the level of the body part of the overhead coal-hoppers; and being 21 feet apart, they act as buckstays for alternate retort-beds. Each stanchion carries the end of a main cross girder 7 ft. 6 in. deep, open lattice in the centre, and plate web at the ends, which run through the hoppers, forming a side thereof. The coal-hoppers, 9 feet wide and 16 ft. 6 in. deep, are continuous for the length of eight beds, and contain 48 hours' supply. They are carried entirely by the cross girders, of which the centre lattice portions only are visible. The hoppers below the girders taper on each side to a width of 2 feet. Sliding doors along the bottom, over each tier of retorts, are opened and closed by levers actuated by the charging machine. Above the coal-hoppers, the main stanchions are continued in a light lattice form to carry the centre bay of the roof. The side-roofs are carried by brackets on the main stanchions at one end, and supported on the side walls of the house at the other. The stage floors are

12 feet above the ground level, constructed of steel reinforced concrete with granolithic finish; and the centre bay is entirely devoted to the machinery for charging and discharging—the whole work being done from one side of the bench.

There are four retort-benches arranged in two rows, the chimneys—one to each row—being in the centre between the ends of the benches. Each bench consists of eight beds of eight 20 feet horizontal retorts, 22 in. by 16 in. Δ shape, heated on the Klönne regenerator system. The house, therefore, contains 256 through retorts, each carrying a charge of 7 cwt. The retorts are discharged and charged at one operation by two Fiddes-Aldridge simultaneous stoking machines; each machine working one line of two benches. The power for travelling and operating the machines is electricity, conveyed to the motors through a short trolley arm from two overhead bare cables, running the length of the house alongside the coal-hoppers. On the retorts being discharged, the coke falls through openings in the side stage-floors into hoppers or cages below, where it is quenched. These cages have doors in the front, which, when opened, allow the coke to discharge into side-tipping waggons on a narrow-gauge railway, to be hauled to the coke-yard by an endless wire rope. The result of this system is good coke, bright and clean, owing to the little knocking about that it receives.

The ascension-pipes are 8 inches in diameter, on the discharge side only, fitted with "Darwin" patent arch-pipes and hydraulic liquor-seal. At the ends of the benches are placed the tar-towers, to automatically separate the tar and liquor running from the

hydraulic mains. The latter are in sections of one bed length, each having a 10-inch diameter gas outlet branch and valve, leading to a 20-inch diameter cast-iron collecting-main. From this collecting-main, the gas from each bench of retorts travels into a 24-inch diameter steel foul-main, through two 10-inch diameter branches, upon each of which is placed a governor, arranged on a platform carried by the bench cross binders. Two 24-inch diameter steel foul-mains travel up and down the house, and join at the coal-store end into a 30-inch diameter main leading to the condensers. Immediately before the condensers are two 24-inch "Everitt's" tar-extractors and a blow-off box, having 8-inch diameter connections, for use when gas-making is suspended on Sundays, or at any other time during alterations.

Alongside the coal-store, facing the main road, and having an entrance leading from the retort-house stage floor, are the stokers' mess-room, lavatories, and conveniences. The lavatories on the ground floor contain two baths and three lock-up drying rooms for the stokers' working clothes (one room for each shift), heated by steam-coils. In the mess-room each man is provided with a roomy and well-ventilated locker, made of expanded sheet metal.

COAL-STORE AND COAL-HANDLING PLANT.

The coal-store at the north end of the retort-house is 100 feet long, 68 feet wide, and 32 feet deep, and has a capacity of 5000 tons. Adjoining the store, and covered by a steel roof, is the coal-breaker pit and hopper, over which a branch siding runs from the inlet line of rails to the siding for empty trucks and out-

ward traffic. Coal-trucks are hauled by hydraulic capstans on to two waggon-tippers, also worked by hydraulic power, placed on either side of the hopper. The back axle of the truck is caught in a fork and raised until the floor of the truck makes an angle of about 45° to the horizontal; the front wheels also being raised about 10 inches by another ram, to enable the buffers to clear the rails. The coal is then discharged into the hopper, through the end door of the waggon. The tipping-rams are fixed in the side extensions of the breaker pit.

From the hopper the coal falls on to a jiggling-screen, and the large coal passes over and goes through a breaker. The coal is then delivered, by means of a bifurcated shoot, on to either of two short inclined tray-conveyors, which discharge the coal into the fillers of the two main gravity bucket conveyors. From the breaker-pit, the two lines of conveyors rise vertically to the top of the coal-store, travel horizontally the length of same into the retort-house, then rise again and travel the whole length of the house over the coal-hoppers. The coal may be tipped into the coal-stores or into the hoppers as required.

At the end of the retort-house, beyond the hoppers, are fixed the electric motors for driving the two main conveyors—one motor of 20 H.P. to each line. Here the conveyors commence to return by descending the retort-house wall, running under the stage-floor, and then along two subways under the coal-store, back into the breaker-pit. When necessary to pick up from any part of the store, the conveyors are automatically fed through shoots in the roofs of the subways, delivering into the filler of the



Interior of the Retort-House, Showing the Coke-Cages and the Wire-Rope Tramway.

conveyor. The coal-breaker, jiggling-screen, and two short tray-conveyors in the breaker-pit, are driven by a 50 H.P. horizontal steam-engine placed in a house adjoining the end of the coal-store.

By means of this plant, 80 tons of coal per hour, with the conveyors running at a speed of 45 feet per minute, can be placed in the retort-house overhead hoppers or into the store.

COKE HAULING AND SCREENING PLANTS.

The two narrow-gauge tramways, running alongside the retort-benches in the basement of the retort-house, are continued in parallel lines across the coke-yard. Each line rises by two easy inclines to a gantry carried on columns 29 feet above the yard-level, from which the coke is tipped. One gantry is 324 feet long, the other a few feet shorter. The coke-yard covers an area of over 1½ acres, and is paved entirely with granite setts on a good solid foundation, to meet the unusually heavy traffic. Side-tipping trucks, coupled together in numbers of three or four, are hauled up the incline and along the gantry by means of an endless wire rope, which returns overhead to the winding drum in the engine-house, situated in the basement of the retort-house. A 30 H.P. gas-engine drives this plant. To guard against the possibility of trucks running back down the incline into the retort-house, safety catch-points are inserted in each line of rails.

The plant for breaking and screening the coke is placed under the covered area of the coke-yard, and is driven by a horizontal steam-engine in a house adjoining. Coke is tipped into a shoot

at ground-level, passed through a breaker, and raised by an endless chain bucket elevator, which discharges the coke into a shoot delivering into a revolving screen. Underneath the screen are hoppers with sliding bottom doors to collect the various sizes of coke and breeze.

CONDENSERS.

Situated along the east side of the coal-store are the condensers, of the atmospheric vertical pipe type, arranged in four batteries, each consisting of 88 vertical 9-inch diameter pipes, 27 feet high. The condensers can be assisted if necessary by means of water sprayed from perforated pipes running along the tops of the batteries. From the condensers, a 30-inch diameter main underground carries the gas across the site to the exhaustor-house.

EXHAUSTERS.

The exhausters are of the Bryan Donkin twin type, in duplicate, each of 160,000 cubic feet per hour capacity.

HYDRAULIC POWER PLANT.

The horizontal tandem hydraulic pressure steam pumping engines consist of two steam cylinders 17 inches diameter, and 20 inches stroke, and four rams 3½ inches diameter, and 20 inches stroke. With 75 lbs. steam pressure, and running at a normal speed of 50 revolutions per minute, they are capable of delivering 150 gallons of water per minute against an accumulator pressure of 750 lbs. per square inch. The ram of the hydraulic pressure



Coke Yard.

accumulator has a stroke of 18 feet by 18 inches diameter, giving a capacity of 198 gallons.

This accumulator supplies the pressure to the two coal-waggon tippers, each capable of lifting a waggon weighing 20 tons at a speed of 26 feet per minute; to the platform lift in the retort-house, having a lift of 12 feet; to the two "turnover" capstans for hauling railway waggons on the sidings, each capable of hauling a load of 100 tons along a level railroad at a speed of 200 feet per minute; and to a 15 cwt. platform lift in the carburetted water-gas generator house. The exhaust water from all the working cylinders returns to an overhead tank in the engine-house, to which the pump suction is connected.

BOILERS.

For supplying steam to the engines, &c., of the coal-gas plant only, three Lancashire boilers are provided, 30 feet long by 7 ft. 6 in. diameter, fitted with Meldrum's forced-draught furnaces. At the present time, the feed-water is heated by means of a Berryman exhaust steam-heater, fixed at the rear of the hydraulic power house; but provision is made at the back of the boiler-house for the installation of a fuel economizer of the "Green" type. The boiler feed-water pumps are placed in the pump-house adjoining.

WASHER AND SCRUBBER-WASHER.

The former is of the Livesey type, and the latter of the Holmes rotary type, each of a capacity of 4 million cubic feet per diem. Tar and liquor from these two washers gravitate to an underground tank of 81,000 gallons capacity. From this tank, the liquor is pumped into an overhead tank, and circulated until it attains about 10 oz. strength, suitable for transfer to the chemical works. Beyond the scrubber is another Livesey washer, in which the gas is brought into contact with a light solvent oil, thereby removing a large percentage of the naphthalene present.

PURIFIERS.

The purifiers and revivifying sheds for the water-gas and the coal-gas plants are adjacent to each other; space being reserved for doubling the capacity of the former, and for three more similar sections of the latter. For the water gas there are six boxes, each 30 feet long by 25 feet wide, and having four covers 12 ft. by 9 ft. 6 in. The first two, for oxide, are fitted with Jäger grids; and the last four, for lime purification, with ordinary grids. In

the coal-gas section there are six boxes; the first four being 50 feet long by 30 feet wide, fitted with Jäger grids, each box having eight covers, 12 ft. by 9 ft. 6 in. These boxes are used for oxide, and are worked in rotation, by means of a 24-inch diameter "Weck" centre-valve. The last two boxes are each 60 feet by 30 feet, fitted with ordinary grids for lime purification; the covers, ten to each box, being 12 feet by 9 feet.

All the purifier covers are screwed down with eye bolts and nuts, and the joints made with a flat strip of first-class rubber, secured with loose copper rivets. For lifting, removing, and replacing the covers, a Hovey patent manual crane is employed, one on each section, travelling on rails carried on brackets attached to the sides of the boxes. The purifiers stand in the open. The revivifying and lime sheds alongside are 60 feet wide; the roofs, in two spans, being carried on cast-iron columns.

METER-HOUSES AND METERS.

Houses for the station-meters of both the water-gas and coal-gas plants, are, at the ends of their respective sections of purifiers, abutting on the works main road. In the former, there is one meter of 60,000 cubic feet per hour capacity, removed from the old works; and space is allowed for another meter of a similar size. In the coal-gas meter-house there are two meters, each to pass 80,000 cubic feet per hour—one new, the other brought from the old works. In the re-erection of this one, a larger drum has been fitted by the makers, Messrs. Parkinson and W. & B. Cowan; its original capacity having been 60,000 cubic feet per hour.

TAR AND LIQUOR STORAGE TANKS.

Hereabouts one gets a good idea of the depth of the dip which has been dealt with, almost in the centre of the site. Reference has been made to the heavy amount of levelling carried out; and there would have been little use in filling up and then excavating again for the construction of the underground tar and liquor tanks. Advantage has been taken of the low ground at this point, by building the walls of the first tank from the solid ground, and then filling up around it. The walls and bottom are constructed of concrete, with brickwork lining, and a layer of asphalt between. It may here be stated that this system of lining has been adopted for the coal-breaker pit and the other underground tanks on the works.

This first tank is 100 feet long by 50 feet wide and 15 feet deep,



Purifiers and Revivifying Sheds, with Station-Meter House in the Distance.

and will hold 450,000 gallons of tar and liquor. Another extensive space has been left unfilled, for the construction, in a similar manner, of the next tanks, without having to incur the expense of any considerable excavation.

GASHOLDERS.

The land allocated to storage is sufficient to accommodate holders of a total capacity of 15 million cubic feet. Two holders have already been erected, 150 feet in diameter, and of four lifts of 30 feet deep each; their joint capacity being $3\frac{1}{2}$ million cubic feet. One of the four lifts is made to rise beyond the framing, after the lead given by the late Sir George Livesey; and plate standards, and flat wind-ties, back and front, also on the Livesey plan, have been adopted. The tanks are constructed of concrete (concrete material being very cheap), lined with asphalt, with an inner facing of brickwork.

Nearby a valve-house has been erected, containing the valves for the two holders (connections are left for three more), and a safety bye-pass governor between the inlet and outlet mains. A vertical steam-boiler is permanently fitted up for use in winter, to prevent the freezing of the hydraulic cups. With the existing holders at the old works, the total storage capacity is 5 million cubic feet. From the gas-holder valve-house the outlet-main passes under the railway, alongside the inlet-main, in the pipe-subway, then crosses over to the canal, the line of which it follows to the works entrance into the driving main exhauster-house.

DRIVING MAIN EXHAUSTER-HOUSE.

In the driving main exhauster-house is installed a rotary exhauster driven by a 23 H.P. gas-engine. With a 3-inch inlet pressure, and against a 20-inch pressure at the outlet, this plant will drive 250,000 cubic feet of gas per hour through the 24-inch diameter main laid along the Foleshill Road to the gasholders at the old works, about $2\frac{1}{2}$ miles distant, from which the gas will then be distributed to the various districts in the city.

THE CARBURETTED WATER-GAS PLANT.

The carburetted water-gas plant, housed in a range of buildings near the works entrance, has been removed from the old works, and is capable of producing $1\frac{1}{4}$ million cubic feet per diem. The buildings are divided into generator, boiler, pump, and machinery houses; and in the three latter space has been provided for the possible duplication of the plant. During the summer months, the plant is not in use; and for closing the fronts of the boiler and generator houses, steel revolving shutters are provided, raised and lowered by chains, such as are used in tram-stations. The

7-inch single ram 5-inch stroke "Cameron" water-circulating pumps; one 5 in. by 3 in. "Reliable" tar-pump; and one 5 in. by 3 in. "Challenge" pump, for unloading the oil-tank waggons and delivering into the store-tank.

Outside the buildings there are two sunk circular water-tanks, 30 feet diameter, and 10 feet deep. The water is pumped from No. 1 tank into an overhead tank. From this it gravitates through the washers, scrubbers, and separators, into tank No. 2, where it cools. The pump suction is then changed over, and the water again circulated, returning to tank No. 1. Close by, is the relief gasholder, 60 feet in diameter, with two lifts, each 20 feet deep, having a storage capacity of 200,000 cubic feet. An underground tar residuum tank has its position marked by four columns and a stage carrying another tank, into which the tar is pumped from the underground tank, to be loaded into tank-waggons on the siding alongside. Near to these a brick basin has been constructed of a size to accommodate two steel circular oil-storage tanks; the intention being to save the oil getting away should



Blowers, Turbines, and Exhausters for the Water-Gas Plant.

the steel tanks spring a leak. One oil-tank has at present been put in, having a capacity of 120,000 gallons. The oil-pipes are laid in trenches to facilitate access.

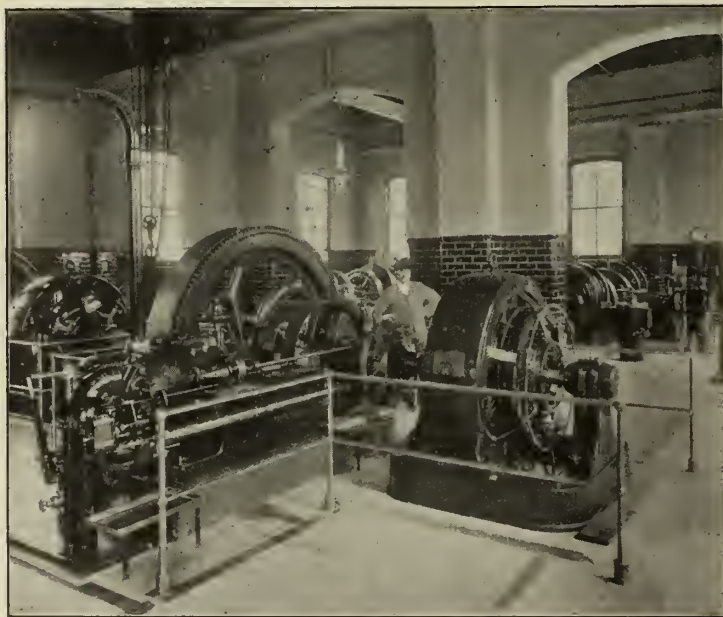
CHEMICAL WORKS.

The chemical works have been in operation for about four years, and comprise a sulphate of ammonia plant and an acid works. The buildings are arranged so that extensions can be made at the minimum of cost, to enable the plant to deal with the whole of the liquor that will be produced when, in the future, the scheme of these works is consummated—that is to say, when they are equal to an output of from 15 to 16 million cubic feet of gas per day. Originally, the plant was used for the manufacture of sulphate of ammonia, and had an open fishing saturator and a capacity for dealing with 60 tons of liquor in 24 hours. Recently owing to the depression in the market for sulphate of ammonia, the plant, with slight alterations, has, with highly profitable results, been converted to the process of purifying and concentrating the ammoniacal liquor, for which there is at present a good market. If at any time it should be desirable to revert to the manufacture of sulphate of ammonia, the plant can readily be adapted.

Turning to the sulphuric acid plant, which has a capacity equal to treble the present requirements, this is very compact, and one of the smallest built in connection with a gas-works. The acid is made from spent oxide, and used in the manufacture of sulphate of ammonia. Near the sulphate works, a circular underground liquor storage tank, 50 feet diameter and 14 feet deep, receives the strong liquor from the washers and scrubbers. It has a capacity of 150,000 gallons.

WATER-TOWER AND WELL.

For the works, a plentiful supply of water is obtained at the well close by the chemical works. Horizontal steam pumping-engines, in duplicate, placed in a house over the well, raise the water into a cast-iron tank at the head of the water-tower, situated at the end of the road beyond the scrubbers. The height of the tank above the works level is 50 feet. It has a capacity of 26,000 gallons, and is constructed so that it can be doubled in depth when necessary. The well water is much too hard for immediate use at the boilers; and in the upper storey of the water-tower a "Bruun-Lowener" water-softening plant has been installed, capable of dealing with 2500 gallons per hour, and reducing the hardness from 26° to 6° . For drinking purposes only, North Warwickshire Water Company's water is used.



Electric Generating Plant.

plant consists of two generators, two carburettors and superheaters with fire-brick linings, two washers, two scrubbers, two water-cooled vertical tube-condensers, and a final scrubber. Around this part of the apparatus an iron staging is provided for coking and operating the plant; the coke being raised to the stage-floor in buggies, by a platform hydraulic lift, having a rise of 16 feet.

There are two Lancashire boilers, 26 feet long by 6 ft. 6 in. diameter, and exhaust steam-feed water-heater; two steam-turbines, coupled direct with flexible couplings to two blower, controlled by a cut-off gate, each set capable of supplying the required blast to the whole of the plant; two sets of Bryan Donkin gas-exhausters and steam-engines, each capable of passing 60,000 cubic feet of gas per hour; two tar-separators, 20 ft. by 8 ft. by 6 ft. deep; two oil-pumps for feeding the superheaters; two $2\frac{1}{2}$ -inch single-ram 5-inch stroke "Cameron" boiler-feed pumps; two



Carburetted Water-Gas Plant.

WORKSHOPS AND STORES.

Roomy and well-equipped blacksmiths', fitters', and carpenters' shops are provided in the centre of the works, built in line, with large doorways between each shop. A branch from the railway siding alongside runs into the building, and heavy loads can be picked up from waggons, and moved to any of the shops, by means of an overhead crane, travelling the full length of the building. At one end of this range of buildings is the works stores, and at the opposite end a powerful mortar mill driven by a 23 H.P. gas-engine. During the erection of the new works, the workshops have been of great service; a large amount of work having been executed by the Corporation's own men.

At the end of this sketch of the new gas-works, it may be remarked, that, though considerable expense has been incurred in developing the site, throughout their design economy has been combined with substantial construction and efficiency; and as the business of the department progresses, the provisions made on the site will ensure extensions being carried out at the lowest capital cost. Henceforth, working under the new conditions, both the department and the consumers must (the markets for materials being favourable) before long enjoy the benefits of the more economically produced commodity. Further than this, the removal of the manufacturing part of the works from the centre of the city will be of great advantage to the inhabitants.

The following is the official list of the Contractors engaged on the new works:—

Moss and Sons	Loughborough	Gas-holder tanks.
do.	do.	Sulphate works buildings.
Bentley and Lock	Leicester	Pipe subway under railway.
Eastwood, G. H.	Kettering	Timber work for acid plant.
Dorse, H.	Cradley Heath	Forming roads, levelling site, and constructing drains and relief gas-holder tank, &c.
Kelley and Sons	Coventry	Buildings, comprising entrance office and canteen for workmen, valve and governor house, weigh offices, canal dock.
Lowe and Sons	Burton	Buildings for carburetted water-gas plant, retort-house, and coal-store and railway docks.
Kettering Co-operative Builders, Ltd.		Meter-houses.
Johnson and Sons	Leicester	Workshops and water-tower.

Vale and Sons	Stourport	Power-house, boiler-house, and chimney shaft.
Orr Brothers	Coventry	Buildings comprising works offices, laboratory, and coal-testing plant.
Dorse, H.	Cradley Heath	Underground liquor tank.
Bentley and Lock	Leicester	do. do.
Vale and Sons	Stourport	do. do.
Mobberley and Bayley	Stourbridge	Fire-clay goods for retorts.
Harrison, George K.	do.	do. do.
Goddard, Massey, and Warner	Nottingham	Sulphate plant.
Horseley Company	Tipton	Gas-holder tanks ironwork.
Danks and Co.	Oldbury	Steam boilers.
Gilbert Thompson, Ltd.	Birmingham	Sulphate buildings iron-work.
C. & W. Walker, Ltd.	Donnington	Gas-holders.
R. & J. Dempster, Ltd.	Newton Heath	Relief gas-holders, carburetted water gas.
Horseley Company	Tipton	Purifiers.
Whessoe Company	Darlington	do.
Cross and Cross	Leicester	Carburetted water - gas buildings ironwork.
Russell and Sons	do.	Roofs for oxide sheds.
Keay, E. C. & J.	Birmingham	Constructional steel work, retort-house, coal-stores, &c., coke-shed, and elevated tramway.
Clapham Brothers	Keighley	Retort-mouthpieces, fittings, and ascension-pipes, &c. Condensers and Livesey washer.
Newton, Chambers, and Co.	Sheffield	Steel foul mains and cast-iron tank.
Aldridge and Ranken	London	Stoking machinery.
Musker, C. & S.	Liverpool	Hydraulic plant.
Edgar Allen and Co.	Sheffield	Coal conveying plant.
W. C. Holmes & Co.	Huddersfield	Washer-scrubber (rotary).

The Opening Ceremony.

At the opening ceremony, which was performed by the Mayor (Alderman W. Lee), there was a large attendance of members of the Corporation and leading citizens; the company including the Chairman of the Gas Committee (Mr. W. H. Batchelor), the Gas Engineer and General Manager (Mr. Fletcher W. Stevenson), the City Engineer (Mr. J. E. Swindlehurst), and the Town Clerk (Mr. G. Sutton). There were also present Mr. G. Hampton Barber, the Secretary of the Gas Department of the Birmingham Corporation, Mr. Charles Meiklejohn, of Rugby, and Mr. Thomas Berridge, J.P., of Leamington.

The company having assembled, Mr. BATCHELOR, on behalf of the Gas Committee, asked the Mayor



Pump House over the Tar and Liquor Tanks—Loading-up Tar.

to declare the works open. He said he thought his Worship had never been asked, during his three years of office, to perform so important a ceremony—certainly not one costing the ratepayers so much money. He recalled the fact that the Corporation purchased the gas undertaking from the Coventry Gas Company in 1884, paying £170,000 for it. At that time the output of gas was 185 million cubic feet; but the present output was 800 millions. It would therefore be seen how greatly the undertaking had grown since 1884. The growth had been steady from the commencement. The old gas-works were not on a very suitable site, which was only about $4\frac{1}{2}$ acres in extent; and they were cramped. Therefore it was not long before it became evident that a move would have to be made. The City Council gave sanction for an Act of Parliament to be applied for in November, 1897; and it was obtained in August of the following year. Many difficulties were encountered in getting a new site suitable for gas making. It was necessary that it should be close to the railway, and, if possible, at the side of the canal. The present site had these advantages; and it cost £5648. It was, however, anything but an ideal one, for it was very irregular in level and of peculiar shape. Some time elapsed after the purchase before any move was made towards putting works upon it. Meanwhile considerable congestion took place at the old works, owing to the rapid development of the city and the growth of its industries; and after Mr. Stevenson had succeeded Mr. George Winstanley as Engineer, he was asked to prepare a scheme. He lost no time in doing so; and the then Chairman of the Gas Committee (Mr. R. A. Rotherham) was able to lay before the Council complete and comprehensive details for the removal of the whole of the gas making for the city to the present works. The Council readily recognized the necessity, and promptly sanctioned the scheme. It was to cost £180,000; and the works were to produce, when completed, $4\frac{1}{2}$ million cubic feet of gas per day. The estimate of cost had been exceeded by about £14,000; but there had been a corresponding increase in capacity of production of from $4\frac{1}{2}$ to $5\frac{1}{2}$ million cubic feet per day. They were thus getting an extra return for the additional outlay. The capacity of the works was much in excess of present requirements; but it was wise to have a fair margin left for reserve. The Gas Committee believed they had excellent and up-to-date works, at which gas would be produced as economically as at any works in the country. They had been designed by Mr. Fletcher Stevenson, who had put his whole energies into the scheme. There were in the new works numerous improvements as compared with the old ones. Great advances had taken place in the equipment of modern gas-works, and the methods of working had been very much improved; and these had been incorporated in the scheme whose completion they were asked to endorse. He desired to call attention to the facilities provided for the comfort and safety of the men employed.

The MAYOR was loudly applauded on proceeding to declare the works open. He remarked that Coventry was one of the first cities to adopt gas as an illuminant. The new works were designed to manufacture and distribute, in the city and the neighbourhood for many miles round, gas for lighting, heating, or driving purposes, with as little sulphur as possible. There was no need for him to repeat any description of the works, but he might say they could be classed as containing one of the finest gas-making plants in the kingdom. No expense had been spared, and every advantage had been taken to secure the latest inventions which human ingenuity could devise. There was a freshness of conception and treatment in some of the details which could not fail to be noticed when the works were inspected. Much had been done to adopt labour-saving appliances, but not with a view to reducing the cost of production only. He was thinking of labour of the most exhausting character which ought to be done by a machine. As to the demand for gas, he was informed that there were some 400 gas-engines of various types depending more or less upon these works, in addition to the large supplies required for lighting and heating. Sometimes it had been impossible to meet the demand; and the new works became absolutely necessary. Originally the gas undertaking in Coventry belonged to a private Company; but the time came when it appeared to the representatives of the citizens that the supply of gas ought to be in the hands of the people. It was very interesting to recall with what hesitation and timidity they entered upon the business. There were only four or five members in the City Council now who were in it when the gas supply was taken over, twenty-five years ago. Long and serious debates took place, and a town's meeting was held before the matter was settled. One gentleman, a member of the Council, said he thought it would be a good thing for the gas supply to be in the hands of the Corporation. He was a shareholder, of course. (Laughter.) The reply was that £168,000 was a lot of money with which to saddle the ratepayers. This was from one of the old sort—one who was supremely anxious to keep the city debt within reasonable limits, and the rates also. But £168,000 was not much at the present day; they could manipulate it over and over again. He supposed much more than twice this amount had been expended upon the new works and the necessary extension of mains. The works taken over from the Gas Company had been greatly extended and practically rebuilt; but they became utterly inadequate for the requirements of the city. They were the goose that was to lay the golden eggs; but it had not been so prolific as some thought it would be. Still, £49,614 had been paid over out of the profits in relief of the rates, besides interest and sinking fund. They hoped for much larger results from the new works; and he trusted the Corporation would always remember that the ratepayers were the shareholders.

A vote of thanks having been accorded to the Mayor for performing the opening ceremony, an inspection was made of the new works.

Hospitality of the Mayor—An Interesting Presentation.

In the evening, the Mayor entertained a large number of guests at St. Mary's Hall, the ancient building in which the meetings of the City Council are held. A special incident of the proceedings was the presentation of a silver epergne to the Mayor by Mr. Batchelor, on behalf of the Gas Committee.

The MAYOR proposed "Success to the new undertaking." In doing so, he said all must confess that they had been much impressed by

what they had seen in the afternoon. He held to the belief that gas would never be superseded by the electric light; for if they had not believed it, they would not have gone to the expense of erecting new gas-works.

Mr. BATCHELOR, in responding, remarked that some people had criticized the gas undertaking, and had said the Gas Committee had gone too far and spent too much money. He did not think they had done so. Judging by the way in which the undertaking had grown, he did not see how anyone could come to any other conclusion than that they had done the right thing. There were rumours in the air that, owing to coalfields being discovered in the neighbourhood of Coventry, the city might grow more rapidly than it had done in the past. The policy of the Gas Committee had been to retain, as far as possible, the whole of the large consumers; and, owing to the reduction in the price of gas, they had succeeded in a great measure in doing this. Though they sold gas to the large consumer at a lower price than to the ordinary consumer, they still had a very good margin of profit on their production charges; and by retaining the large consumer they stood to gain more, because these charges would be less. The policy of the Committee in the future remained to be settled. In any reduction they made, he was convinced that the small consumer should be considered. He also strongly advocated reducing, when opportunity occurred, the dead-charges caused by the abandonment of the old works. A point for congratulation was that they had removed the works to Foleshill without asking for any financial support from the ratepayers. He did not care about prophecying, but he thought he might say there was every prospect of their making at least £10,000 additional profit next year.

At this point in the proceedings the presentation to the Mayor was made, and suitably acknowledged by his Worship.

Mr. BATCHELOR then proposed "The Health of the Gas Engineer." He said Mr. Stevenson rapidly gained the confidence of the Committee, and had maintained it. They got along with the work of the Committee very smoothly, due largely to the fact that everything was made clear to them when it was brought forward. Mr. Stevenson had the management and designing of the new works in his sole charge, and had no outside assistance whatever. If anything could compare with his ability as a gas engineer, it would be the courtesy he showed to everyone connected with the work. The responsibility of managing the old works and the construction of the new ones at the same time must have been very heavy; and they were glad Mr. Stevenson had survived the ordeal, and would now get some well-deserved rest from his labours.

Mr. R. A. ROTHERHAM (who was Chairman of the Gas Committee when the scheme was introduced and adopted) spoke in response to loud calls. Dealing with the question of relief of the rates from the gas undertaking, he said he did not wholly believe in it. The Corporation held a monopoly, not only of gas making but of gas distribution in the city; and they must not forget that the profits they earned were being made out of the pockets of the gas consumers, who were paying off the sinking fund, and that when this disappeared the city would have as an asset the old and the new gas-works. They must remember, therefore, that the gas consumer was the first person to receive consideration at their hands. As to the Engineer, he (Mr. Rotherham) participated to the whole of his power in inducing the Gas Committee to secure Mr. Stevenson's services; and he hoped they would keep him. It was sometimes said that sums spent on the Gas Department were investments of the ratepayers; but the money spent was as nothing compared with keeping Mr. Stevenson as their Gas Engineer. They could not have a finer investment than a really good man. They had him, and he hoped they were going to keep him, as the success of the undertaking had been largely due to his ability, loyalty, and hard work.

Mr. STEVENSON, in responding, referred to the capital expenditure upon the new works. He said he had heard it stated that the Gas Committee had spent £25,000 more than the £180,000 he estimated, and that the works they now had were no good. They had only to live a year or two to prove or disprove the latter part of the statement. The estimate he put before the Committee in 1902 was for works to produce $4\frac{1}{2}$ million cubic feet of gas per day for a capital expenditure of £180,000. Before he became their Gas Engineer, there had been an expenditure of £10,000 on the siding which the London and North-Western Railway Company made to connect their line with the works. This had to be added to his estimate, which made a total of £190,000 for a production of $4\frac{1}{2}$ million cubic feet per day. In developing the works, he was clearly impressed with the fact that a small extra expenditure would give them a greatly increased output; and the consequence was that, for the increased cost of £14,000, they had now works which would produce $5\frac{1}{2}$ million cubic feet of gas daily—a million more than if the works had been carried out on the original estimate. The cheapness of raw materials at the time the contracts were accepted, and the boom which had taken place in the city, were very fortunate circumstances in connection with the undertaking. The increase in the consumption of gas during the boom had not only enabled them to pay their way but to reduce the price of gas on two occasions during the time the work had been in progress. With regard to future profits, he could confidently state that the sum mentioned by the Chairman of the Gas Committee as the additional profit expected next year was the minimum; and if trade improved, and the consumption of gas increased, he hoped to be able to show a balance that would surprise them. As to profits in relief of the rates, he said let the people who made the profit—that was the gas consumers—have the benefit of it. In Coventry, gas was so largely used for trade purposes, so many traders were dependent upon it, that it was suicidal to keep up the price. It should be supplied at the lowest figure. There were two things, now that the works were completed, which he would not be satisfied till he had effected. One was to reduce the capital of the concern for the business done to what it was when he came in 1902; the other was to bring down the price of gas to 2s. per 1000 cubic feet on an average.

Mr. BAND (the Vice-Chairman of the Gas Committee) proposed "The Health of the Contractors;" and the toast was acknowledged by Mr. THOMAS CLAPHAM, of Messrs. Clapham Bros., Limited.

Mr. WHITE proposed "The Visitors."

Mr. E. W. DREW, the Auditor of the gas accounts, responded, and congratulated the citizens upon the sound policy adopted by the Corporation in connection with the gas-works.

PRIVATE RAILWAY SIDINGS AND TRAFFIC.

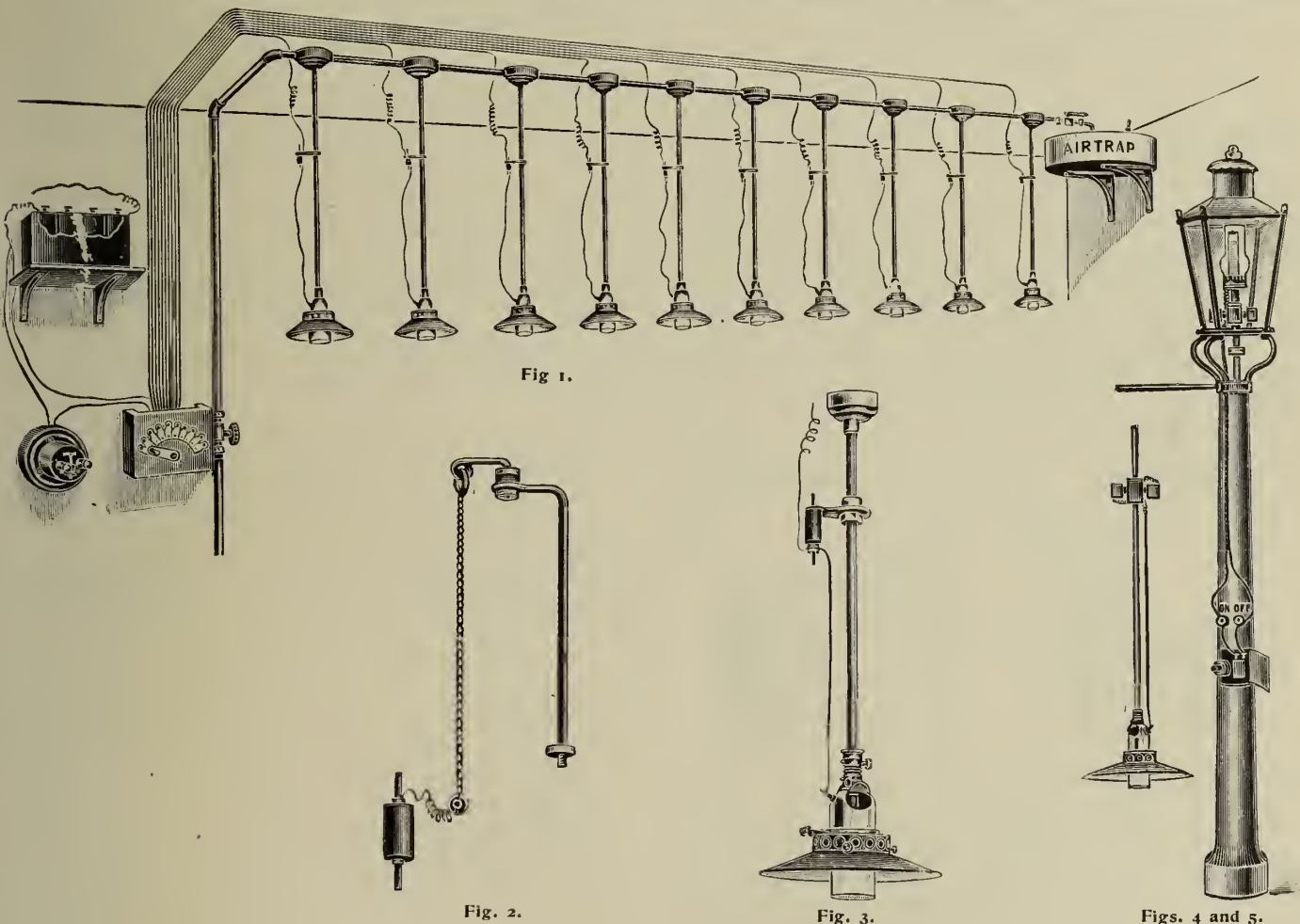
THE proceedings recently reported in the "JOURNAL," in which the Corporation of Birmingham, who have constructed extensive private sidings at their Saltley, Nechells, Windsor Street, and Swan Village Gas-Works, applied to the Railway Commission for an order declaring them entitled to an allowance or rebate on charges made by the Midland, London and North-Western, and Great Western Railway Companies, on inward and outward traffic to the various works, have brought into unusual prominence, so far as our readers are concerned, the subject of private sidings and railways and the traffic upon them. Very opportunely, therefore, comes to hand a little book by Mr. J. H. Cockburn, a solicitor of Rotherham, in which he places before the public the law on the subject in brief and concise form, and in plain and simple terms.* He has endeavoured to collect and set out the principal enactments and decisions in a way which, while it may assist the members of the legal profession in a certain degree, the ordinary business man may read and understand.

Mr. Cockburn divides his work into three parts. In the first he deals with the making and maintenance of private railways and sidings, and begins by indicating the lands and thoroughfares over which they can be made. He then passes on to consider

* "The Law of Private Railway Sidings and Private Traders' Traffic." By John Henry Cockburn, Solicitor. London: Stevens and Sons, Limited; 1909. [Price 7s. 6d. net.]

successively the subjects of light railways, making connections with statutory railways, and entering into contracts for the construction of private railways and sidings. Some remarks on nuisances, accidents, and criminal offences follow; and this portion of the book closes with a chapter on the discontinuance of siding connections. The author emphasizes the point that when once a private railway or siding has been connected with the main line of a railway company pursuant to statutory authority, the company have no power to disconnect it; and they can be made to pay exemplary damages if they block up the junction. An opening once made into a railway is a permanent right, and cannot be taken away because circumstances have altered. In dealing with private traders' sidings, Mr. Cockburn clearly defines what are the "reasonable facilities" which, under the Railway and Canal Traffic Act, 1854, every railway company are to afford for receiving, forwarding, and delivering traffic; and he follows up his remarks with two chapters on conveyance rates and special charges for sidings traffic. The other chapters in this part of the book are devoted to rates and charges, rebates, and undue preference. The third part contains chapters on private owners' waggons, agreements as to sidings and traffic, and the powers of the Railway and Canal Commissioners.

The foregoing is merely an epitome of the contents of Mr. Cockburn's book, the preparation of which must have occupied considerable time; for at the foot of each page references will be generally found to the various sets of law reports, and in many instances to the page of the report on which the statement in the text is founded. The text is preceded by tables of cases and statutes, and is followed by a useful index.



DISTANCE LIGHTING WITH SPARK IGNITION.

In view of the extended adoption of distance lighting in connection with both indoor and outdoor installations of incandescent burners, it is unnecessary to dwell upon its many advantages; and we refer to it now merely to direct attention to an addition which has been made to the systems already before the gas industry, in the shape of the spark ignition arrangement of the Herbert Tuchman Manufacturing Company. It is claimed for this system that it embodies a novel principle, consisting in the separation of the transformer from the trembler, which permits the use of bell wire or flex for the primary leads, and dispenses with insulation of the secondary leads, which are only of short length. The gas can either be controlled mechanically by a cock for 10 or 20 lights, or be operated from a distance by a mechanical pull device; and for installations where each light requires to have separate control, small magnets are used in place of cocks or taps, which permit the lights to be switched on and off by means of a two-way push-button.

The system consists of a battery, transformer, trembler, and spark leads. The 4 or 6 volt current generated by the battery is altered by means of the trembler to a current that can be changed to high tension in the transformer, which is placed near the burner, and which when connected to the spark leads on the burner produces a hot spark. The transformer consists of a core of laminated soft iron surrounded by a short coil of thick and a long one of very thin wire; and the over-all dimensions vary from $\frac{1}{2}$ inch to 1 inch. The spark leads are stout sparking wires with seatite insulators. These leads are not affected by heat, and the transformer for inverted burners can be kept out of the heat zone, or can be enclosed in an iron or aluminium casing. The spark produced by the transformer is of the same strength as that used for firing the explosive mixture for internal combustion engines. For outdoor installations, where the wire is subject to atmospheric influences, lead-covered wire is used.

The preceding illustrations will give an idea of the application of the system. Fig. 1 shows a 10-light inverted or vertical burner installation for 100 feet run of piping, with one gas-cock controlling 10 lights, and the 10-way switch placed near the

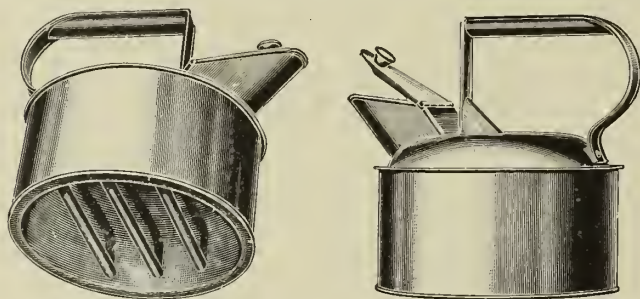
gas-cock. When the handle of the switch is turned, the burners light up instantaneously. Fig. 2 is the stout wire spark-lead and transformer for vertical burners. Fig. 3 is a 16-inch pendant with spark leads, transformer, and inverted burner. Figs. 4 and 5 show an inverted and a vertical burner, with electric tap and spark leads, with which two-way push-buttons switch the light on and off.

The manufacturers claim for their system that it is specially adapted for the lighting of churches, school-rooms, mills, and factories; and they submit that for places where the presence of naked lights is not desirable—in retort-houses, for example—it offers great advantages by obviating fire risks. It can be applied to the lighting of railway carriages, sidings, and signal-lamps; and in the latter case it would allow each light to be under the control of the signalman, thereby obviating the climbing of a ladder by an attendant to turn on the bye-pass. The system is in use for the ignition of mantle burners on trains where the conditions of service are most severe; and it is stated to be giving every satisfaction. The following are the advantages claimed for it: Instantaneous lighting of large units from one central point; absolute reliability of the spark, which cannot miss-fire; abolition of bye-passes, thereby saving consumption; naked lights or matches dispensed with, thereby reducing risks of fire; extended life of mantles; and the services of a lamplighter rendered unnecessary.

With regard to cost, it is stated that the outlay required for renewals for an installation of (say) 50 lights will not exceed 20s. per annum, including new batteries, which have an average life of fifteen to eighteen months. Portable battery sets can be supplied which will ignite 500 lights for an entire year. The wiring can be done by any bell-fitter; and the cost of the wire is a very small item.

GAS-STOVE KETTLE.

Specially constructed utensils for employment with gas-stoves and boiling-rings are not so plentiful on the market as the extensive use of domestic appliances in which gas is the heating agent might have led one to expect. The reason for this is that the cheap utensils that have been in use with the old open coal fire are equally applicable—if not always of the most economical form—to the gas-stove. But the question of the production of special vessels for boiling and cooking, in conjunction with gas stoves and rings, has not been altogether neglected. Gas heating for cooking and boiling purposes is economical already; but there is no reason at all why, by simple construction of the auxiliaries, it should not be more economical still. Economy, combined with efficiency, is the mainstay of the gas industry. In Waite's patent quick boiling tubular kettles (made by Messrs. Crompton and Fawkes, Ltd.), we have a successful attempt at getting a greater



amount of work out of a given consumption of gas in the boiling of water. A sample is before us, left for inspection by one of the agents, Mr. H. R. Hammond, of 5, Matham Grove, East Dulwich. The time saved by the use of this kettle in boiling water over a gas-ring represents a saving of half the cost of the gas used in boiling an ordinary kettle of similar capacity. The kettle is strongly made from the best quality tinned sheet metal. But the bottom of the kettle is where the interest lies. It is recessed in such a manner that inside the kettle a fairly deep channel is formed, in open connection with which are three copper tubes, tinned inside. On to these tubes and the recessed bottom the gas-flame directly impinges; and, immediately, there is set up a circulation of the water inside the kettle, much on the same principle as the geyser. The kettles are made from two up to ten pints, at quite reasonable prices. The two-pint kettle, we are informed, only takes between two and three minutes to boil with gas of about the commonly supplied calorific power. Another point is that the rapid flow of the water through the tubes prevents furring; one kettle that has been in continuous use in a particularly hard-water district for over eight months shows tubes and bottom almost as clean as when new. The inlet and outlet of the kettle is the broad spout, with hinged cover. At a small extra expense, the bottoms (as well as the tubes) are made of copper, tinned inside. Of course the kettle must not be allowed to stand over a flame without water in it, as the tubes would no doubt quickly become injured; but their replacement is only a matter of a few pence. The same principles of construction are applied to milk or porridge saucepans, egg saucepans, urns, and bronchitis kettles.

EXTENSION OF THE LANDY (PARIS) GAS-WORKS.

Some time ago, the Paris Gas Company decided on extending their works at Le Landy; and, in accordance with requirements, they made application to the Prefect of the Seine for the necessary authority. The Hygienic Council of the Seine had also to be consulted in the matter, so as to ensure that the proposed works would be in no way injurious to the public health. This body referred the Company's proposals to M. Jungfleisch, who reported favourably upon them to the Prefect; and, as there was but slight opposition, which was easily satisfied, they were approved by the Council. From his report, which is given in the current number of the "Journal des Usines à Gaz," we take the following particulars in regard to the extensions.

The works have been in existence since 1882, and are favourably situated for their purpose. They occupy a vast area on the plain of St. Denis, so that the extensions will be made upon the old site. Recent purchases of land have, however, considerably increased the area at the disposal of the Company. The productive capacity of the works is to be increased fourfold. The daily output has hitherto been rather more than 6 million cubic feet; but it is to be raised to 24½ millions. It is proposed to erect three retort-houses, each containing six settings on the same lines as those in the old house. They will all be on the Siemens regenerative system—each setting containing nine through retorts 20 feet long; and the houses will be equipped with mechanical stoking and coke quenching and conveying machinery. In connection with each house the usual condensing, washing, exhausting, and purifying plant will be installed. The coke-breaker will be constructed so as to be able to screen all the coke produced. The coal-conveying and stoking machinery will be actuated from the central electricity station, of about 3200 kilowatts capacity, already in operation. The works will be amply supplied with river and well water; and the comfort and health of the men will be assured as far as possible by lavatories, clothes closets, and mess-rooms.

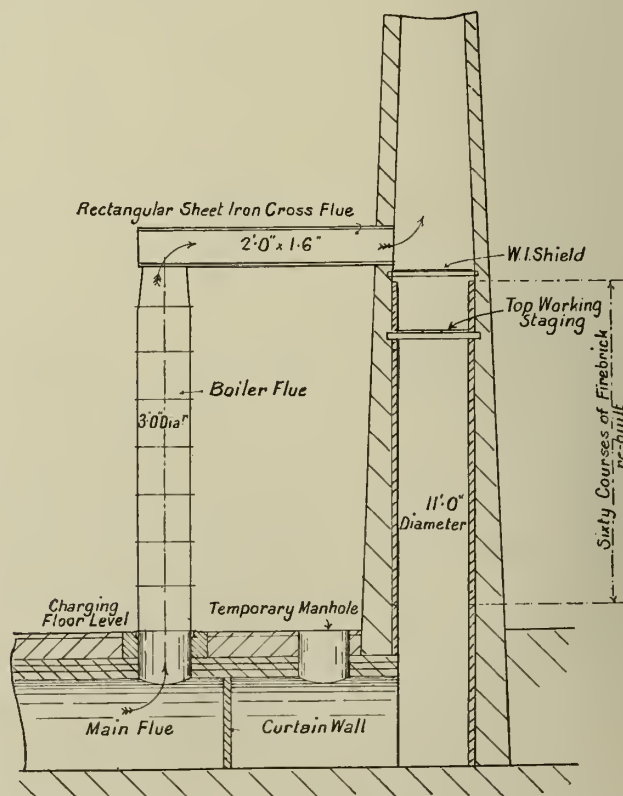
The present storage capacity of these works is close upon 6 million cubic feet; but three additional holders, each of about 5½ millions capacity, are to be provided. Two are in hand, and are to be ready by October; and the third will be finished next year. The new holders are three-lift; their full height being 131 feet. They will be of nearly 33 feet greater diameter in the lowest lift than the existing large holder.

The works above described will be followed eventually by others which will bring up the total productive capacity of the station to 35½ million cubic feet per day.

REPAIRING A GAS-WORKS CHIMNEY.

By HUBERT POOLEY, of Stafford.

It has occurred to me that some photographs and an explanatory sketch of a difficulty which we have just overcome may be of interest to readers of the "JOURNAL."





During the early part of the winter, the fire-brick lining of our gas-works chimney fell in part, completely blocking the main flue on two occasions. The main flue was opened, and the accumulated bricks got out each time.

On Wednesday, the 2nd inst., we commenced the repair of the chimney; bye-passing the lower part in the way indicated on the sketch. The photographs show the material used, which consisted of an old flue from a Cornish boiler and steel sheets which

will ultimately be made into barrows. The false bottom in the interior of the chimney was made of old light rolled joists, with a flooring of similar steel sheets. Sixty courses of brickwork had to be put in.

The work was commenced on the Wednesday, and completed on the following Sunday morning. The only difficulty we had was that, since the bye-pass was so restricted in area, our heats dropped, and our make per ton fell.

DESCRIPTION OF THE WEARDALE AND CONSETT WATER-WORKS.

By ROBERT ASKWITH, M.Inst.C.E., President.
[Prepared for the Annual Meeting of the Association of Water Engineers.]

The district within the limits of supply of the Wear- dale and Consett Water Company has an area of 422 square miles, and is situated in the north centre of the County of Durham. This area is under the jurisdiction of two County Councils, a small portion (about 20 square miles in extent) being in Northumberland, 7 Rural District Councils, 14 Urban Councils, and the Corporation of the City of Durham. The registered office of the Company is at Darlington, which town is outside the limits of supply. The head office of the Engineer is at Bishop Auckland, which town, with an area of about 1½ square miles, is within the limits of the district of supply, but is excluded therefrom by Act of Parliament, and is supplied with water pumped from the gravel beds of the River Wear, which flows on the outskirts of the town. There is a branch office at Consett, used by a District Secretary and Assistant Engineer; and there are rate-collecting offices at Bishop Auckland, Consett, Durham, Chester-le-Street, Crook, Spennymoor, and Annfield Plain, which also act as centres for inspectors and plumbers.

The population supplied with water is estimated at 360,000—largely engaged in the coal-mining industry. The large ironworks of the Consett Iron Company, Limited, are in the Company's district, and consume a great quantity of water for manufacturing and domestic purposes. At one time a large iron-works at Spennymoor, known as the Tudhoe Ironworks, and other large works at Tow Law, Witton Park, and Thrislington were supplied with water by the Company; but, with the exception of the blast-furnaces at Tudhoe, Spennymoor, which formed only part of the Tudhoe works, these have all been removed to the seaboard. The City of Durham is supplied by the Company—a residential place and fitted with water-closets throughout.

The supply of water is obtained from four impounding reservoirs situated on the high hills in the western part of the limits of supply, as follows:—

	Top Water. Feet above Ordnance Datum.	Date when Brought into Use.	Capacity in Millions of Gallons.
Waskerley reservoir . . .	1172	1871	450
Hisehope " . . .	1128	1905	106
Smiddy Shaw " . . .	1120	1876	305
Tunstall " . . .	720	1879	520

A supplementary supply of water is obtained in seasons of drought from a disused lead mine outside the limits of supply.

There are 22 service reservoirs or tanks, whose capacities vary from 3 millions to 175,000 gallons. The necessity for these will be understood when it is stated that a part of the highest town supplied—viz., Tow Law—is 1033 feet above sea-level; while a portion of the lowest town—Chester-le-Street—is only 40 feet above sea-level. The length of supply and distributing mains is 580 miles. The number of houses supplied is 68,000. The number of meter supplies is 1680.

There are many points of interest to the engineer in these works; but the author proposes to describe only the works of the two large reservoirs at Waskerley and Tunstall which are to be visited by members of the Association.

WASKERLEY RESERVOIR.

This, the erection of which was commenced in 1867, is formed by an earthen embankment with a centre puddle wall, 600 yards in length; the top-bank level being 1178 feet above Ordnance Datum. It is situated on a moorland in the millstone grit formation; the puddle trench being excavated in shales and greybeds, which, fortunately, were sufficiently free from crevices as to render the use of concrete unnecessary. The trench was filled with puddle made from local clay, and proved to be perfectly water-tight.

The waste-weir is 100 feet in width; the masonry being of local millstone grit. The bye-wash was excavated in sandstone, and it was thought unnecessary to protect this. But as, in course of time, this broke away and a deep ravine was formed by the flood water in the lower half, this was lined with concrete a few years ago, and ultimately the upper part will require lining also.

The tunnel and shaft (as was customary in those days) are in the centre of the embankment; and only one valve controls the discharge of water. The shaft, where hidden in the embankment, is built of brick set in lias lime. This was thrown out of the vertical and towards the reservoir to the extent of 3 feet in a vertical height of 90 feet by the uneven pressure of the earthwork of the embankment, and cracks appeared both horizontally and laterally in the lowest 30 feet of brickwork. When the valve was built in, a centre core of brickwork in cement was built in the shaft from the bottom to a point above the cracks. This movement caused great anxiety at the time; but, fortunately, it ceased in twelve months' time, and there has been no cause for anxiety since. The construction of the reservoir was commenced by contractors, who were unable to complete the work; and the latter half was carried out by administration.

The water passes from the reservoir through the tunnel

into a compensation-water gauge-basin, which, however, is no longer used for gauging purposes, owing to the Company being relieved from the obligation to give compensation water since the completion of the Tunstall Reservoir, which is at a lower altitude in the same valley.

The water is treated by an admixture of finely-ground burnt lime to prevent plumbo-solvency. Crushed carboniferous limestone was at one time mixed with the sand in the filter-beds; but, although this had the desired effect on the water, it was found that, after the lime contained in the stone had been dissolved by the water, there remained an insoluble residue which partly choked the beds and seriously retarded the process of filtration. The present simple arrangement, by which water is passed under pressure into the bottom of a tub, which has been charged with lime, and is carried through an overflow into a settling box and then forward into the gauge basin, answers its purpose thoroughly, as is shown by tests made by Sir Thos. Oliver, M.D., of Newcastle.

Quantity of Lead Expressed in Milligrams in each Half-Litre of Water.

	Before Treatment.	After Treatment.
1st day	0.9 ..	0.1
2nd „	1.2 ..	0.15
3rd „	1.8 ..	0.20
4th „	2.0 ..	0.25
5th „	2.1 ..	0.30
6th „	not taken ..	0.30
7th „	2.2 ..	0.45
8th „	2.5 ..	0.50
9th „	2.6 ..	0.60
10th „	2.6 ..	0.65

The cost of this treatment of 1,660,000 gallons of water per day is less than £50 per year.

The water passes from the gauge basin into five filter-beds, which, owing to their great altitude, are covered by a timbered and slated roof. This gives the advantages that sand-washing can be carried on in the severest weather, each bed having a sand-washer in the centre; and the exclusion of light prevents the growth of algae during the summer months. Four out of the five beds are capable of efficiently filtering 1,660,000 gallons of water per day.

For several years water has been pumped from this reservoir into the Smiddy Shaw Reservoir, over the intervening hill 155 feet in height, by means of a steam pump; but two years ago the steam-pump was replaced by a suction-gas engine and three-throw pump capable of pumping a million gallons in 22 hours—the engine being of 105 (maximum) B.H.P. The cost of pumping 113,554,680 gallons against a total head of 170 feet during the year 1908 was £212 17s., which works out at 0.45d. per 1000 gallons pumped, or 0.26d. per 1000 gallons lifted 100 feet.

TUNSTALL RESERVOIR.

This reservoir is formed by an earthen embankment having a centre puddle wall 340 yards in length, and was commenced in 1873. It is on the same stream as the Waskerley Reservoir, but four miles lower down the valley. The top-bank level is 726 feet above Ordnance Datum, or 452 feet lower than that of the Waskerley Reservoir. It is built in the mountain (or carboniferous) limestone formation, in which some of the beds are very open, but are intersected by thick beds of shale, which prevent water going downwards, one of which formed an excellent water-tight foundation for the puddle wall. The stratification can now be easily seen and examined in the escarpment by the side of the bye-wash. The open beds caused great difficulty in making the reservoir water-tight, as the water can readily pass into the hillside for nearly its whole length.

When the reservoir was built, the puddle trench was terminated in the hillside near the bye-wash, and the joints in the open beds, which at that point were found to be filled with clay and appeared water-tight, were carefully cleaned out and filled with fine cement concrete. When, however, the reservoir was only partly filled, it was found that water was passing through these rocks in large quantities, and it became necessary to tunnel under the hill and cut a further trench 90 yards in length by 90 feet in depth, and 6 feet in width, and to fill this with cement concrete. It was impossible to remove in bulk that part of the rock against which the end of the puddle wall rested, and a wedge-shaped piece of rock was left standing to support the puddle until the extended trench had been excavated to its full depth. The rock was then tunnelled at the lowest level until the puddle was reached (care being taken to expose a very small quantity of the puddle at one time)

and the space was filled with brickwork in cement. A tunnel was again driven at a higher level and similarly treated; and this was repeated till the whole of the wedge of rock was removed and replaced by brickwork.

When this and the concrete wall were completed, it was found that the water was passing near the base of the brickwork which supported the puddle; and holes were bored from the surface on the inside of the puddle wall at a distance of 10 feet from it, and cement grout poured into them. The percolation of water was in this way completely stopped in 1879, when the reservoir was brought into use.

The building of the concrete wall did not completely stop the flow of water through the limestone beds; but the quantity so passing was reduced to less than a million-and-a-half gallons per day when the reservoir is full. The whole of this is caught by means of drifts cut in the hillside at a distance of 22 yards from the wall, and taken into the hill on two levels beyond the end of the wall. The water, being of excellent quality, is turned into the filter-beds.

The overflow weir is 120 feet wide. The tunnel, which is 7 feet in diameter, and the shaft are built in the hillside; and there are two valves for letting out the water) placed one behind the other, the shaft being divided into two compartments. The water passes from the reservoir through the tunnel into a gauge basin, where compensation water is run into the stream; but a small quantity is drawn through a grating in the invert of the tunnel into the filter-beds to supplement the water obtained from the hillside.

The four filter-beds are open, and were built seven years ago on a surface that had been formed by deposit of earth about 23 years previously. The floors are of cement concrete, 18 inches thick, upon which the side walls are built. It will be noticed that the beds have gone slightly out of level without any visible fracture. Three of the filter-beds are capable of filtering 2 million gallons of water per day. The water passes from the filters into a covered pure-water tank, and thence, through a "Venturi" meter, into a 24-inch pipe, 10 miles in length, which conveys it into a service reservoir at Beechburn, having a capacity of 3 million gallons.

The whole of the work in connection with the erection of this reservoir and the filter beds was carried out by administration.

Messrs. T. & C. Hawksley, of Westminster, are the Consulting Engineers to the Company; and except the filter-beds at Tunstall, the works described were designed by them.

Tests of a Small Gas-Engine and Producer Plant.

In the course of a lecture delivered before the Manchester Section of the Institution of Electrical Engineers by Mr. A. H. Gibson, particulars were given of a series of experiments which had recently been carried out on a suction-gas producer coupled to a gas-engine in the Engineering Laboratories of the Manchester University. The plant was capable of developing 24 B.H.P., and was run at approximately full load over the whole series of experiments. The object of these was to determine the efficiency of the producer and engine under different conditions of working. The fuel used throughout was gas coke, containing 81.75 per cent. of carbon and 1.19 per cent. of hydrogen, and having a net calorific value of 12,635 B.Th.U. per pound dry. The general conclusions to which the experiments led are as follows: The composition and calorific value of the gas varies greatly with the quantity of water vapour supplied to the vaporizer, as does the thermal efficiency of the producer; the latter attaining its maximum value of 78.6 per cent. when the gas produced has its highest calorific value—viz., 127.1 B.Th.U. per cubic foot at 32° Fahr. under a pressure of 29.021 inches of mercury. The efficiency of the engine, however, falls off as the gas becomes richer; the reduction of thermal efficiency being accompanied by a decrease in the percentage of heat rejected to the jackets, and in an increase in the percentage rejected in the exhaust gases. The engine has a maximum thermal efficiency of 26.9 per cent. and a minimum efficiency of 22.8 per cent., measured on the brake horse power. The over-all thermal efficiency of the plant has a maximum value of 18.16 per cent., measured on the brake horse power; this occurring with a slightly greater vapour supply than that (0.4 lb. per pound of dry fuel) giving the maximum producer efficiency. This value coincides very fairly with that obtained by Drs. Bone and Wheeler in a series of trials, already noticed in the "JOURNAL," on a large pressure producer developing approximately 3000 H.P., and burning bituminous coal as fuel. Under conditions of maximum efficiency in the small producer, the consumption of dry fuel was 1.11 lbs. per brake horse power per hour.

Canadian Gas Association.—The annual meeting of this Association will be held next Friday and Saturday in Montreal; and according to a statement made by the Secretary (Mr. A. W. Moore, of Woodstock, Ontario), a programme has been arranged which will ensure a highly successful gathering.

INTEREST AND DEPRECIATION.

	£	s.	d.
Interest on capital, 5 per cent on £2315	116	0	0
Depreciation on engines, piping, and tanks, 5 per cent. on £1355 10s.	67	16	0
On producers and coverings, 7½ per cent. on £290 10s.	21	16	0
On generators and switchboard, &c., 5 per cent. on £410	20	10	0
On belts, foundations, gratings, &c., 10 per cent. on £154	15	8	0
Annual total	£241	10	0
Average weekly output, 9500 k.w. hours.			
Volts, 230.			
Capacity: Large set, 425 amp.; small, 105 amp.			
Average output: Large set, 330 amp.; small, 70 amp.			
Load factor, 77 per cent.			
Average coal per week (anthracite doubles, at 15s. 6d.)	14,500	lbs.	
Average coal per k.w. hour.	1	53	

STAND-BY LOSSES.

Two producers at week end	450	lbs.
Small producer, five nights	250	"
	700	lbs.
Average coal per week for power (14,500-700)	13,800	lbs.
Average coal per k.w. hour for power	1	45

LABOUR.

One man at 24s., one at 22s. (night shift), and relief at 4s. per week	£2	10s.	od.
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WATER (costing 4d. per 1000 gallons).

In large scrubber and boiler, per hour	260	gallons.
In small scrubber and boiler, per hour	159	"
In exhaust valve	112	"
Total per week	40,200	gallons.
Per k.w. hour	4	24

OIL (Average cost, 1s. 8d. per gallon).

Total for all purposes per week	3	6	gallons.
Per k.w. hour	0	00038	"

COAL GAS.

In starting engine and burner of 140 H.P. engine per week	1000	cubic feet.
Per k.w. hour	0	105

Repairs and renewals (say) £15 per annum.

COSTS per k.w. hour, assuming a working year of 49 weeks.

Anthracite.	$\frac{1'53 \times 15s. 6d. \times 12}{2240}$	. . . . .	0	1270
Coal gas	$\frac{1000 \times 2 \times 12}{1000 \times 9500}$	. . . . .	0	0026
Wages	$\frac{50s. \times 12}{9500}$	. . . . .	0	0630
Water	$\frac{40,200 \times 4d.}{9500}$	. . . . .	0	0170
Lubricating oil	$\frac{3'6 \times \frac{1}{2} \times 12}{9500}$	. . . . .	0	0076
Depreciation and interest	$\frac{241'10 \times 240d.}{49 \times 9500}$	. . . . .	0	1250
Repairs and renewals	$\frac{15 \times 240}{49 \times 9500}$	. . . . .	0	0077
			0	3499
Total cost of 1 k.w. hour at switchboard, 0'35d.				

In January, 1909, Mr. Percy Griffith, M.Inst.C.E., conducted a series of tests with two gas-engines and producer plants at the new Skegness Water-Works at Welton, Lincolnshire. The trial extended over twelve hours; anthracite coal, costing 37s. 10d. a ton delivered, being used in the producers. The water was lifted 210 feet high, including

the friction of the rising main; and it was found that the cost (fuel only) of raising water into the reservoir was 0'25d. per 1000 gallons.

Since the previous paper on this subject was read, great improvements have taken place, not only in engines, but also in producer plants. Much larger engines are now on the market; and the question can be looked at by water-works engineers from quite a different standpoint.

Mr. Dowson, M.Inst.C.E., recently pointed out, in a letter to the "Electrical Times," that the working costs of gas power are considerably less than those of steam power per brake-horse-power. But for station work there are other costs to consider; and it is not safe to assume that in all cases when gas power is used the total cost will be only one-third the cost of steam power. The chief saving is in fuel; the cost of repairs is also less; wages, oil, and sundries are about the same; interest on capital outlay and depreciation should also be considered in each case. All makers of gas-engines guarantee that the consumption of fuel shall not exceed 1 lb. of small anthracite, or about 1½ lbs. of coke, per brake-horse-power-hour. The stand-by loss of a gas-producer is much smaller than that of a steam-boiler of the same power; and the importance of this is often overlooked. After much careful investigation, it has been found that for plants of from 200 to 500 brake-horse-power, the stand-by loss of the boiler plant was 15 to 20 per cent. of the total fuel consumed in 24 hours; whereas with a gas-producer the loss was only 2 to 4 per cent. Speaking with some knowledge of units up to 300 and 375 horse power, one may state that with good engines and gas plants the working is reliable and trustworthy, and the saving in cost of fuel is about 50 per cent., where the price of the fuel for gas is not more than 25 per cent. higher than that of steam coal. It will, however, be clearly understood that the losses in connection with the pumps will be the same whether gas or steam is used for power. The saving in cost of fuel may, however, in some cases be proportionately very large, and therefore of great value in the case of small stations. But in others it may not be so; and each case must therefore be considered on its merits.

The tabular statement appended is the report of a test of plant that was recently put in for the Mersey Docks and Harbour Board, for emptying the Queen's Dock. It comprises two 510 B.H.P. gas engines, each directly connected to a 48-inch centrifugal pump, fitted with a 7 ft. 10 in. disc. The engines are of the two-cylinder horizontal *vis-a-vis* type, and are driven by coal gas taken from the Corporation mains. The engines are not working to their full capacity, or better would have been obtained. Coal gas is used in this case, owing to the fact that the dock may have to be emptied at a moment's notice, and the saving of the time necessary to get gas-producers into working condition is an important consideration.

A similar plant was at the same time installed for emptying the Brocklebank Dock.

Among the points which will most naturally occur to the water-works engineer in connection with gas-driven pumping stations generally is the small space occupied, the small amount of attention required, and the absence of smoke and tall chimneys. The two latter considerations are very important where a pumping station has to be erected in a residential district.

Results of Test of Gas-Engines Operating Centrifugal Pumps at Queen's Dock (Mersey Docks and Harbour Board).

Time.	Approx. Water Levels in Dry Dock.	Fall of Water in Dry Dock.	Levels in Wet Dock.	Static Head.	Friction through Pipes.	Total Head.	Galls. per Min. each Pump. Average.	W.H.P. Total for both Pumps Sea Water. 10'27 lbs.	B.H.P. Gas Engine. 85 per Cent.	Pump Efficiency W.H.P. B.H.P.	Revs. per Min. Average	Gas Consumption. Cubic Feet.	Gas per B.H.P. Hour.	Gas per W.H.P. Hour.	U. Velocity Through.
	Ft. In.	Ft. In.	Ft. In.	Ft. In.						Per Cent.					
12.20	32 0	—	32 0	—	—	—	—	—	—	—	—	—	—	—	—
12.35	—	5 3	32 1	2 7½	3'1	5'7	70,000	248	780	31'8	132	3,400	17'45	54'9	—
12.50	21 8	5 1	32 2	7 10	2'7	10'5	63,800	418	870	48'2	140	3,700	17'00	35'4	—
1.5	—	4 9	32 2	12 9½	2'3	15'1	58,800	552	910	60'7	138½	3,900	17'15	28'3	—
1.20	12 7½	4 3½	31 9	17 1	1'7	18'8	51,500	602	925	65'1	135½	3,800	16'45	25'3	—
1.35	—	3 9½	31 9	20 10½	1'2	22'1	43,100	594	915	64'8	131½	3,800	16'6	25'6	—
1.50	5 6	3 4½	31 10	24 5½	1'0	25'5	38,000	604	893	67'6	133½	3,800	17'00	25'2	—
2.5	—	2 10	31 10½	27 3½	0'7	28'3	31,400	554	923	60'0	133	3,800	16'45	27'5	—
2.20	+1	2 7	31 11	30 5	0'6	31'0	27,600	533	918	58'0	135½	4,000	17'4	30'0	—
2.35	-2 2	2 3	31 11½	33 0	0'4	33'4	23,400	486	920	52'9	135½	3,900	16'95	32'1	—
2.42	Crown of dock dry			—	—	—	—	—	—	—	—	—	—	—	—
2.47	South engine stopped			—	—	—	—	—	—	—	—	—	—	—	—
2.50	—	—	—	35 5	0'35	35'8	20,800	465	930	50'0	138	3,500	16'7	33'6	5'04
Aver.	—	—	—	—	—	—	—	506	902	56'0	—	—	16'8	30'0	—

NEW METHOD IN WATER-GAS MANUFACTURE.

By HENRY I. LEA, of Chicago.

[Extracts from a Paper read before the Illinois Gas Association.]

We shall all probably agree that the method of manufacture desired in our industry is one which will enable us to produce continuously, from the least expensive fuels, a gas having such characteristics as local conditions may require. In the gas producer field, we find at hand the instrument which enables us to utilize the inexpensive fuels with very high thermal efficiencies; but producer gas alone will probably never be successfully used for general distribution because of its bulk and low flame temperature. This view is confirmed by recent Mond gas experience in England, which, while perhaps not conclusive, is at least important through showing some of the weak spots. By combining producer gas with other gases, however, we enter at once a very promising field. Many attempts have been made to carburet producer gas; but in every case of which the writer has been able to learn, these attempts have involved intermittent operation, with its many disadvantages. As in ordinary coal gas and water gas practice, the disadvantage of passing periodically from one to another bad extreme of temperature in the gas-making process applies also to the intermittent carburetting of producer gas. It is possible, however, to avoid this objection.

Because producer gas may be made continuously from liquid as well as from solid fuels, it will be seen that producer gas may be considered as a basis for the final product in all parts of the country; and it is the purpose of this paper to show the results we may reasonably expect from the continuous manufacture of a new gaseous mixture, composed of producer gas and hydrocarbons from oils or solids and products of combustion of producer gas. It has always been assumed that the addition of carbon dioxide or of nitrogen to our final product offers nothing but disadvantage. Nevertheless, in view of the many losses due to intermittent operation, the writer has considered the possibility of providing the heat required in carburetting producer gas by burning within the body of gas being made a portion of that gas, and allowing the products of such combustion to remain in the finished product. In spite of the obvious objection to this last-mentioned step, there are accompanying advantages which would apparently make the process worthy of serious consideration. The figures which follow, however, must be understood as being only theoretical, though they are based, as far as possible, upon actually known conditions.

The equipment necessary in carrying out this process is practically that of a carburetted water-gas plant in which the generator is replaced by a producer of the type best adapted to the local fuel, and in which the carburetter is so constructed that the combustion of a portion of the producer gas entering it will have been completed before the products of combustion will have reached the point of the admission of oil. The exact construction would, of course, be determined by the costs and characteristics of coals and oils locally; but this general illustration will serve to make clear the scheme of operation.

While it is possible, within a certain range, to use solid fuels for carburetting, this possibility is avoided in the following calculations, as involving too many uncertainties. Farther along in this paper will be found summaries of a number of calculations representing working results that seem to be possible with three distinctly different types of producer fuel. These calculations have been carried out for gases of three different values with each fuel; and though values higher and lower than those shown may be made with either of the fuels indicated, the range covered is believed to fully meet all demands now in sight. To make it clear that the summaries given are not entirely based on conjecture, the following calculation is submitted as being typical of all from which the summaries are drawn. Naturally, the thermal efficiency of the process, other things being equal, will be highest when the producer gas contains no tarry vapours, as their presence makes it necessary to raise the entire body of the producer gas from the temperature at the producer outlet to that of the fixing of the oil vapours. With a tar-free producer gas, only the portion necessarily burned will be raised in temperature above that of the producer outlet; the balance of the producer gas in the final product being admitted after the carburetting stage. The following calculation is based upon the assumption that our producer fuel is to be a bituminous coal having these characteristics:—

Constituents,	Per Cent.
Moisture	12.43
Volatile matter	32.65
Fixed carbon	45.70
Ash	9.22
Sulphur	1.41

The thermal value of this coal as fired is 11,237 B.Th.U. per pound. The producer gas made shows the following analysis:—

Components,	Per Cent.
CO ₂	9.72
O ₂	0.12
CO	15.12
H ₂	9.98
CH ₄	6.00
N ₂	59.06

The thermal value of this gas is 151.5 B.Th.U. per cubic foot,

corrected to 60° Fahr. and 30 inches barometer. The gas made per pound of coal as fired equals 51.5 cubic feet; and the thermal efficiency of the producer operation equals 68.86 per cent.

There is good reason to believe that this efficiency can be considerably improved in regular practice; but this figure is taken because it is the actual result of operation. The gas leaves the producer at an average temperature of 882° Fahr., and the tar recovered equals 5 per cent. (by weight) of the coal used. The oil employed in this calculation is Beaumont, of 22° Beaumé. The United States Naval Liquid Fuel Board have conclusively shown this oil to have an average thermal value of 19,224 B.Th.U. per pound. Water-gas practice has shown that permanent fixing of the average oil into desirable gases may be accomplished below 1450° Fahr., when the carburettor and superheater have sufficient capacity.

The average product of destructive distillation of gas oil in the presence of inert gases at the correct temperatures may be shown to be as follows:—

Components,	Per Cent.
CO ₂	1.26
C ₂ H ₆ (equivalent)	42.627
CH ₄	49.488
H ₂	6.169
N ₂	0.450

The thermal value of this gas at 60° Fahr. and 30 inches barometer is 1612.2 B.Th.U. per cubic foot. The oil above specified will yield the equivalent of 86771 cubic feet of this gas per gallon, or 113278 cubic feet per pound. Good water-gas practice shows that, of the oil used, only 8 per cent. remains unaccounted for.

Because the formation of tar may be entirely, and the formation of lampblack almost entirely, avoided by continuous operation under correct conditions of temperature and pressure, it seems reasonable to assume that we can attain a thermal efficiency of 95 per cent. in the gasification of oil in the presence of inert gases which themselves supply the required heat and temperature. To avoid unnecessary details, we will assume that we now have our plant in operation, with the producer fuel bed and carburettor and superheater at the desired temperatures. Because the sensible heat of the producer gas entering the carburettor is alone not sufficient for fixing the desired amount of oil vapour, we must burn an amount of producer gas which will supply the difference.

We will assume that the gas we desire to make shall have about 675 B.Th.U. per cubic foot. To attain this value, we shall need to have in our finished product 76.65 cubic feet of oil gas for each 51.1 cubic feet of producer gas remaining as such in the final product. As a convenient base, the 51.1 cubic feet of producer gas made per pound of coal is here used. The heat it is now necessary to supply, in addition to the sensible heat of the producer gas, will be as follows: To raise 51.1 cubic feet of this producer gas from 882° to 1450° Fahr. we require 5.47 B.Th.U.; to raise 76.65 cubic feet of this oil gas from 250° (which temperature is reached by utilizing waste heat) to 1450° Fahr. will require 2785 B.Th.U.; to raise 0.05 lb. of tar vapour from 882° to 1450° Fahr. will require 13 B.Th.U. The heat rendered latent in making the above oil gas equals 2355 B.Th.U.; and that rendered latent in gasifying the above tar vapour equals 17 B.Th.U. The total of the above requirements is 5717 B.Th.U.

Water-gas practice shows that the loss of heat by radiation and convection need not exceed 9 per cent., even with intermittent operation. Adding 9 per cent. to 5717, we have 6232 B.Th.U. to be provided by the actual combustion of a portion of the producer gas entering the carburettor. The value of this gas at 882° Fahr. is 167.8 B.Th.U. per cubic foot corrected. To provide 6232 B.Th.U., we must therefore burn 37,134 cubic feet of this producer gas. Because the air admitted to this producer gas will be under absolute and automatic control, the resulting products of combustion may be calculated, very closely, as follows:—

	Cub. Ft.
CO ₂	11.452
N ₂	56.027
H ₂ O	8.162

The water vapour, of course, will condense, and is not carried further in our calculation. It is assumed that the tar gas will be composed of practically equal volumes of hydrogen and marsh gas, and the uncertainty in this connection is covered by an allowance of volume very much less than would probably be obtained in practice.

The original volumes of producer gas and the products of combustion of the additional producer gas burned having now been given the temperature and volume of heat required in fixing the desired amount of oil, they are carried forward to the point of the admission of oil, where they are mechanically mixed with the oil vapours continuously and automatically introduced. On passing through the carburettor and superheater, the oil vapours are now fixed into desirable permanent gases by the heat and temperature supplied by the producer gas and products of combustion. Because of the very intimate contact of this source of heat with every vesicle of oil admitted, this transfer of heat will be very effective, and at the outlet of the superheater we should find the following gases and thermal values:—

	Cub. Ft.	B.Th.U.
Original producer gas (51.10—0.06 O)	51.04	7.742
Products of combustion	67.48	—
Oil gas	76.65	123,575
Tar gas	1.00	667
Total	196.17	131,984

The average thermal value of this gas is 672.75 B.Th.U. per cubic foot, and its analysis should be as follows:—

	Per Cent.
CO ₂	8.88
CO	3.68
H ₂	5.27
CH ₄	21.20
C ₃ H ₆ (equivalent)	16.74
N ₂	44.23
	100.00

This gas contains 46.89 per cent. of combustible by volume. The air admitted for secondary combustion in the operation will have been 43.106 cubic feet. The weight of the above gas is 0.076897 lb. per cubic foot, and its specific gravity at 32° Fahr. and 30 inches barometer is therefore 0.9525. The combustion of a cubic foot of this finished gas will require 5.841 cubic feet of air, and will yield the following products:—

	Cub. Ft.
H ₂ O	0.9789
CO ₂	0.8398
N ₂	5.0627

The net heating value of this gas is found to be 623.07 B.Th.U. The heat required to raise the products of combustion of 1 cubic foot of this gas 1° Fahr. equals 0.192816 B.Th.U. The flame temperature is therefore 3231° Fahr. To produce 196.17 cubic feet of the 672.75 B.Th.U. gas, we have used:

1 lb. of bituminous coal =	11,237 B.Th.U. (51.1 cub. ft. producer gas).
0.7266 lb. bituminous coal =	8,165 B.Th.U. (37.134 cub. ft. do.).
6.7665 lbs. oil =	130,079 B.Th.U. (76.65 cub. ft. oil gas).
Total	149,481 B.Th.U. employed in the process.

The gas produced contains 131,963 B.Th.U., and the thermal efficiency of our operation, apart from the raising of steam and the operation of auxiliaries, is therefore 88.28 per cent. Reducing the foregoing figures to the basis of 1000 cubic feet of finished gas, we find that we have made 1000 feet of this gas by consuming 8.8 lbs. of bituminous coal in the producer and 4372 gallons of oil in the carburettor. We have made per 1000 feet of finished gas a total of 449.78 cubic feet of producer gas, of which we burned 189.3 cubic feet in the carburettor. To burn this amount of gas, we admitted 220 cubic feet of air for secondary combustion. For the operation of the producer, we admitted to the fuel bed something less than 335 cubic feet of air and 6.86 lbs. of steam.

It will be noticed that the volumes of air and steam needed per 1000 cubic feet of finished gas are considerably below the requirements of water-gas practice; and, as there are no auxiliaries not required by water gas, these advantages are clearly with this process as against water gas. As the coal can be bought in Chicago for less than \$2 per ton, and the oil or its equivalent at not to exceed 3½c. per gallon, we have a total cost of 16.18c. for raw material per 1000 cubic feet of 672 B.Th.U. gas in the holder. As the process is continuous, the labour charge will be considerably below that of coal gas or water gas per 1000 cubic feet. Also, because of the continuous operation, the life of the linings and chequerbrick will be very much greater than the life of water-gas linings or of coal-gas retorts.

With the prices for raw material assumed above, this gas would yield 41,579 B.Th.U. for one cent's worth of raw material. If water gas of this value were made from the same amount of oil, at the same price, and 35 lbs. of coke, at \$4 per ton, the cost per 1000 cubic feet for raw material would be 22.3c., the B.Th.U. delivered at the plant for one cent's worth of raw material would be 30,134, and the steam and air required would be about 16 lbs. and 2450 cubic feet respectively. The increased efficiency with which the gases of lower value may be made, and the constantly increasing range in which they are being successfully employed, explain the presentation here of data in connection with gases as low as 288 B.Th.U., as it is the belief of the writer that a great many sets of conditions will be found where it will be advisable, from the standpoint of the consumer as well as of the company, to supply a gas of considerably less than 600 B.Th.U. per cubic foot.

It is not claimed that the process here described is applicable to all conditions, nor that the present details of gas manufacture are not now being carried out along the best lines possible with present processes. The only claim made is that the process involves a new method of gas manufacture, which may or may not be shown of value in practice.

[In a series of tables appended to the paper, the author summarized the results of some of the many calculations made by him in connection with the method of water-gas manufacture described.]

In the course of the discussion on the paper, as reported in the last number to hand of the "American Gaslight Journal,"

Mr. BATTIN said he considered the secret of the success of the process, if it worked out in practice, would be found in the fact of its continuous operation. People who sell producer processes had an old saying that "continuous processes mean continuous profits." There was no question about it, if the temperatures could be kept, as Mr. Lea believed, uniform in a continuous process, the percentage of efficiency obtainable would be very much increased over that of present processes. The secret of the whole paper lay in the paragraph where the author said: "Because the formation of tar may be entirely avoided by continuous operation, under correct conditions of temperature and pressure, it seems reasonable to assume that we can attain a

thermal efficiency of 90 per cent. in the gasification of oil in the presence of inert gases which themselves supply the required heat and temperature." This was a rather high percentage to look for; but it was possible to approach it, especially in the case of gas of the lower heat value. In other words, the gas running about 300 B.Th.U. was the more promising field. He believed gas companies would be rather slow to take up a proposition of this kind; but, on the other hand there had been for years attempts made to carburet producer gas by people interested in metallurgical work and in glass furnaces, or similar operations, and he thought that here was a field which was very promising—a chance to make a 300 B.Th.U. gas that would have the advantages all looked for, one of which was that the flame had luminosity. The amount of luminosity in any of the gases that Mr. Lea figured out would probably not be very great, on account of the carbonic acid—in fact, that would work against it in the case of ordinary gas company distribution under the present system. But for the metallurgical work the gas had enough luminosity to make it of value. A point which did not seem explainable was that gas of a certain heat value, giving a non-luminous flame, was not anything like as effective for metallurgical work as one which had a luminous flame; so he thought that here was a place where the process could be tried out.

Mr. J. L. UNGER said that, assuming the efficiencies of carburation and oil gasification were, as stated by Mr. Lea (which he much doubted), and that 6.7665 lbs. of oil = 76.65 cubic feet of oil gas, were added to 51.1 cubic feet of producer gas from 1 lb. of coal, and that these gases must be heated to 1450° Fahr. for complete carburation, the additional producer gas admitted and burned must be 75 per cent. more than he stated, or about 65 cubic feet, instead of 37.134 cubic feet, because Mr. Lea omitted to allow for heat to balance the heat carried out and lost by the products of combustion. Assuming that these products of combustion must be heated to 1550° Fahr., or 100° more than the other gases, in order to allow for heat transfer between them, then the heat required would be—

20.05 cubic feet CO ₂ heated 1490°	1,062
98.00 " N ₂ " 1490°	2,810
14.28 " H ₂ " "	595

Total heat in products of combustion	4,377
Heat required, according to Mr. Lea, to heat the other producer gas, the oil gas, and the tar	5,717

Total	10,094
Add 9 per cent. for losses	908

Total heat required 11,002

$$\frac{11,002}{167.8} = 65.4 \text{ cubic feet.}$$

Gas will Contain :	Cubic Feet.	B.Th.U.
Original producer gas	51.04 by 151.5	7,742
Products of combustion	118.05	0
Oil gas	76.65 " 1,617.2	123,575
Tar gas	1.00	667
	246.74	131,984

$$\frac{131,984}{246.74} = 535 \text{ B.Th.U. per cubic foot, instead of } 672.75$$

To obtain this thermal value, there were used—

51.1 cubic feet producer gas = 1 lb. of coal	11,237
65.0 " " " = 1.274 lbs. of coal	14,316
76.65 oil gas from 6.7665 lbs. oil	130,079
	155,632

$$\frac{131,984 \times 100}{155,632} = 84.16 \text{ per cent. efficiency, instead of } 88.28$$

This efficiency was still too high, owing to Mr. Lea's assumption of 95 per cent. efficiency of the oil conversion. Mr. Lea assumed that there would be no tar formed from the oil, and that the condition of gas carburation would be more favourable than was the case in ordinary water-gas practice. The process proposed differed from water-gas practice in being continuous, instead of intermittent, which, in some respects, was an advantage. But since he was obliged to admit the oil after the combustion of the producer gas had taken place, he lost the benefit of heat-transfer between the gas and the brickwork that had been heated by the producer-gas flame, and must depend upon his heat-transfer solely from the hot gases of combustion. His carburettor apparatus might be compared with a Lowe water-gas set, in which the carburettor was used solely as a combustion chamber burning the necessary producer gas, and the superheater used as a carburettor for the heating of the oil gases without any admixture of air. It would, therefore, seem that his conclusion, based on water-gas practice—that only 9 per cent. would be lost in radiation and convection during the carburettor—might not be warranted, as the process was different. Mr. Lea evidently obtained his data about temperatures and heat losses from Mr. A. G. Glasgow's paper on "The Practical Efficiency of an Illuminating Water-Gas Setting;" and it might be of interest to point out the efficiency of the oil gasification from Mr. Glasgow's experiments. Mr. Glasgow used a lighter oil than Mr. Lea—consequently, an oil that made more gas per pound. But Mr. Glasgow got only 355 cubic feet of oil gas from 5 gallons of oil, or 10 cubic feet from 1 lb. of oil, whereas Mr. Lea assumed 11.3278 cubic feet. Mr. Glasgow got 1555 B.Th.U. per cubic foot of oil gas, whereas Mr. Lea assumed 1612.2 B.Th.U. Mr. Glasgow got 15,550 B.Th.U.

per lb. of oil in his gas, whereas Mr. Lea assumed 18,263 B.Th.U., or a result 15 per cent. higher from an oil inferior to Mr. Glasgow's. The latter estimated the ultimate heat effect of 1 lb. of oil at 20,000 B.Th.U., and got back in his gas 15,550 B.Th.U., or an efficiency in oil gasification of 77.75 per cent. Mr. Lea assumed an efficiency of 95 per cent. Mr. Glasgow got 5 lbs. of tar from 5 gallons of oil, and besides confessed to a loss in a machine of 8 per cent. Mr. Lea got no tar, and estimated his loss at only 5 per cent. Mr. Glasgow used 33.4 lbs. of hard coal per 1000 cubic feet of carburetted water gas, which at 13,500 B.Th.U. was equal to 450,000 B.Th.U.; 35 lbs. of oil per 1000 cubic feet, less 5 lbs. of tar, at 20,000, or 600,000 B.Th.U.; total B.Th.U. required per 1000 cubic feet of gas, 1,050,000. The carburetted water gas of 30 candles, from calculation, contained 764 B.Th.U. per cubic foot, or per 1000 cubic feet, 764,000 B.Th.U.; loss during process, 286,000 B.Th.U., or 72 per cent. efficiency, not figuring on coal used for steam making. Mr. Lea's figure of 88.28 per cent. for producing 672.75 B.Th.U. gas would seem too high for anybody to believe without demonstration from practice. According to his (Mr. Unger's) criticism above, these figures should be 84.16 and 535 respectively—still based on Mr. Lea's assumption of heat efficiencies of conversion.

Mr. HARTMAN pointed out that the "new gas" proposed to be made was almost as heavy as air; and the author said that the additional cost of distribution on this account would be extremely difficult to discover in actual operation. He (Mr. Hartman) disputed this statement. The quantity of gas flow in a given sized pipe varied inversely as the square root of the specific gravity of the gas. In other words, a pipe that would pass 1000 cubic feet of coal gas of .400 gravity would pass only 550 cubic feet of the proposed gas of .950 gravity. This difference was so great that one could not fail to notice it in actual operation. Studying the analysis of the gas, it would be seen that the amount of unsaturated hydrocarbons was nearly 17 per cent. The unsaturated hydrocarbons were constituents of comparatively low vapour tensions; and consequently they were more easily driven out of the gas by compression or by a lowering of the temperature. Therefore, it was to be expected that a gas depending for its heating value on so large a percentage of unsaturated hydrocarbons would not hold its heat units under compression in high-pressure distribution, or under exposure to cold in high or low pressure distribution, nearly as well as coal gas or water gas made according to present practice. The method might find a very profitable field in metallurgical work; but he did not believe it was practicable in competition with the present coal-gas or water-gas manufacture.

Mr. LEA said that, in giving the cost of 22 c. per 1000 cubic feet for raw material, he certainly did not mean to say that 22 c. was the lowest cost reached in practice. The figures were given only to show relative costs under specified conditions. If he wanted to show the cheapest, he would not take oil costing 3½ c. for instance. As to Mr. Unger's criticism, he (Mr. Lea) had based his contentions on the fact that producer gas has a certain value—say, 135 B.Th.U. per cubic foot. Mr. Unger said to burn this gas it was necessary to allow for the amount of heat required in raising the temperature of the gas, together with the air consuming it; and he (Mr. Lea) maintained that was incorrect, because no gas has any given value until one has already made allowance for the raising of the gas and air required in combustion to the temperature of combustion. Consequently, the value of 135 B.Th.U., or whatever other figure was used, would cover the loss that Mr. Unger pointed out. He said, too, that before heat could be transferred from the producer gas to the oil gas, the producer gas must be 100° higher in temperature. The difference in temperature between the heating and the heated gases would, of course, be determined by the relative volume—other things being equal; but it was not possible to say what this difference would be. On the other hand, 1450° would be found higher than was required in many cases. Mr. Unger objected to the assumption of 95 per cent. efficiency in the transformation of oil into gas. The 95 per cent. was based upon the condition that the heat required and the temperature required must be obtained from the accompanying producer gas and produce the combustion; and the difference between the 95 per cent. and the total of 100 per cent. was only the amount of the oil that remained unaccounted for. Mr. Unger compared the figures given in the paper with these found in Mr. Glasgow's paper. He (Mr. Lea) had studied Mr. Glasgow's paper, but had not used Mr. Glasgow's oil figures, since he was not using Mr. Glasgow's oil. He simply specified in his calculation the oil he was using. It was not to be expected that the various steps might be fairly compared in detail with those of water-gas practice, since one process was intermittent and the other continuous.

Installations of Large Gas-Engines.—In the course of a paper on "The Nürnberg Gas-Engine," read by Mr. R. Bechtel before the Birmingham Association of Mechanical Engineers, the author gave a table showing the number of gas-engines of 1000 H.P. and upwards installed throughout the world up to the 15th of August last year. The total is 628, of which 129 were supplied by the Nürnberg Company. The Snow Steam-Pump Company, of Buffalo, come next with 60, and the Allis Chalmers Company, of Milwaukee, follow pretty closely with 46. The statistics tabulated by the author showed that the combined output of these engines is rather more than 1,035,000 B.H.P.

MANCHESTER JUNIOR GAS ASSOCIATION.

Visit to Messrs. W. J. Jenkins and Co.'s Works at Retford and to "The Dukeries."

Members of the above-named Association last Saturday paid a visit to Retford, and after an inspection of the works there of Messrs. W. J. Jenkins and Co., Limited, spent the afternoon in a drive through "The Dukeries," returning home in the evening from Worksop by rail. The party was not a large one, considering the attractive programme; this being due, no doubt, to the difficulty which a great many of the members found in arranging to join up from their respective towns with the main body—the railway facilities from a number of places, including Manchester, leaving much to be desired. At Retford, it was found that 35 of the members had made the journey; those present including Mr. J. Taylor, the President of the Association, several members of the Council, the Hon. Treasurer (Mr. R. H. Garlick), and the Hon. Secretary (Mr. J. Alsop).

The "Beehive" works of Messrs. Jenkins are situate not far from the railway station; and when the party reached them shortly after midday, it was to find the three hundred men and boys at work. Mr. W. J. Jenkins, the Managing-Director of the Company, extended a cordial welcome to the party; and then a tour of the works was made under the guidance of Mr. Jenkins and the following members of his staff: Mr. P. Fishburne (Secretary), Mr. W. Dallis (Outdoor Superintendent), and Mr. R. A. Williams, (Chief Draughtsman). What struck the visitors most in the inspection of the works was the skilful manner in which an old building had been modernized for the purposes of an up-to-date gas engineering firm; the general equipment of the whole place for the efficient and economical turning-out of the work in hand; the extreme orderliness of everything in the different departments; and the seemingly most comfortable conditions under which the men laboured.

The special machines which the firm have for dealing with the "D.B." hot-coke conveyor chain, of which several miles are turned out yearly, were seen at work; but it was in the erecting shop where most of the time was spent. Here were seen stoking machinery and conveyors in various stages of completion; also a retort-house equipment for Japan. A demonstration was given with a large "D.B." charging-machine, constructed for the Alliance and Dublin Consumers' Gas Company. This machine, which is fitted with elevators for taking coal from the floor level, and is arranged to work on settings of ten retorts in five tiers, discharged 10 cwt. of coal into a dummy retort in 25 seconds; the fuel being forced along with tremendous velocity like water from a hose-pipe. It is claimed for the "D.B." machine that the whole operation of charging a retort 20 feet long takes from 20 to 25 seconds only, and it is stated that it may be done more quickly if desired.

At the conclusion of the inspection, the party adjourned to the large drawing office, where light refreshments were served. In this room there hangs a map of the United Kingdom, showing by distinctive marks towns where the firm's machines have been installed, from Alloa in the North to Hastings and St. Leonards in the South; while an accompanying scroll indicates places in the Colonies and abroad from which orders have been received and executed.

It was after two o'clock that the drive to "The Dukeries" was commenced; the route being by Babworth to Edwinstowe, where a halt was made for tea at the Royal Oak Hotel. Prior to the party leaving the dining-room, a few speeches were made.

Mr. W. J. Jenkins, in the course of his remarks, expressed the hope that the members, in their inspection of the Beehive Works had seen something which had interested them—adding that it had been a pleasure to him and to his colleagues to welcome them, and show them round. When he first went to Retford, more than eleven years ago, feeling ran very high on the question whether or not the town should develop on manufacturing lines. For a time there was what he might call the "tall chimney" party and the "residential" party; but to-day he believed there was only one party, and that was the former. Being connected with the gas industry, they at the Beehive Works tried their best to keep down smoke; but he was afraid that at times they broke the rules, because they were not so strictly kept up to the mark as they might be. He referred in complimentary terms to the way in which the affairs of Retford were managed; and he specially mentioned the name of Mr. J. B. Fenwick, the Engineer and Manager of the gas and water works.

Mr. C. E. Teasdale (Salford), in moving a vote of thanks to Messrs. Jenkins and Co. for their courtesy and kindness in showing the members over their establishment, said the outing that day would rank as one of the most successful the Association had had. They were especially indebted to Mr. Jenkins, Mr. Fishburne, Mr. Dallis, and Mr. Williams for showing them over the works, explaining the different processes, and supplying information regarding the work in hand. With the vote, Mr. Teasdale coupled the names of Mr. J. T. Lister, the Assistant Managing-Director of Messrs. Jenkins and Co., and Mr. Fenwick.

Mr. R. H. Gimson (Birkenhead), in seconding the vote, cordially associated himself with the remarks of the mover. He complimented the Council of the Association on having arranged such an excellent programme, and expressed the hope that Retford

might very soon have more tall chimneys, if only at the works of Messrs. Jenkins and Co.

The President, in putting the resolution, expressed his appreciation of the kindness shown by Mr. Jenkins and his assistants; these gentlemen having spared no pains to make the inspection of the works of interest to the members. He added that what they had seen proved that Messrs. Jenkins were one of the foremost gas-engineing firms in the country.

The resolution having been carried with acclamation,

Mr. Jenkins briefly responded on behalf of himself and his firm.

Mr. Fenwick also acknowledged the vote; thanking the mover and seconder of the resolution for having included his name in it. He expressed the hope that the members of the Association had benefited by their visit and by what they had seen. He said he trusted that at some future date they would inspect his "little gas and water works." It was true he had not much to show them; but, as they knew, they could always learn something, even at a small works.

This concluded the proceedings at the hotel. The party then walked to the "Major Oak," and afterwards joined the brakes for the drive to Worksop to take the train for home.

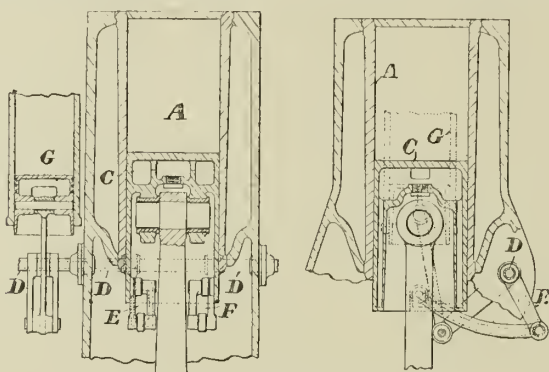
REGISTER OF PATENTS.

Scavenging Gas-Engine Cylinders.

BURSTALL, F. W., of Birmingham University.

No. 10,443; May 14, 1908.

According to this invention, an auxiliary cylinder for providing air under pressure is combined with the hollow rocking-shaft of the engine so as to be operated from the movement of the shaft, to provide a practical method of working the cylinder without any complications in construction. It is said to be preferable to provide the auxiliary air cylinder parallel to the axis of the power cylinder, and to connect the piston to the rocking-shaft by a crank or arm and connecting rod, the axis of the rocking-shaft to be (as usual) parallel to the crank-shaft of the engine. The illustration shows sectional elevations at right angles to each other.



Burstall's Gas-Engine Cylinder Scavenger.

The power cylinder A, the water-cooled piston head C, the hollow rocking-shaft D, and two sets of hollow links coupling the rocking-shaft to the piston (both mechanically and in a water supply sense) E and F, are features well known in engines of this kind, and by themselves form no part of the invention. One side of the shaft D serves for the introduction of cold water through the one set of links, and the other side as an exit for the hot water through the other set of links; one set communicating with the inlet passages to the hollow piston head and the other communicating with the exit passages from the hollow piston head, in the usual well-known manner.

G indicates an auxiliary cylinder for providing air under pressure for scavenging and other purposes—such, for instance, as supplying air to a container to be used in the cylinder as part of an explosive charge. This cylinder is in any convenient way made part of the engine; but it is preferably arranged as indicated, so that its axis is parallel to the axis of the power cylinder. The piston of this auxiliary cylinder is connected with the rocking-shaft D by a connecting rod and cranks or arms, so that, when the shaft moves, a reciprocating motion is imparted to the piston—the throw of the crank and the length of the connecting rod being anything suitable for the purpose.

Rotary Valves of Gas-Engines of the Scavenger Type.

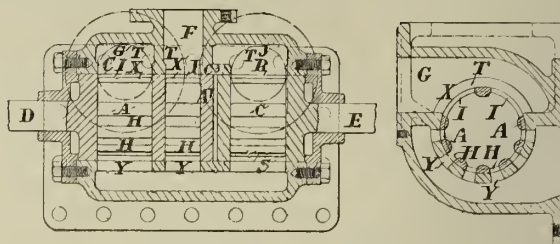
BURSTALL, F. W., of Birmingham University.

No. 10,444; May 14, 1908.

This invention relates to a circular hollow valve for regulating the supply of air and gas to a gas-engine in proportion to the load upon the engine. It is circular in section, and has a number of narrow ports in its lower side parallel to the axis of the valve, and on the upper side wide ports for the admission of air or gas; and it is divided into two parts, separated by a plate, so that air enters into one compartment of the valve and gas the other. The amount of rotation of the valve is so placed under the control of the governor that the quantity of air and gas taken in is proportional to the load. A second valve of precisely similar construction to the gas and air valve, and lying in the same casing, is opened through a definite amount by means of a movement from the half-speed shaft, and not under the control of the governor.

In the longitudinal and transverse sections shown, A is an air and gas

regulating valve, and C is a separate scavenging or air valve—both quite independent, but arranged in the same general casing, which is adapted to communicate on one side with a cylinder or mixing-chamber fed on the other side T with air and gas. Both valves A and C are circular and hollow, and axially in line. The former is partly rotated from the shaft D, which is moved from a suitable governor control mechanism; and the latter from the shaft E, which is moved from a half-speed shaft. The valve A is longitudinally partitioned off, by a



Burstall's Gas-Engine Regulator.

plate, into two chambers, one of which provides an air-chamber, and the other a gas-chamber. The gas-inlet is at F, and the air inlet at G. Each chamber has a number of narrow and wide ports H I through its longitudinal walls, with corresponding wide and narrow ports X Y through the casing, so that there is a free entrance of the gas and air into the interior of the circular hollow valve, but a regulated exit from it to the cylinder or mixing-chamber, by the more or less opening or closing of the narrow ports. The valve C and its casing part are all of precisely similar construction to the valve A; the entrance for the air being at J and the wide and narrow ports at R S.

The working of the two valves in the one casing is as follows: The mixing valve A is rotated from the shaft D and the scavenging valve C from the shaft E—quite independent, but timed to each other. Both valves are shown open to the side of the cylinder; but they are never in this position at the same time. The engine works on the four-stroke cycle; and one valve is always shut when the other is open. Thus during the suction stroke the scavenger valve C is closed, at which time the gas and air valve A is open. When the gas and air valve shuts, the scavenger valve opens, during the exhaust stroke; so that the two valves are never open at the same time. The valve C is rotated through a portion of the arc of a circle by the usual lever actuated by a cam on the half-speed shaft. The valve C opens during the exhaust stroke of the engine in order to clear out the products of combustion—the scavenging air being under pressure; but it may open at any other period except when the valve A is open.

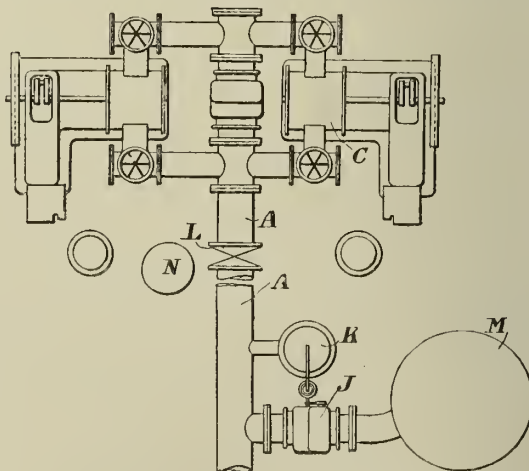
Bye-Passing a Town's Gas-Making Plant.

WALLER, E. B., of Brimscombe, Glos.

No. 10,501; May 14, 1908.

The object of this invention is said to be "to provide an improved bye-passing arrangement of the type in which the pressure in the hydraulic main may be prevented from rising substantially above atmospheric if the exhauster fails, so that excessive leakage of gas into the retort-house may be avoided."

The patentee proposes to provide in a town's gas-making plant, a bye-pass valve controlled by a separate automatic sensitive governor placed between the hydraulic main and the exhauster; this bye-pass valve being opened by the governor to blow-off the gas when a pre-determined pressure is exceeded, and to deliver the gas either into a balanced bell holder or to a chimney shaft. Thus, in the event of one or more of the exhausters failing, the gas produced by the retorts (or, if one exhauster is still in operation, the surplus gas over that with which the exhauster can deal) may be taken off for subsequent collection, or delivered into the atmosphere through a chimney shaft.



Waller's Bye-Passing Arrangement.

As shown, there is placed between the hydraulic main and the exhausters C a bye-pass valve J, in a branch from the pipe A. The valve is controlled by a governor K, influenced by the pressure of gas direct from the hydraulic. The valve preferably blows off at little above atmospheric pressure; and the blow-off may lead either into an over-balanced bell holder M (so as to create the slight vacuum desirable) or else to a chimney shaft; so that, in the event of the main exhauster failing, the gas produced by the retorts may be taken off for subsequent collection, or may be delivered into the atmosphere at a level above the

retort-house until the exhauster is started again, or until the heat from the fires has been diverted from the retorts.

In the event of a breakdown, the governor K and valve J prevent the pressure in the retorts from rising sufficiently to permit of blowing past the seals in the hydraulic main and to cause excessive escape into the retort-house.

A full-bore valve L, operated by a regulating governor N, is preferably connected by a separate pipe to the hydraulic main, although the valve itself is in the main connection A to the exhausting machinery. Consequently, the governor maintains a steady pressure by varying the amount of opening of the valve L.

Treating Sulphate of Ammonia.

ENGLAND, R., of Mark Lane, E.C.

No. 10,781; May 18, 1908.

The ordinary sulphate of ammonia of commerce, the patentee points out, contains free sulphuric acid and moisture in quantities liable to cause injury to packages in which it is stored for transport—particularly when in the form of bags. Furthermore, the presence of the free acid is detrimental when the sulphate is directly applied to the land as a fertilizer. His invention, therefore, to obviate the disadvantages named, comprises a treatment of the ammonium sulphate whereby practically all the free acid is neutralized and a part of the moisture is absorbed; "the resulting product being a salt which is not only more suitable for transport, but is also better fitted for direct use as a fertilizer than the ordinary sulphate of ammonia of commerce."

He proposes to add to ordinary commercial sulphate of ammonia phosphatic material in a dry and fine powdery condition, which can appropriate the free acid and absorb moisture. For instance, any one or more of the following substances may be employed: Dry, finely ground degelatinized bone, calcined bone finely ground, or precipitated or alkaline phosphates. The mixing of the material with the sulphate may be done mechanically or by hand, and at any time after the sulphate is removed from the saturation tank or other plant. Furthermore, the proportions of the material added to the sulphate may vary according to the condition of the salt treated. It is found that 1 per cent. suffices in some cases.

The result is said to be a drier and more neutral salt than the ordinary commercial salt, whereby it is possible "to effect economy in cost of packages for transport and to diminish waste and loss of weight." The free acid may also be utilized economically for rendering the phosphate in the material used more or less soluble—thus "adding to the manurial value of the sulphate, which is, moreover, rendered more suitable for direct application to the land as a fertilizer than the usual commercial salt."

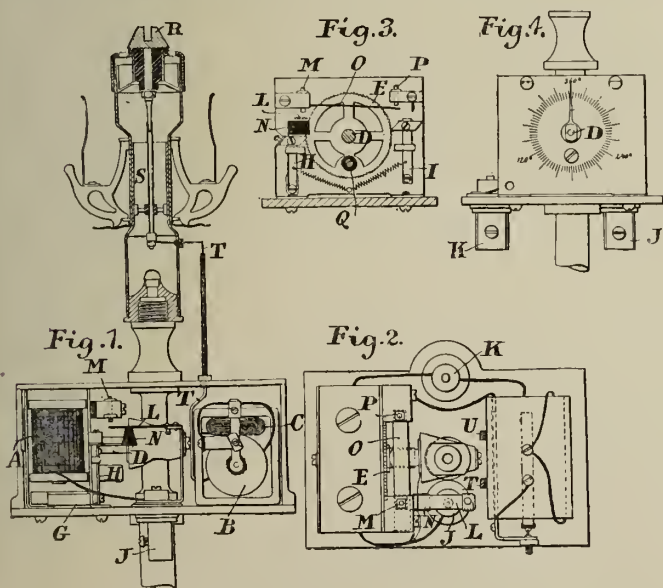
Lighting and Extinguishing Gas-Lamps from a Distance.

GROSSMANN, A., of Rheydt, Germany.

No. 24,925; Nov. 19, 1908.

This invention relates to systems for lighting and extinguishing gas-lamps from a distance, "in which no pilot-burners but spark-gaps are employed for igniting the gas or mixture of air and gas."

In order to avoid contact between the primary circuit of the induction coil and the casing of the mechanism in each gas-lamp, the primary circuit of the induction coil and the circuit of the electro-magnetical device are connected in multiple with the two binding posts; and current is supplied to the spark-gap through a special insulated conductor forming part of the secondary circuit. There are means for closing the primary circuit of the induction coil only during the period in which the sparks are required for igniting the gas—that is, during the opening of the gas-cock or valve, so that afterwards the primary circuit is automatically opened.



Grossmann's Lamp Lighter and Extinguisher.

Fig. 1 is an elevation of an incandescent gas-lamp with an electro-magnetic device and induction coil; the burner with the spark-gap being shown in section. Fig. 2 is a plan of same; the burner and

a bridge over the electro-magnetic device and induction coil being omitted. Fig. 3 is a vertical section through fig. 2. Fig. 4 is an elevation of the parts shown in fig. 2, when looked at in the direction from left to right.

The example shown is a gas-lamp with a single burner. Between the gas inlet tube and gas-cock is a casing with two electro-magnets A and an induction coil B and a condenser C. A shaft D is mounted to turn in the casing, and is so coupled with the plug of the gas-cock as to take it along with it on being turned. The shaft carries on its inner end a large ratchet-wheel E, and on its outer end an indicator moving over a scale F, and indicating thereby the angle in degrees. The armature G is assumed to be pivoted in the casing and provided on its free end with a projection, which passes through a slot and carries a vertical rod H pivoted to it. The upper part of the rod is bent, and carries a pawl and a pusher of insulating material. The pawl engages the teeth of the ratchet-wheel E, and the rod H is pressed towards it by a helical spring. Another rod I, pivoted to the casing, carries a pawl engaging the ratchet-wheel E, and is pressed towards the latter by a helical spring.

It will be understood that the ratchet-wheel E can be turned only in one direction, and that the electro-magnets A, on being energized, will attract their armature G, so that one pawl will feed the ratchet-wheel one tooth forward, while the other pawl rides over the back of the respective tooth until it engages in the following space. On the electro-magnets becoming without current, the armature will, by reason of its weight, drop, so that the first-named pawl rides over the back of the respective tooth until it engages in the following space; the ratchet-wheel E being during this period prevented from moving by the other pawl.

The circuit of the electro-magnets A and the primary circuit of the induction coil B are connected in multiple with the two binding posts J K. The first cut-out L M can be closed by the pusher N on the electro-magnets being energized. The second cut-out O P can be closed in the following manner: The ratchet-wheel E carries insulated from it a roller; and during the rotation of the ratchet-wheel through an angle of (say) 30° or 40° the roller Q presses the contact spring against the contact screw while bending the former. As long as the second cut-out is in its normal position, any impulse entering the binding post J will only pass through the circuit of the electro-magnets to the other binding post K. Then the energized electro-magnets will attract their armature G and feed the ratchet-wheel E one tooth forward; at the same time the pusher N connected with the rod H will push the contact spring against the contact screw M—in other words, it will close the first cut-out. However, the primary circuit will not be thereby closed, as the second cut-out is still open. When the impulse ceases, the electro-magnets, becoming without current, release their armature G. Obviously a number of impulses equal to the number of the teeth of the ratchet-wheel requires to be sent through the electro-magnets for feeding the ratchet-wheel forward tooth for tooth until it completes one revolution. When the roller Q closes the second cut-out, each impulse will first energize the electro-magnets and close, by their armature and the parts H N, the first cut-out, whereupon a part of the impulse passes through the primary circuit now closed by the two cut-outs for operating the induction coil B.

The secondary circuit of the induction coil is constructed as follows: Two parallel vertical rods fastened on the outside of the casing and insulated are connected with the two ends of the secondary winding of the induction coil. A metallic disc R fastened on the burner is insulated from it—resting on an annular piece of soapstone and with its shank terminating in a tapering point which is in electrical contact with a metallic tube S, the lower end of which is electrically connected with the rod T by a line. The disc R forms one terminal of a spark-gap, the other terminal of which is formed by a tube electrically connected with the other rod U. During the passage of an impulse through the primary circuit, sparks will be produced between the two terminals and serve for igniting the gas as it passes upwards.

The electro-magnetic device described is substantially the same for every gas-lamp comprised in the system—no matter whether it has only one or several burners; but certain modifications of the device in the latter case will be required. The gas-cocks and their plugs will have to be varied in construction in accordance with the points of time at which the gas is to be lighted and the light extinguished.

APPLICATIONS FOR LETTERS PATENT.

- 12,714.—BIRCH, G., DUDLEY, S., and DOXEY, A. S., "Bunsen burners." May 29.
 12,740.—CROSSLEY, K. & I., and REEVES, A. W., "Internal-combustion engines." May 29.
 12,742.—GEARINS, A. D., FULLWOOD, W. B., and BOUCHER, P. J., "Manufacture of coke and gas, the construction of gas-retorts, and recovery of bye-products." May 29.
 12,755.—ROBIN, J. I., "Mantles." May 29.
 12,770.—DOLPHIN, A. R., "Generating gas for power." May 29.
 12,785.—FOUCAR, J. L., "Fuel for gas-fires." June 1.
 12,938.—WHITE, T. W., "Jointing of pipes." June 2.
 12,940.—GÖRITZ, F., "Water-cooled gas cut-off valve." June 2.
 12,946.—GIBB, A. L. S., "Meter for fluids." June 2.
 12,991.—CONTI, A., and GALLI, A., "Automatic kindling and extinction of gas-lamps." June 2.
 13,026.—CLIMIE, W., "Gas-producers." June 3.
 13,048.—POTTER, W. G., "Water-main for supplying tap water to the public and motive power for driving purposes." June 3.
 13,049.—POTTER, W. G., "Water-meters." June 3.
 13,058.—GUNNING, J., "Inverted gas-lamps." June 3.
 13,130.—WOLF, O., BAMBUKY, N. F., and BERNARDY, E., "Mixing and supplying air and gas." June 4.
 13,152.—JEFFERY, H., "Self-fitting split double collar or clip for repairs to mains and pipes." June 4.
 13,186.—PALATINE ENGINEERING CO., LTD., BLAKESTON, R., and ANTHONY, T. E., "Liquid meters." June 5.
 13,226.—STANSELL, R. A., "Acetylene generators." June 5.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Young-Glover-West Process.

SIR,—In the discussion which followed Mr. Thomas Glover's paper read before the Institution of Gas Engineers in 1906, I said that I did not consider that the mere preparation of a paper and the making of drawings was sufficient to justify the claims made for the hypothetical Young and Glover process. When the process was in operation, we should be in a much better position to consider and discuss it.

Three years have elapsed since then; but the articles now published in your issue of June 8 furnish the fullest justification for my remarks in 1906, as it is now clear that every original claim of the Young and Glover process has been abandoned.

What is not made clear, however, is that the system as now worked, and which has apparently met with some measure of success, is the Woodall-Duckham system pure and simple.

Bournemouth, June 12, 1909.

H. W. WOODALL.

[In view of the importance attaching to (particularly the last paragraph of) the above letter, and in view, too, of the discussions on carbonizing at the meeting of the Institution this week, it was considered only fair to Messrs. Glover and West that they should have an opportunity of publishing a reply simultaneously with Mr. Woodall's letter. A copy of the letter was therefore forwarded to them; and we are, as the result, requested to publish the following answer.]

SIR,—Referring to Mr. H. W. Woodall's letter, we cannot allow the conclusions he has arrived at to go unchallenged.

The system of vertical retorts in operation at St. Helens is the outcome of the Young and Glover patent, and the system of continuous carbonization perfected by the late Mr. Young years before the Woodall-Duckham methods were developed.

Further the main features of the Glover and West system—included in which are the method of feeding the retorts by gravitation, the method of heating, and the method of discharging the coke, all of which are a great success and are also covered by patents—are absolutely and entirely different from the Woodall-Duckham system.

It is not, however, our intention to discuss, or elaborate upon, the matter in the Technical Press. Suffice it to say, we repudiate entirely Mr. Woodall's unjustifiable and erroneous assertion at the conclusion of his letter; and if the patentees of the Woodall-Duckham system imagine that their rights are in any way affected, we are quite prepared to defend our interests in the proper quarter.

June 14, 1909.

JOHN WEST
SAMUEL GLOVER.

Vertical Retort Patents.

SIR,—From the almost weekly records in the "JOURNAL," it would appear that one has only got to launch out with a good invention, and a valuable patent, and then at once lose sight of the eighth and tenth Commandments. The protection for a prior patent obtained, the infringer entirely ignores.

Messrs. Settle and Padfield, the pioneers of the vertical retort system as now practised, were granted their patent for England on June 2, 1902, for Germany on June 3, 1903, for France on May 20, 1903, and for the United States on May 25, 1903, with fifteen other patents in other countries and colonies by May, 1904. One of the most eminent Counsel on Patent Laws—at the time—was engaged to give an opinion upon the Settle-Padfield patent. An extract from Counsel's opinion runs as follows: "This being so, I am of opinion that the letters patent are valid, and would be supported by a Court of Law."

Such an opinion, of course—without litigation for rights of patent—cannot benefit the "first and true inventor," which is the strong point the infringer invariably works upon, in first satisfying himself that the true inventor has not got the money strength to fight for what is already his own. Consequently infringements such as we see daily, almost, go ahead unmolested.

June, 1909.

T. SETTLE.

Mr. J. H. Brown and Vertical Retorts.

SIR,—In the report of the Gas Committee of the Corporation of Nottingham, a copy of which appeared in your issue of the 8th inst., there occurs the following paragraph with reference to the Dessau vertical retorts:—

"Unfortunately, by this system, considerable difficulty is experienced in producing gas of sufficiently high illuminating power to comply with the standard to which your Committee are now working."

As the Corporation of Nottingham are not working to any unusually high standard of illuminating power (for this country), the paragraph would naturally lead any gas engineer to suppose that the Dessau system does not lend itself to the production of (say) 16-candle power gas.

I shall be much obliged if you will kindly let me state that the paragraph in question can only be based upon certain tests which the Nottingham people carried out at Dessau in April and May of last year. These tests were not satisfactory as regards illuminating power; but as I have already pointed out to Mr. Brown, and as he himself practically admitted in the course of the discussion on Mr. Hayman's paper at the last meeting of the Institution of Gas Engineers, the conditions were such as to injuriously affect the result.

Further, in fairness to the Dessau Company, I would like to state that throughout the whole of the correspondence which I had with

Mr. Brown subsequent to the results of the tests being known—extending over some five months—this point was never raised; and although the Dessau people were asked to tender for an installation, no guarantee was ever asked for with regard to illuminating power. Had any such guarantee been asked for, there would have been no difficulty in meeting the Nottingham Corporation in the same way as the Sunderland Gas Company were met upon the same point.

Victoria Street, S.W., June 12, 1909.

CHARLES HUNT.

The Relative Costs of Gas and Electricity.

SIR,—I have noted your reply to my letter published in your last issue.

The calculations you give in your reply are, of course, very interesting and very theoretical; but I entirely fail to see how you can expect to refute actual results by mere hypothetical figures. We have many cases here where electricity has proved to be cheaper than gas for lighting purposes; the illumination given being, in the consumers' opinion, quite as good, and in the majority of cases better, with electricity than with gas. After all, he is the man both the Gas Company and this Department have to serve and satisfy; and no amount of contentious letter-writing in the "JOURNAL OF GAS LIGHTING" will alter his opinion.

Regarding the particular case to which I referred in my last letter, you say that there must be some other explanation than "electricity is cheaper than gas" for the big discrepancy in cost in favour of electricity. I note, however, that even your inventive powers are apparently at a loss to suggest one. To my mind, the explanation of the whole business is that the figures given in your paper and by the gas companies for the consumption in cubic feet per hour for the different burners are not, and never have been, obtained in ordinary practice; and that the cases I have quoted to you bear out my opinion, you can but admit.

H. H. HOLMES, Sales Manager,
West Ham Corporation Electricity Department.

June 9, 1909.

[Our correspondent possesses among his gifts the one of being able to by-pass unflinchingly all awkward points; and he thinks it sufficient to bury calculations that cannot be refuted beneath the weight of such terms as "theoretical" and "hypothetical." This is an interesting characteristic; but it is not a convincing one in its application. Now permit us to say, Mr. Holmes, that there was not a single theoretical or hypothetical calculation submitted in our reply last week. We are constantly realizing those figures in ordinary practice, and, to our own knowledge, so are many other consumers who use gas in a manner that will give them the greatest amount of illumination for the money expended. Mr. Holmes's expressions will not fit a condition of things that actually exists—perhaps not in his mind, but in many other homes with which we have personal acquaintance, otherwise than from the reports of gas inspectors. If he will only look for it, the evidence of a widespread practical experience as to what gas is doing day by day is at his command. But, we ask him, which of the figures quoted last week, he believes are theoretical and hypothetical? Is the calculation of 800 candle-hours per unit of electricity used with the Osram metallic filament lamp? We think not; for it is a figure proved by practical experience and photometrically. Beyond it with a unit of electricity it is impossible to go in ordinary practice; beyond 8800 candle-hours for 2s. 9d. worth of electricity in West Ham it is impossible to go. Is there anything theoretical so far? Up to 20,000 candle-hours with 2s. 8d. worth of gas it is possible to go. And the man is foolish who does not use proper burners, and give them a moderate amount of attention, to get that efficiency. Does Mr. Holmes say this possibility does not exist in gas? If so, we shall be pleased to arrange to show him the contrary with ordinary burners, if he will permit us to publish his testimonial to the effect that he is satisfied. If it exists, it is neither theoretical nor hypothetical. Our correspondent says that, to his mind, the figures given in the "JOURNAL" and by gas companies for the consumption in cubic feet per hour with the different burners are not, and never have been, obtained in ordinary practice. Mr. Holmes is as one who sits in darkness. He harbours disbelief—in his mind; but he does not go to any trouble to confirm himself in it, beyond the bare assertions of certain users (but laymen in the science) of artificial lighting. We should like an opportunity of getting him on a photometrical test with ordinary burners and mantles; so as to do something towards having a part, if not all, of these cobwebby disbeliefs cleared from his mind. Mr. Holmes does not grasp with avidity, and deal with, the fact that, if these consumers are getting "the same illumination, and in the majority of cases better, with electricity than with gas" used in incandescent burners, he has to defend the absurd illuminating efficiency of between 2 and 3 candles per cubic foot of gas consumed. Mr. Holmes is most careful not to show any disposition to be seen attempting anything so idiotic as the defence of this point, which is important as following from the general statement. Consumers who say it is a fact they get quite as good, and in the majority of cases better, illumination (for, we presume, equal expenditure) with electricity than with gas, accuse themselves of lamentable negligence and wastefulness; and their testimony is not of the slightest value. We have made inquiries as to the accuracy of the figures as to gas quoted by the consumer whose testimonial Mr. Holmes included in his letter

last week; and the gas figures are correct. The consumption for the past nine quarters by this consumer has been as follows:

1907: Ladyday, 15,400 cubic feet; Midsummer, 12,000 cubic feet; Michaelmas, 9000 cubic feet; Christmas, 15,800 cubic feet.

1908: Ladyday, 15,400 cubic feet; Midsummer, 8,400 cubic feet; Michaelmas, 4500 cubic feet; Christmas, 900 cubic feet.

1909: Ladyday, 1200 cubic feet.

So that he has not forsaken gas altogether; and his consumptions before using electricity show rather variable effects—for example, between the two summer quarters of 1907; and between the midsummer quarters of 1908 and 1907. The electric lamps were put in in August, 1908. This point indicates that the consumer did not exercise any great control over his gas lighting. On investigation, we find that he did complain early in 1908 that he had a big escape of gas in the house on his private fittings, but to what extent cannot now be traced. The house it is also seen is at least a ten-roomed one; so that the gas account for the winter half year would not appear to have been anything very excessive. The whole of the house was lighted with incandescent burners, upright and inverted, which the consumer maintained personally. He does not appear to be particularly well disposed towards the Gas Company. Just as thousands of the householders in West Ham are favourable to gas, this particular one is favourable to electricity. His average weekly gas consumption in the winter quarters of 1907-8 was about 1200 cubic feet; his electricity consumption an average of 4·3 units! We assert that an average of 4·3 units of electricity for seven days' lighting in a ten-roomed house in the darkest months of the year, will not give anything like the same illuminating power as an average of 1200 cubic feet of gas. Mr. Holmes cannot deny that at most, with 4·3 units of electricity, 3466 candle-hours can be obtained; and that it is possible to get 24,000 candle-hours with 1200 cubic feet of gas, if good inverted burners are used. The consumer is deceiving himself and the easily satisfied Mr. Holmes; or the only possible, and then only partial, explanation is that the consumer's burners were allowed to get in a most deplorable condition, that he used his gas-burners to a larger extent and for more hours than electricity, and that he exercised no control over them.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills reported, with amendments: Blackwood Gas Bill, Bungay Water Bill [Lords].

The Bill of the Gaslight and Coke Company was set down by order for the third reading stage at the commencement of private business last Tuesday; but, Mr. W. Thorne again formally objecting, its consideration was further postponed until the 17th inst.

Last Thursday, Captain Clive asked the President of the Local Government Board if his attention had been called to the resolutions passed by several Boards of Guardians in London protesting against the action of the Metropolitan Water Board in granting to their Chairman an annual salary of £500 for the purpose of defraying the expenses of the official hospitality of the Board; and if he would use all the influence and the powers he possesses to prevent it. Mr. Burns, in reply, informed the gallant member that sub-section 4 of section 1 of the Metropolis Water Act, 1902, empowers the Board to pay a salary to their Chairman, and said it was in the exercise of this power that the Board had recently voted a salary. He added that he understood a certain number of Boards of Guardians had passed resolutions to the effect stated in the question; but they had not been brought under his notice, and he had no authority to interfere in the matter.

The Earl of Dudley has withdrawn his petition against the South Staffordshire Water-Works Bill, the promoters of which have petitioned against the Stourbridge and District Water Board Bill; and the Dublin Port and Docks Board have petitioned against alterations in the Alliance and Dublin Consumers' Gas Bill.

PRESTATYN URBAN DISTRICT COUNCIL BILL.

Local Legislation Committee.—Tuesday, June 8.

(Before Sir FRANCIS LAYLAND-BARRATT, Chairman, Mr. ERNEST GARDNER, Mr. COOPER, Mr. HARRISON BROADLEY, and Mr. MANFIELD.)

Authority is sought in this Bill to transfer the undertaking of the Prestatyn Gas Company to the Prestatyn Urban District Council, to confer upon the Council further powers in relation to the supply of gas and water, and for other purposes.

Mr. WEDDERBURN, K.C., and Mr. F. N. KEEN appeared for the Urban District Council. The Hon. J. D. FITZGERALD, K.C., Mr. RAYMOND ASQUITH, and Mr. RABAGLIATI represented Lady M'Laren; Mr. JOSEPH SHAW, the Ecclesiastical Commissioners; and Mr. J. B. ASPINALL, the Earl of Plymouth. Mr. BOYCE (Local Government Board) was also present.

Mr. WEDDERBURN, in opening the case for the promoters, said this was an omnibus Bill. By Part 2 it proposed to transfer the gas under-

taking to the Urban District Council, and Part 3 dealt with certain powers as to the supply of gas which would be consequent upon the transfer. Part 4 had reference to the increased water supply. Prestatyn was a seaside resort in North Wales, with a promising future before it. The gas limits were beyond Prestatyn itself, and consisted of Prestatyn, Dyserth, and Meliden. There was a population of some 2650. The gas undertaking originally started in 1892, in which year the Lord of the Manor (Mr. Pochin) obtained a Provisional Order enabling him to carry on a private gas undertaking. In 1881, a similar Order was obtained in regard to water; but the undertaking was transferred to the Urban District Council in 1901. The case of the promoters now was that the Council found it essential that the gas undertaking should also be under their control. Both the works of the Gas Company, and the management of them, were unsatisfactory. The Company had come to the end of their tether; and it was admitted that, in order to carry on the undertaking, there must be enlargements and extensions. The money necessary for these could be raised on better terms by the Local Authority than by an individual. As Lady M'Laren had parted with the water undertaking, there was less reason for her to object now, as to any estate she still retained there, to parting with the gas undertaking than there was to parting with the water undertaking, because water was more important to the development of the estate. The Local Government Board suggested that Prestatyn was a small authority; but there were many other smaller authorities who successfully owned gas-works. They had had some little difficulty in obtaining information; and when they first asked for an inspection of the works, they were refused. When, ultimately, they were allowed to inspect them, the whole place had had a coat of paint, and had been made to look better than it otherwise would have done. The accounts had never been deposited with the Clerk of the Peace, as was required by the Gas-Works Clauses Act, 1871. Some accounts had now been furnished to the Council; but they were incomplete, and disagreed. Then there had never been any testing apparatus, and they had been unable to test for illuminating power. The maximum daily output was 26,000 cubic feet. The works were sufficient, with the exception of the scrubber, which was only equal to about 10,000 feet, which might account for the amount of ammonia which passed with the gas. Complaints as to the quality of the gas had been received both with regard to private and public lighting. At the ratepayers meeting for the Bill, Lady M'Laren's Manager was present, and even he complained of the shockingly bad light. The quality was bad, the smell offensive, and the gas dirty. It choked the burners with a sort of tarry substance, and they had to be constantly cleaned or renewed. The pressure was bad and irregular, and the light altogether was most unsatisfactory. There had been complaints with regard to the laying of the mains in the streets. The capital expenditure per million cubic feet sold was about £1400; whereas it ought not to exceed £1000. The leakage was about 13 per cent., instead of being about 6 per cent. for a district of this character. The carbonization results were altogether unsatisfactory; the average being 9089 feet per ton. The works were in the hands of an amateur, except so far as he had gained experience from the works. The Council approached Lady M'Laren with a view to purchasing the gas undertaking; but she was not willing to dispose of it. It was necessary to apply for further capital powers; and her ladyship had gone for a Provisional Order.

The CHAIRMAN: And the Provisional Order was referred to us; so that the Committee should consider the Bill.

Mr. WEDDERBURN: Yes; so that practically you have before you two competing Bills in this sense, that you would not pass one if you passed the other.

Mr. FITZGERALD said he appeared on the Provisional Order. He would hardly call the two measures competing Bills. There was no question at all that further capital was required. The only question was whether compulsory powers of purchase should be given to the Council.

The CHAIRMAN: Yes. If the Committee refuse to give the compulsory powers to purchase, I do not think there is any objection to increasing the capital to improve the gas-works.

Mr. WEDDERBURN went on to say that the Provisional Order was made after their Bill was deposited. The further capital was to be £5000, and the borrowing powers £1250. Lady M'Laren had no interest except a financial one; and if the Council bought the undertaking on arbitration terms, it could not be said she was damaged in any way. She ought not to suffer one penny of loss. Under the Order there was provision for a 7 per cent. dividend upon new capital expended and 5 per cent. upon borrowed money. There were no auction clauses; so that the position apparently which was contemplated was that on every £100 raised, Lady M'Laren should be entitled to 7 per cent. No Committee would give a company such a position. Again, if there were no auction clauses, no doubt the money would be raised to return about 4½ per cent. In her ladyship's petition against the Bill, she strongly objected to be obliged to sell the undertaking and to the compulsory purchase of the lands which would interfere with her building schemes.

Mr. John Hughes, the Clerk to the Urban District Council, said the gas supplied was dirty, and the fittings got clogged and required frequent cleaning. He had no written complaints; but he had received several verbal complaints that the gas was poor. The agreed purchase price of the water undertaking was £7500. It was not quite paying at the present time.

Mr. T. J. Scott said that, as a member of the Council, he had heard complaints that the gas was most unsatisfactory. He thought it would be to the advantage of the town if the works were under the control of the Local Authority. The price of gas in the past 17 years had been reduced by 6d.

Mr. C. Roberts, surveyor, said he had had cause to complain of the bad quality of the gas, and also of the insufficient depth at which the mains were laid. The public lighting was bad; and in November, 1907, complaints were pretty general.

Mr. F. Wilkinson, the Surveyor to the Urban District Council, said he had had to make complaints in regard to the breaking up of the roads by the Company, and in some cases when a road had recently been repaired.

Mr. E. H. Stevenson gave evidence in support of the Bill. He stated

that when he first asked to inspect the works he was refused permission until the Company's Engineer was present. He examined the gas as far as he was able. In the Council's offices he undid one of the burners, and he had never smelt such foul gas. He put a piece of paper against the burner, and he could actually see the gas coming out. On his second visit to the works, the gas was as pleasant smelling as it could be after purification. The retorts were capable of dealing with 55,000 or 60,000 cubic feet per day; the condensers could deal with about 100,000 feet; the purifiers were large enough for the present requirements; but there was only one small scrubber. That the gas had been so foul was clearly the result of carelessness. There were two gasholders. Considering the various features of the works, they were almost larger than the present demand needed. There had been some difficulty in getting the Company's accounts; but those supplied showed the capital to be £6613, which had all been expended. The quantity of gas sold was 4,486,000 cubic feet a year; and the capital expenditure represented £1400 per million cubic feet sold, which he considered a high figure. The quantity of gas made was 5,170,000 feet; the quantity accounted for being 4,511,000 feet. This showed a leakage of 13 per cent.; whereas it ought to have been only 6 per cent. There had been bad management in the carbonizing department. On the works there was no gas-testing apparatus; whereas it was a statutory obligation that there should be. Considering the amount of gas produced per ton of coal, he thought the gas supplied was of 15-candle power; but it was impossible to say definitely in the absence of any testing apparatus. He did not see any reason why the undertaking should not be a profitable one; and the price of gas might be reduced. Something over £400 was the profit made last year; and the output of gas was likely to increase. Where a gas company had been in default in the conduct of their undertaking, so far as he knew Parliament had never refused a local authority power to purchase. In almost every instance where the local authority had control of the gas undertaking, the consumer as well as the local authority had benefited, and the shareholders, as a rule, had been thoroughly satisfied with the amount they had received by arbitration.

Replying to Mr. FITZGERALD, witness said he did not think the price charged for gas was unreasonably high, considering the size of the undertaking.

Re-examined by Mr. WEDDERBURN, witness said that on the water undertaking there had been a deficit of £70 a year; but that was being paid off. In Prestatyn, the price for gas in slot-meters was 5s. per 1000 cubic feet. The price for ordinary lighting was 4s. 6d.; but this was reduced to 4s. if the consumer took gas for cooking as well. There had been no testing apparatus provided on the works. The Council had a remedy for the supply of bad gas; but it had to be proved.

Mr. J. C. Belton, the Engineer of the Chester United Gas Company, said he was appointed Gas Examiner to the Prestatyn Urban District Council. When he examined the works, he found there was no testing apparatus, and the purifier had not been changed—the reason apparently being that the works had been left in charge of a stoker. The gas had been insufficiently scrubbed. The make of gas per ton was exceedingly low; while the consumption of coke on the premises was very high indeed. With careful management the result would be different; and he believed that they would produce a better article at a much less cost of production.

Replying to Mr. FITZGERALD, witness said that, with regard to the suggestion that local authority management of gas-works was better than company management, it depended upon the kind of company. He agreed that Sheffield and Plymouth were the best managed undertakings in the country, and they were in the hands of Companies.

Mr. L. Hall, the Engineer and Manager of the gas and water undertaking of the Rhyl Urban District Council, said that, on the average of the five years ended Dec. 31, 1908, the quantity of gas produced per ton of coal carbonized was 9060 cubic feet. During the same period the quantity of coke sold per ton of coal carbonized was 4.61 cwt. These figures pointed to very indifferent management. The least quantity of gas produced per ton of coal should have been 10,000 cubic feet, and the least amount of coke sales per ton of coal should have been 9 or 10 cwt. There had been no loss as a result of the purchase of the gas undertaking by the Rhyl Urban District Council. The price of gas had been lowered and the consumption considerably increased. Good profits had resulted during the past six years; the total being £8174. The profit for 1907 was £1813. If the management were as good at Prestatyn as at Rhyl, there would be no fear of a loss.

Mr. Wm. B. Keen, chartered accountant, said he had examined the accounts which had been supplied by the Company; but they were not satisfactory or full. They did not even include a balance-sheet, to show the exact financial position of the undertaking.

Mr. J. Banks, a member of the Council, said he had had to complain of the quality and pressure of the gas. The illuminating power had frequently been poor, and the gas was very dirty. The taps became stiff as a result of the ammonia in the gas.

Further similar evidence was given—one witness describing the gas as "lurid glare, yellowish red."

This closed the case for the promoters.

Mr. FITZGERALD then called

Sir Chas. M'Laren, who gave evidence in support of the case of Lady M'Laren. He said that the people might have been injured if they had tried to make a profit out of the concern, and they had tried to work as economically as possible. When the Council took over the water-works, there was an increase in the rates; and there would be just the same sort of thing again if they acquired the gas undertaking. He was aware that Lady M'Laren was in receipt of a good percentage; but it was only now, after 17 years, that she was getting any benefit. Her ladyship had stood the racket for all the time, and it should not be taken away from her. His interests, and those of Lady M'Laren, were for the good of Prestatyn; and if he thought that the sale of the gas-works would be to the benefit of the place, he would do it.

Mr. H. D. M'Laren, M.P., gave further evidence of a similar nature. He said that if her ladyship obtained the Provisional Order the works would be brought entirely up to date.

Mr. William Cash, chartered accountant, said he had examined the estate books of Lady M'Laren with regard to the gas undertaking. For the past year the profits amounted to £445. In this, as was the

case in undertakings carried on by a single individual, there had been no formation of share capital. The money had been found in the first instance by Mr. Pochin, and afterwards by Lady M'Laren. The quantity of gas made had largely increased between 1904 and 1908; and the consumers had increased in five years from 120 to 159. If this increase were continued, the undertaking would become a very profitable one. Under the Provisional Order, it was proposed to take an additional £5000 of share capital and £1250 borrowing powers, thereby doubling the existing capital and borrowing powers. With the increased capital the undertaking could be carried on for about ten years. In a business growing as this was, there would undoubtedly be some claim for prospective profit, and so on. He thought it was unfair, in a sense, that the proprietor who had borne the burden of the undertaking from the start should be deprived of the business at a time when it was becoming a paying concern. He did not see that there would be any material advantage to the consumer if the undertaking were transferred to the Council.

Replying to Mr. WEDDERBURN, witness said that the gas accounts were kept with the estate accounts in separate columns; but it would not be right to say that the absence of statutory accounts constituted a disadvantage to the consumer. He agreed that the accounts now supplied to the Committee differed from those which were supplied to the promoters. An undertaking of this kind was under the ordinary statutory regulations in regard to gas; but being a private concern, they were not under the same regulations as limited liability companies or even statutory companies. They were under the same liability to the public.

Mr. Henry Woodall (Messrs. Corbet Woodall and Son) said that, having regard to the quality of coal used at the works, the illuminating power of the gas produced would probably be between 17 and 18 candles. The complaints which had been referred to did not arise from the quality of the gas manufactured. If they had a rich gas of this kind, carbon might be deposited on mantles, on account of the air adjustment being badly arranged. If the mantles were properly arranged, there would be no blackening of them. With regard to the burners being in bad condition, it was probably due to the fact that, Prestatyn being a holiday resort, the people might use the burners for three months of the year, and for the other nine months they were not lighted. The staff employed was sufficient and capable of doing the work. The results obtained were quite good; and there was really no justification for the statement that the works were in a bad condition. The price charged for gas was a reasonable one for works of this size, and was lower than the price charged by any company of a similar nature within a radius of 20 miles.

Mr. FITZGERALD agreed that the installation of testing apparatus was a statutory obligation; and he was authorized to state that such apparatus would be provided.

Replying to Mr. WEDDERBURN, witness said he thought default was a good reason for transfer.

Mr. James B. Linnell, J.P. (a member of the Urban District Council and Agent to Lady M'Laren), said that when he had complaint made to him of the unsatisfactory light, it was found that the burners were in a dirty condition. After they had been cleaned, the light was greatly improved. He suggested that the reason why so many members of the District Council supported the case was their desire to pay a visit to London.

Mr. FITZGERALD, in addressing the Committee, said there had been a sort of suggestion running through the whole of Mr. Wedderburn's speech that there was some sort of parliamentary principle or practice that if a local authority wanted a gas undertaking it was entitled to take it, as if the onus was thrown upon the undertakers to show some reason why the concern should not be transferred. There had been a number of transfers of gas undertakings to local authorities; but in the great majority of cases the transfers had been made by consent. Where compulsory transfers had taken place, they had generally been non-statutory companies; and in the comparatively few instances where statutory undertakings had been compulsorily transferred, it had invariably been in special cases. With regard to the complaints that had been referred to, he pointed out that, unless flat-flame burners were carefully looked after, a bad light would probably result. With regard to the absence of a testing-station, he agreed that the terms of the Act had not been complied with; but the Local Authority were in a position to demand the appointment of a gas examiner, and the consumers also could have one appointed. But an examiner had not been asked for at all. The undertaking compared favourably with any company in the adjoining counties; and this was a sufficient answer to all the complaints that had been made. Lady M'Laren had taken nothing out of the concern. She had provided money whenever it was wanted; and her endeavour had been to keep the expenditure low, so as to enable the gas to be sold cheaply. He admitted that the accounts had not been supplied in accordance with the Act of 1871; but the matter had been overlooked, and in the future it would have proper attention.

Mr. WEDDERBURN, replying on behalf of the promoters, held that where a gas company were in default or had come to the end of their tether, there was sufficient ground for the transfer being made to the local authority. The transfer was asked for by the people of Prestatyn; and they knew very well, remembering the Water Bill, what the expenditure would be. The costs of the Water Bill had been paid off; and now the ratepayers were willing that the gas undertaking should be in the hands of the Council.

After a private discussion,

The Committee decided that the Urban District Council were to be granted the compulsory powers to purchase; but with regard to the preamble of the Bill, they considered that the words "whereas the works are in a bad condition" should not appear.

Mr. FITZGERALD asked that the Provisional Order promoted by Lady M'Laren should be allowed to proceed pending the final decision on the Prestatyn Bill; so that if the gas portion of the Bill were rejected in the other House, there would be someone left in a position to give the gas supply and carry on the undertaking.

The CHAIRMAN said he did not see how the Committee could authorize two authorities to do the same thing.

Mr. WEDDERBURN said there was no precedent for such a procedure;

and if what Mr. Fitzgerald asked were done, it would encourage opposition elsewhere.

The CHAIRMAN said the Committee had no course open to them but to declare the preamble of the Provisional Order not proved.

Other portions of the Bill will be proceeded with to-day.

BLACKWOOD GAS BILL.

This Bill, for incorporating and conferring further powers upon the Blackwood Gas Company and for other purposes, came before the Unopposed Bills Committee of the House of Commons on Thursday last—Mr. EMMOTT, Chairman of Ways and Means, presiding.

Mr. LEES (Messrs. Lees and Co., Parliamentary Agents for the promoters) stated that the Bill was to incorporate as a statutory concern a Company that had been carrying on business under the Joint-Stock Acts since 1890. It was registered in that year to supply gas to two urban districts in the county of Monmouth. In 1891, there was a proposal to give statutory powers to another company to supply an area, including the Blackwood district. The present promoters opposed, with the result that a clause was inserted protecting the area to them. The issued capital raised at present was £7200. The Company paid a dividend of 3 per cent. each year up to 1901, afterwards 4 and 4½ per cent., and last year 5 per cent. The present measure asked for a total capital of £30,000, of which £22,500 was additional capital to be raised under the Bill. In reply to the Chairman, he added that the present charge for gas was 5s. per 1000 cubic feet within a mile of the works, and 5s. 6d. beyond. The Company could not increase the price; but they believed that with the existing population of the district they would be able to reduce it.

The Surveyor to the Company gave evidence, in the course of which he said that the production of gas was 5 million cubic feet, and with the new works it was estimated that in twelve years it would be 40 millions.

The CHAIRMAN inquired what the shares of the Company had changed hands at recently?

Mr. LEES: At par.

The Committee passed the preamble.

LEGAL INTELLIGENCE.

Action against the New Toddington Gas Company.

One of the cases set down to come before Mr. Justice Hamilton in the King's Bench Division of the High Court of Justice last Tuesday was that of *Savage v. New Toddington Gas, &c., Company and Others*. On it being called, however, Mr. Gore-Browne, K.C., who appeared with Mr. Thorpe for the plaintiff, said his Lordship would not be troubled with the action, as he had been able to come to terms with his friends, who represented the defendants, Mr. Atkin, K.C., and Mr. Poyser. It would not be necessary to state the facts; but, by consent, there would be judgment for the plaintiff for £450, with interest at 4½ per cent. from June 24, 1908—the judgment not to be acted upon if certain moneys were paid within 30 days. The substance of the claim was with regard to the omission of matters which by Statute ought to have been included in the prospectus. The statement, however, also contained a charge of knowingly making misleading misrepresentations; and this charge had been withdrawn. His Lordship gave judgment in conformity with the terms agreed upon.

The Case of Alleged Trespass at Ventnor.

In the "JOURNAL" for the 9th of February last (p. 392), we reported the proceedings in an action in which a Mr. Cato and his wife claimed damages from the Ventnor Gas and Water Company and their Solicitor (Mr. A. W. Drew) for alleged trespass. The dispute arose originally over the balance of an account; and in the result a writ was issued. Owing, however, to Mr. Cato's absence, it could not be served; and Mr. Drew obtained an order for substituted service. At last the sheriff's officer took possession, and remained for seven weeks. This was the alleged trespass. Interpleader and other legal proceedings ensued; and eventually the case came before Mr. Justice Ridley and a Special Jury. The outcome was that his Lordship held that no cause of action had been shown; and he directed the Jury to give a verdict for the defendants. This was done; and the case was dismissed, with costs. Against this decision the plaintiffs appealed; and the matter came before Lords Justices Fletcher Moulton and Buckley and the President of the Probate and Admiralty Division (Sir John Bigham) last Tuesday. Mr. Norman Craig, K.C., submitted that the learned Judge was wrong in entering judgment for the defendants without allowing evidence to be given for plaintiffs, and he contended, on the authority of the Court of Appeal, that this was good ground for a new trial. Mr. Powell, K.C., who represented the defendants, opposed the extension of the litigation which had already taken place over this dispute by having a new trial. Sir John Bigham, however, thought Counsel would be well advised to consent to this course, as it would afford the learned Judge in the Court below an opportunity of ascertaining what questions should go to the Jury. In the result, an order was made for a new trial; the costs of the appeal to be borne by the defendants, on the ground that they had resisted the plaintiffs' application.

Price of Gas Reduced at Droitwich.—The Droitwich Gas Committee have resolved to reduce the price of gas by 2d. per 1000 cubic feet, as from Sept. 30 next. The annual report of the working showed that a debit balance of £42 had been converted into a credit of £371.

MISCELLANEOUS NEWS.

GAS SECTION OF THE FRANCO-BRITISH EXHIBITION.

Report of the Committee.

The following report of the Committee for the Gas Section of the Franco-British Exhibition, signed, on their behalf, by the Chairman (Mr. H. E. Jones), has just been issued.

FRANCO-BRITISH EXHIBITION, 1908—GAS ENGINEERING SECTION.

The Committee of the above section have pleasure in presenting herewith a copy of the statement of receipts and expenditure in connection with the above Exhibition, together with a short report giving a few particulars with regard to the same.

When the Committee was first formed, it was recognized that there would be a difficulty in getting manufacturers of apparatus and plant dealing with the gas industry generally to co-operate with them, principally on account of the short time that had elapsed since the International Gas Exhibition held at Earl's Court in 1904. They therefore decided to devote their energies to the provision of such an exhibit as would give to visitors an opportunity of seeing for themselves the many ways in which gas can be economically and efficiently used for lighting, cooking, heating, and other industrial and domestic purposes. They wish, however, to recognize the action of those firms which took space in the section, and by their efforts added so much to its attractions.

In furtherance of their object, the Committee arranged with the well-known firm of Messrs. John Barker and Co., Limited, of Kensington, to erect and furnish a complete suite of rooms, including drawing-room, dining-room, billiard-room, boudoir, study and library, bedrooms, bath-room, nursery, kitchen, scullery, and laundry, which were lighted and heated throughout by the most modern gas appliances, and in which gas was shown in use for cooking, laundry, and other purposes. Practical demonstrations in these departments were given daily, and were extremely well attended. The London meter-makers also arranged a stand at which skilled workmen gave demonstrations of the processes involved in the manufacture of gas-meters; while the Gas-light and Coke Company provided a very attractive display of the many beautiful and useful products obtained from the residuals produced in the manufacture of coal gas, and in addition gave daily demonstrations of the manufacture of incandescent mantles.

The Committee were fortunate enough to secure the order for the lighting of a considerable portion of the grounds. The principal area was entrusted to Messrs. James Keith and Blackman Company, Limited, who very effectively lighted a large number of the principal thoroughfares and avenues by means of over 230 of their high-pressure lamps, each giving an average illuminating power of 1500 candles. The compressing plant which was used in connection with the installation was situated on the Committee's stand, where it attracted considerable attention. A further portion of the ground was entrusted to Messrs. Moffat's Limited, who made use of their Lucas thermopile lamps. It was generally conceded that the parts of the grounds lighted by gas were brilliantly and evenly illuminated, and compared very favourably with the areas in which electricity was used. The lighting of the Indian Pavilion was also entrusted to the Committee; the work of fitting, &c., being very effectively carried out by the Gas-light and Coke Company. Gas was also extensively used in many other parts of the grounds and buildings, as may be gathered from the fact that during the progress of the exhibition the total quantity of gas consumed amounted to about 48 million cubic feet, of which nearly 2 million cubic feet were used in the Committee's exhibit.

In order to obtain a sufficient sum to enable the Committee to carry out their scheme, circulars asking for contributions were issued to all gas companies in the United Kingdom above a certain size. The response to their appeal was barely adequate as a whole; but the Committee gratefully acknowledge the public spirit of the 148 gas undertakings which subscribed to the fund, and thereby placed the Committee in possession of a total sum of £4057 3s.

It may be mentioned that the exhibit was described in the official catalogue as an "Exhibit arranged by the Gas Undertakings of the United Kingdom," which was the inscription that appeared over the exhibit itself. The Committee have reason to believe that as a popular and attractive advertisement the exhibit completely fulfilled its purpose, and met with general approval from the thousands who inspected it. That the beneficial results have not been confined to the neighbourhood of London is proved by the fact that over 3500 definite inquiries from visitors were received at the stand, which were transmitted by letter to 367 different gas companies situated all over the kingdom—figures which would have been greatly exceeded if sufficient funds had been available to allow of the employment of a larger number of assistants. In this connection the Committee desire to tender their best thanks to those gas companies which at their own cost rendered valuable assistance by sending officials to act as attendants.

The Committee have pleasure in stating that the exhibit was awarded two diplomas for grand prize by the International Jury.

After the close of the exhibition, the stand was allowed to remain, in the hope that it might prove of some further use. But the authorities responsible for the exhibition being held at Shepherd's Bush during the present year required the Committee to demolish it; and the cost of doing so has more than exhausted the small balance shown on the statement of accounts as standing to the credit of the fund.

The Committee feel they cannot conclude this short report without recognizing the great assistance rendered by the Gaslight and Coke Company, and the Brentford Gas Company, and by those of their officers who took part in the arrangements. They wish also to offer their best thanks to Mr. D. Milne Watson, the Vice-Chairman of the Committee, to Mr. James William Helps, the Honorary Secretary, and to the members of the Sub-Committee, for the important share they took in organizing and carrying out the scheme.

Accompanying the report are the names of the Committee and of the

gas undertakings which subscribed to the fund, and also the statement of accounts, as examined and certified by Mr. William Cash, F.C.A.

Gas Engineering Committee.

H. E. JONES, London, *Chairman.*

D. MILNE WATSON, London, *Vice-Chairman.*

A. COZE, Reims.	W. R. HERRING, Edinburgh.
E. ALLEN, Liverpool.	A. A. JOHNSTON, Brentford.
J. F. BELL, Derby.	S. H. JONES, London.
T. BERRIDGE, Leamington Spa.	F. D. MARSHALL, London.
A. E. BROADBERRY, Tottenham.	J. G. NEWBIGGING, Manchester.
W. F. COTTON, Dublin.	HANBURY THOMAS, Sheffield.
T. GOULDEN, London.	S. Y. SHOUBRIDGE, Sydenham.
T. GLOVER, Norwich.	W. H. Y. WEBBER, London.
W. DOIG GIBB, Newcastle.	A. WILSON, Glasgow.
F. W. GOODENOUGH, London.	H. WOODALL, London.
C. HUNT, London.	H. W. WOODALL, Bournemouth.
D. H. HELPS, Reading.	

J. W. HELPS, Croydon, *Hon. Secretary.*

Gas Undertakings Subscribing to Joint Fund.

Aldershot. Ascot. Ashton.
Bagnalstown. Barking. Barnet. Barrow-in-Furness. Bath. Birming-
ham. Bishop Auckland. Bognor. Boston. Bournemouth. Bir-
kenhead. Brentford. Brighton. British. Burton-on-Trent.
Cambridge. Canterbury. Carrick-on-Suir. Cheltenham. Chertsey.
Chester. Chigwell. Loughton, and Woodford. Commercial. Com-
pagnie l'Union des Gaz. Croydon.
Dartford. Derby. Devonport. Douglas (I.M.). Dublin. Durham.
Eastbourne. Elland. Enfield. European. Exeter. Exmouth.
Felixstowe. Fernoy. Frodsham. Frome.
Gaslight and Coke Company. Glasgow Corporation. Gosport. Guern-
sey. Guildford.
Hampton Court. Harrow and Stanmore. Hastings. Herne Bay. Hert-
ford. Hexham. High Wycombe. Hitchin. Hornsey. Horley.
Ilford. Imperial Continental Gas Association. Ipswich. Jersey.
Kidderminster. Kilkenny. Kingston-on-Thames.
Leamington Priors. Leicester Corporation. Leighton Buzzard. Liver-
pool Corporation. Longford. Lowestoft. Louth. Luton.
Magherafelt. Maidstone. Mallow. Manchester. Matlock. Mount-
mellick.
Newmarket. Newport (I.W.). Northampton. North Middlesex.
Oldham Corporation.
Pelton. Peterborough. Prescott. Preston. Queenstown.
Radcliffe. Reading. Redditch. Redhill. Richmond. Rochdale.
Rochester. Romford. Ross. Rushden. Rugby. Runcorn.
Salford Corporation. Sandown. Scarborough. Shanklin. Sheffield.
Sleaford. Southampton. Southend. South Metropolitan. South
Shields. South Suburban. Spennymoor and Tudhoe. Stafford. St.
Albans. Stockton-on-Tees. Stockport. Stourbridge. Stretford.
Sunderland. Sutton.
Taunton. Thurles. Tipperary. Tottenham. Tunbridge Wells. Tyne-
mouth. Uxbridge.
Wakefield. Waltham Cross. Wandsworth. Warrington. Warwick.
Waterford. Watford. Wellingborough. Wellington (Salop). West
Ham. Weston-super-Mare. Wicklow. Widnes. Winchester.
Wolverhampton. Worthing. Wrexham.
Yeovil. York.

Statement of Accounts.

RECEIPTS.

Contributions from 148 gas undertakings.		£4057	3	0
Rebate on price charged for gas, <i>per contra</i> —				
Gaslight and Coke Company. . . .	£51 17 5			
Brentford Gas Company	51 17 5			
	<hr/>		103	14 10
Contributions to cost of leaflets . . .			46	0 0
Repayment of charges (<i>per contra</i>) Franco-British Exhibition—				
Lighting in grounds	£102 0 0			
Telephone (one moiety)	8 10 0			
Gas supplied	9 12 5			
	<hr/>		120	2 5
		<hr/>	£4327	0 3

PAYMENTS.

Expenditure on exhibit—				
Franco-British Exhibition for space	£950	0	0	
Erection and furnishing	1906	15	7	
Fitting-up stand	152	16	9	
Maintenance and materials, including wages	373	9	9	
Electrical work for gas-engine for laundry exhibit	47	17	10	
Gas, water, and drainage connections	31	7	5	
				£3462 7 4
Expenditure during exhibition—				
Gas and water	£291	0	8	
Notice in official catalogue	7	7	0	
Salary of Superintendent	100	0	0	
Telephone	17	0	0	
Insurance	7	5	0	
Showcards, photographs, &c.	43	9	2	
Attendants' wages	27	9	6	
				493 11 4
Self-intensifying lighting in grounds (re- paid <i>per contra</i>)				102 0 0
Cookery demonstrations—				
Superintendent's fees	£86	16	0	
Materials and utensils	35	4	10	
				122 0 10
Stationery and leaflets				51 17 7
Clerical labour, postage, travelling, and petties				89 2 11
				£4321 0 0
Balance in hand available for printing and postage, balance-sheet, &c.				6 0 3
				£4327 0 3

MANCHESTER'S DEPLETED GAS RESERVE FUND.

No Further Concession to Automatic Meter Users at Present.

The minutes of the Manchester Gas Committee presented for con- firmation at the Council meeting last Wednesday contained a paragraph to the effect that to reduce the price of gas to slot-meter consumers, as suggested by Mr. Jennison, would mean so serious a loss of revenue to the department that the proposal could not be entertained at present.

Alderman Gibson, in moving the confirmation of the Committee's proceedings, said they had been passing through a very trying time. Not only had the Committee agreed to continue the payment of £50,000 in relief of the rates, but they had had to pay practically £50,000 more for coal. Despite the heavy calls made on the department, they had contrived so far to avoid raising the price of gas, as had been the case with some other undertakings. He added that their reserve fund had been depleted; but he looked forward to a better state of things. Mean- while, it was impossible to accede to the request to place automatic meter consumers on the same terms as those with ordinary meters.

Mr. Jennison, who expressed in no measured terms his dissatisfac- tion at the Committee's decision, moved that the minute referring to penny-in-the-slot meter users be referred back for further considere- ation and the presentation to the Council of a fuller report. Some 60,000 ratepayers, he said, were affected; and there was an impression abroad that the consumers of gas by automatic meters were charged more because the collection of their contributions cost more.

In seconding, Mr. Fox said no doubt Alderman Gibson, as Chair- man of the Gas Committee, knew all about the subject; but other members of the Council were not in the same fortunate position. Re- plying to the remarks made, Alderman Gibson contended that they might as well expect a small grocer, who had to measure his tea 32 times to the pound, to sell it at the same price as the man who sold half-pounds or pounds at a time. They had some 50,000 automatic meters in use, and each had to be examined once a month—the total sum collected each month being about £5000. He reminded the Council that, not only was there the cost of collection, but many of the meters were robbed of their contents and spoiled; and altogether the department was put to considerable expense with these automatic meters. He desired also to point out that within the last ten years concessions had been made to penny-in-the-slot consumers representing £100,000. Was it the wish of the Council, he asked, that these con- cessions should be withdrawn? They had not been made in a philan- thropic spirit, it was true, but so that the people would burn more gas. Since he took up the chairmanship of the Gas Committee, con- cessions representing £1,500,000 had been made to the consumers; and whereas at the beginning of the period they had £175 worth of assets for every £100 of liabilities, they had to-day £225 of assets for every £100 of liabilities. After what he had said, he asked the Council to support the Committee in their decision. The minutes of the Com- mittee were then confirmed by an overwhelming majority.

BURY CORPORATION GAS-WORKS RESULTS.

The report to his Committee of Mr. H. Simmonds, the Engineer and Manager of the Bury Corporation Gas-Works, on the past year's work- ing, states that the total quantity of gas made was 427,820,400 cubic feet; while that unaccounted for was equal to 5·2 per cent. The following is the working statement:—

	s.	d.
Cost of manufacture, distribution, &c., per 1000 cubic feet of gas sold.	2	4 17
Less tar, sulphate, coke, and sundries	0	11 13
Net cost of gas	1	42 04
Add interest on loans, stock, and sinking fund	0	7 13 32
Total cost of gas	2	01 36
Income from gas, hire of meters, cookers, and boilers	2	31 22
Profit (£5689)	0	31 86

At March 31, there were 2448 public lamps in use, 2324 cookers, 6176 grillers, 5997 hired ordinary meters, 3568 prepayment meters, and 111 gas-engines.

The Gas Committee resolved that the sum of £2860, one moiety of the profit for the year, be carried to the credit of the general rate, and a similar sum to the credit of the gas consumers; and that the price of gas for the ensuing twelve months be as follows: To consumers within the borough (except the added areas), 2s. 3d. per 1000 cubic feet; to consumers within the added areas and outside the limits of the borough, 3s. per 1000 cubic feet; and that for motive power and manufacturing purposes the price be: For consumers in the borough (excepting added areas) using less than 100,000 cubic feet a quarter, 2s. 1d. per 1000 cubic feet; exceeding 100,000 cubic feet, but not exceed- ing 500,000 cubic feet, 1s. 11d.; exceeding 500,000 cubic feet, 1s. 9d. For consumers in the added areas using less than 100,000 cubic feet, 2s. 10d.; exceeding 100,000 cubic feet, but not exceeding 500,000 cubic feet, 2s. 8d.; exceeding 500,000 cubic feet, 2s. 6d.—the whole of these prices to be subject to a discount of 1d. per 1000 cubic feet of gas con- sumed for prompt payment, and a reduction of 2d. per 1000 cubic feet allowed from the amount now standing to the credit of the gas con- sumers. Also that for the sum of 1d. consumers using prepayment meters be allowed 32 cubic feet of gas.

In moving the adoption by the Town Council of the minutes of the Gas Committee, Alderman Fletcher said they had a very successful undertaking in the gas-works. Ten years ago, the make of gas was 340 million cubic feet, and last year it was 427 millions; and, further, the works had been very greatly improved during these years. For the past year there was certainly some £200 or £300 profit less than

was estimated; but they must remember that the cottages had been repaired, and some £200 had been spent on them. If they took this item into account, they would see that the estimates had just about been realized.

The minutes were adopted.

COVENTRY GAS-WORKS REPORT.

The annual report of the Gas Committee of the Coventry City Council states that the total borrowing powers exercised since the acquisition of the undertaking amount, with nominal additions, to £449,316, of which £31,340 has been repaid out of the sinking fund, leaving the present liabilities at £417,976. Against this, the Corporation have reserve and sinking funds invested amounting to £55,839, leaving a balance of liability of £362,137. The amounts expended during the year on capital account have been as follows: Structural works (Foleshill), £47,437; new mains and service pipes, £3793; new meters, £1635—total, £52,870. The total capital expenditure since the acquisition of the undertaking, including the original purchase money, has been £454,823; and as the borrowing powers exercised amount to £449,316, there is at present a balance overdrawn of £5507. The total revenue for the year from all sources, including sales of gas, coke, tar, &c., came to £124,688. The expenditure for coal and all other materials, wages, repair and maintenance of works, &c., was £101,372. This leaves a gross profit of £23,316, to which has to be added the amount brought forward from last year, £953, making a total of £24,269. Against this are capital and other charges amounting to £21,020; so that the final balance of profit for the year is £3249, which the Committee think, considering the state of trade during the year, may be regarded as very satisfactory. The amount of the reserve fund at the present time is £10,157.

The Committee recommend that the balance of profit of £3249 be dealt with as follows: That £2000 be paid over to the district fund in relief of the rates, and that the balance of £1249 be carried forward to the next account. Last year the net profit on the undertaking amounted to £9953; and the reduction this year is mainly ascribed to the dulness of trade in Coventry.

OLDBURY GAS PROFITS.

The annual statement of accounts of the Oldbury gas undertaking, which has just been issued by the General Manager (Mr. A. Cooke), shows a net profit for the year ending March 31 of £672. The amount of loans outstanding on March 31 was £56,440; and during the year £959 11s. 3d. was spent on new meters, mains, &c. The cost of the manufacture of gas was £11,360, of distribution £1205, of public lamps £889, of rent, rates, and taxes £1188, and of management £399. The receipts from sales of gas amounted to £14,712 (including £3098 from prepayment meters); residual products realized £4268; and gas-fittings, £260. The gross profit was £4264.

The quantity of gas manufactured was 130,780,000 cubic feet, of which 6,480,000 feet, or 4.95 per cent., was unaccounted for. The make included 5,336,000 cubic feet of carburetted water gas. In the manufacture of the 125,444,000 cubic feet of coal gas, 10,275 tons of coal were used, which gave a make per ton of 12,202 cubic feet.

The report was discussed at a meeting of the Urban District Council last week, when the Chairman (Mr. C. Thomlinson) observed that, considering the fact that during the year they had reduced the price of gas 2d. per 1000 cubic feet, and that trade had been bad, the report was a satisfactory one. The amount received for gas showed a decrease of £728, which was partly accounted for by the reduction in price, and partly by 2,608,900 cubic feet less having been sold, owing to the state of trade. The decrease in the sale of gas amounted to 1.33 per cent. Mr. Wilson, in seconding the adoption of the report, said they were fully satisfied with the able, conscientious, and loyal way in which Mr. Cooke managed the gas undertaking. The report was adopted.

DECREASED CONSUMPTION AT LOUGHBOROUGH.

The annual statement of accounts of the Loughborough Corporation Gas Department, which were submitted at the last monthly meeting of the Town Council, showed on the capital account a total expenditure of £126,394—an increase during the year of £473. The revenue account exhibited a total income of £20,317, as compared with £22,133 in 1908—leaving a balance, after meeting £14,551 expenditure, of £5766. The manufacture of gas cost £11,510, as compared with £12,676 last year, with a corresponding reduction in the consumption. The profit and loss account showed a deficiency of £286. About 9563 tons of coal were carbonized, and 42,174 gallons of oil. The residual products sold realized £7526.

In moving the adoption, Alderman Bumpus said that, in consequence of the decreased consumption of gas, mainly on account of the depression in trade in the town, but partly owing to the competition of electricity, the financial result was not so satisfactory as in previous years. This was borne out by the balance on the revenue account carried forward, of £5766, which was in round figures £300 less than the year before. It was anticipated the profit would have been considerably larger. There had been 10 per cent. diminution in the output of gas; while a large part of their costs were fixed charges, and could not be reduced at all. They had endeavoured to maintain economy all round. The unexpected extent to which the profit had been reduced had had the effect of placing the profit and loss account £286 to the bad, which was unanticipated at the commencement of the financial year. If they had anything like a normal state of trade in the town, there was ample evidence to show that they might expect during the current year a decidedly better financial result than was achieved in the financial year just closed.

CALDICOT AND ITS GAS SUPPLY.

On March 17 new gas-works were opened at Caldicot, near Newport, Mon., and though the whole of the works are not yet completed, a supply of gas to the district is already being given.

About three years ago, Mr. Rust, the late Manager of the Chepstow Gas-Works, who was then residing at Caldicot, felt convinced that there was an opening for a gas-works in the district. He first consulted Mr. Thomas Canning, the Engineer of the Newport (Mon.) Gas Company, who made a report upon the prospects of the district, and the possibilities of a good future. After seeing the report, several gentlemen came forward; and a Company was formed with Messrs. George Winstanley, J. L. Cloudsley, and John Griffiths as Directors.

On canvassing the district, over 200 of the inhabitants promised to become consumers. There was also a prospect of the district opening out considerably, as the Great Western Railway Company were erecting large engine-sheds at the Severn Tunnel Junction. This prospect has been fulfilled; many new houses have been built, and more are in course of erection.

The Company applied for a Provisional Order, which was granted, and their capital of £6000 was later increased by the Board of Trade to £7500 at 10 per cent., and a further £2500 borrowing powers.

Nearly the whole of the works have been completed and mains laid to most of the districts the Company have power to supply. Quite model works have been built to the designs of Mr. Canning. Everything is up-to-date and prepared for an expected increase. The buildings and work are of the best quality, and of good appearance—reflecting great credit upon all concerned. The Company have fitted up nearly 300 houses with slot installations, and there is a fair number of private consumers.

The people in the district are already finding out the advantages of gas, and consumers are being added daily. With the great possibility that the Great Western Railway Company will adopt gas next winter and the starting of a large tin-works, the prospect of the Company is very bright; and with the exertions of the Manager (Mr. Rust), supported by the Consulting Engineer and the Directors, the concern should go ahead rapidly.

A successful gas exhibition has just been held by Messrs. Parkinson and W. & B. Cowan; and this has already greatly increased the demand for gas.

INCREASED OUTPUT AT STAFFORD.

The annual report of the Gas and Electricity Committee which was adopted at the last monthly meeting of the Stafford Town Council showed that nearly 204 million cubic feet of gas were delivered from the works during the past financial year; being an increase of 6½ millions over the previous year. The leakage was 1.29 per cent. The sale of gas yielded £25,611; and the total revenue from all sources was £33,563. The total expenditure was £18,000, and the gross profit was £14,754, which was a decrease compared with the previous year of £1171. The net profit, after meeting capital charges, was £5660; and this has been disposed of by transferring £3000 to the district rate account, £1000 to the credit of the suspense account in payment for the purchase of the water-gas plant, and £1000 added to the reserve fund. Out of the balance, £393 has been ordered to be distributed among the workmen under the profit-sharing scheme; and the balance is carried forward. The income of the electric lighting works was £4400; and the working expenditure was £2000. The balance, representing the gross profits, was transferred to the net revenue account to meet the capital and other charges.

Alderman Wright, commenting on the report, mentioned that, since they took over the gas-works in 1878, they had paid off loans to the amount of £71,220, and paid towards the reduction of the rates £51,675—a total of £122,897. In addition, they had paid large sums to keep the works up-to-date. It was estimated that the works would sell for £375,000. They had in hand a stock of coal valued at £8900; and all they owed on loans was £42,661, and to the bank £8557. So that, when these were paid off, they would have the works clear. They had a capital value of £339,000 over and above their liabilities, which was a large sum in excess of the total liabilities of the Corporation of Stafford; and thus their works were a very valuable asset.

Carlisle Corporation Gas Accounts.

With further reference to the gas accounts of the Carlisle Corporation for the year ending March 31, to which allusion was made in the "JOURNAL" last week, we learn from the Engineer and Manager (Mr. W. J. Smith) that they include the following items of expenditure: £150 for a new 18-inch trunk main, £1250 for steel lining to a gasholder tank, £586 for the conversion of public lamps from the flat-flame to the incandescent system, reduction in the price of gas charged to prepayment consumers amounting to £659, and £250 increase in wages. There was a reduced consumption of gas amounting to 1,521,000 cubic feet; less gas was used in the works and offices, and less was unaccounted for. There was more coke saleable, and more sulphate of ammonia produced per ton of coal carbonized; but £700 less was received for residuals, and gas oil showed an increased cost of £509. The increase in sales amounted to £159. After paying £1000 off the cost of the carburetted water-gas plant, there remains £463 for the relief of the rates, compared with £3634 available for this purpose for the year 1907-8.

Hindley Gas Undertaking.—In his report to the Gas Committee of the Hindley Urban District Council, the Engineer (Mr. H. O. Timmins) stated that the gross profits on the year's working were £3874, and the net profit £186; while the averages for the last seven years were: Gross profit, £3827, and net profit £813. The gross profit for the year represented 4.52 per cent. interest on the capital invested.

GAS SUPPLY IN ROME.

According to the report of the Anglo-Romano Gas Company for the year ended Dec. 31, 1908, some extracts from which were given in a recent number of "L'Electricita," the quantity of gas sold was about 790½ million cubic feet, of which 160½ millions were supplied to the Municipality and 630 millions to private consumers. There was a decrease of rather more than 2 million cubic feet in the municipal consumption, but an increase of about 15½ millions in that of private establishments; making the total increase 13½ millions, compared with the year 1907. The falling off in the consumption of gas for public lighting is attributed solely to the extended use of the Auer incandescent burner. On the other hand, there was a greater quantity of gas consumed for lighting, heating, and cooking purposes, stimulated, possibly, by a reduction made in the price charged. The prices paid for coal enabled the Company to avert a fuel crisis; and the exceptionally low rates of freight prevailing would have brought down the total cost of the raw material had it not been for the high price of labour. On Dec. 31 last there were in Rome 9701 public lamps, of which 9283 were in use. The number of meters then in operation was 28,139, representing 187,375 burners; being 1201 meters and 6000 burners more than at the close of 1907. It is now customary, however, to reckon for each meter a much greater number of burners than that indicated by its nominal capacity, owing to the use of the incandescent mantle; so that the actual number of burners may be put at fully 50 per cent. more than that arrived at on the basis of the marked capacity of the meters. At the close of last year, there were at work 187 gas-engines, representing about 875 H.P.; being 11 engines less than before, owing to the growing tendency to employ electric power. The length of the mains is now close upon 300,000 yards—an increase of 5800 yards in the period covered by the report.

TAUNTON AND THE ELECTRIC LIGHT.

The Financial Position.

At the Monthly Meeting of the Taunton Town Council last Tuesday—the Mayor (Alderman J. G. Price) presiding—a somewhat animated discussion took place on the presentation by the Electric Light Committee of a revised list of charges to private consumers. The Committee recommended the Council to abandon the present complicated system of charge by "demand indicators" and to adopt a scale of charges for lighting ranging from 6d. down to 3d. per unit, according to consumption. They suggested that consumers who are supplied from the free-wiring installations should be charged 6d. per unit for the summer quarters, and 5d. per unit for the winter quarters. In cases where arc lamps are used for outside lighting (provided the consumption for inside lighting of the premises is not less than 50 units per quarter), the charge to be 2d. per unit for all current used through such arc lamps. If more than one meter is required for any supply, such meter-rents to be subject to a reduction of 20 per cent. off the ordinary charge in respect to each meter.

Dr. Macdonald, the Chairman of the Committee, in moving the adoption of the report, said that the Committee had taken a good deal of trouble to get a reasonable basis of charge for the consumers, and that presented was the best they could put before the Council.

The motion having been seconded, Mr. Van Trump said he was surprised at the report of the Committee, especially as only a few months ago the Chairman said the electric light concern was doing so well that they could reduce the charge for current to the Tramway Company, who, as a matter of fact, were now being supplied at a loss, and would be in future supplied at a greater loss. Then, without being asked to reconsider the charges, the Committee came to the Council and raised the price 2d. per unit. These increased charges would mean that consumers would have to pay £2000 for what they had been receiving for £1200 last year. He considered it a disgrace to the Committee and to the town to say that they had been running the concern on a profit, and in previous years had shown a profit, while now the Committee, to make the concern a financial success, had to propose an increased charge of £600 or £700 a year on the ratepayers. This was a matter that ought to receive further consideration; and, if necessary, the consumers and ratepayers should be consulted. It was apparent to anyone that the electric light had not been paying as a trading concern for the last two or three years. He moved that the whole rearrangement of charges be adjourned for further consideration.

Mr. Spiller seconded, and said that if the Committee wanted to charge these new rates for current they would soon find there would be a great deal less used in the town.

The vote for the adjournment of the discussion was ultimately lost by a large majority—only five voting in favour of this proposal.

Mr. Penny, continuing the discussion, said the Committee had got as near as they could to a fair price. The large customers were the best; and they ought to have current at a less price than those who burnt a smaller amount. With regard to the trams, they had a very valuable day-load. If it were not for the trams, they would have to be running their machinery throughout the day with no practical output; and they were glad to sell the day-load at a much cheaper rate.

Mr. Van Trump replied that the trams were running up to 11 o'clock at night, and so could hardly be calculated in the day-load. If the Committee had come forward and said they were running the business at a loss to the ratepayers, and that they wanted the £700 or £800 to be secured from an increase in charges to make up this loss, he would have voted for it at once; but it was not right to rearrange the charges without saying why. He had known for the past three years that the business was running at a loss. He believed that some people who had their places fitted up with the electric light would have it out, and gas installed in its place. He was one who, if the increase were sanctioned, would clear out the electric light and have gas instead; while it was possible for a few people to combine and supply their friends. This could be done, provided the highway was not crossed. He moved that the matter be reconsidered; and Mr. Standfast seconded.

Alderman Vile thought Mr. Van Trump should not be too hard on the Committee; and Mr. Tolman hoped it would be made clear that the electric light works had been run at a loss the past three years.

Dr. Macdonald said it was difficult to reply to what had been said, as it was a series of statements that had no foundation whatever. The works had not been carried on at a loss during the last few years. The idea of the Committee was to draw up the charges on something like a logical basis; and every Committee in the country had taken the same course, and gone back to the flat-rate. The idea of making up any loss had not occurred to them. No one had a right to insinuate that the Committee were trying to make up a loss on the trams by charging the consumers extra. Referring to Mr. Van Trump's threat that he would give up the use of the electric light and ask other people in the town to do the same, Dr. Macdonald said he wanted them to consider that the electric light works were the property of the town; and anyone who wished to keep the works from being a success, was doing harm to the town. It did not harm the Electricity Committee; but a man who would injure a concern by taking away its employment, was not, if he might say so, acting in a manner consistent with good citizenship.

Mr. Van Trump: What is the reason for increasing the charges?

Dr. Macdonald said they did not yet know whether they were increasing them. Strictly speaking, they could not reckon definitely on making anything by the increased charges at all, because of the customers they might lose.

The discussion then ended; and the report, with the Committee's recommendations as to the increased charges, was carried by a large majority.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

We have received from Mr. G. A. Lewin, the Town Clerk of Lyttelton (N.Z.), his report to the Mayor and Corporation on the municipal work of the year ended the 31st of March. In the course of it, he furnishes the following particulars in regard to the gas and water supply.

In the spring of last year, the Municipal Council decided, on the recommendation of the Gas Committee, to reduce the price of gas for lighting purposes from 8s. 4d. to 6s. 8d. per 1000 cubic feet, which represented an annual concession of £320 on the then output. The results of the year's work have, however, fully justified the step, as the actual receipts from gas and residuals are shown by the accounts to be within £50 of those for the year 1907-8, when the higher rate was charged; while the ascertained net profit, due entirely to gas manufacture, is actually a few pounds in advance—being £790 against £787. Mr. Lewin refers with gratification to the success of the gas undertaking during the six years it has been under municipal control, as the price of gas has been reduced by 33½ per cent., the output increased by 150 per cent., the works and plant improved at a cost of £2556 out of revenue, and the rates relieved to the extent of £1200. The gas capital is £20,000; and the gross profit is roughly 8 per cent. upon it.

The following are some working statistics submitted by Mr. Lewin: Coal carbonized, 844 tons; gas made, 10,005,000 cubic feet; gas sold, 9,260,000 cubic feet; coke sold, 346¼ tons; and tar sold, 950 gallons. He points out that, for the first time in the history of the works, the yearly output of gas reached eight figures; while the make per ton of coal continued to rise in a gratifying manner, without bringing to light any of the compensating drawbacks which are so often associated with big makes. In this connection, he quotes the figures for the past three years. During 1907, the make of gas per ton of coal was 11,515 cubic feet; in 1908, it was 11,690 cubic feet; and last year, it had risen to 11,854 cubic feet. For the same period the net cost of coal per 1000 cubic feet sold worked out at the low figures of 4'63d., 3'43d., and 2'95d. respectively. Mr. Lewin says this fact would seem almost to indicate that the Manager (Mr. W. M'Auliffe) is, in the matter of cost of coal per 1000 cubic feet, rapidly approaching the diminishing-point.

Reporting upon the water supply, Mr. Lewin gives figures showing that the total quantity of water pumped to the main reservoir in the past financial year was 59,737,000 gallons, compared with 56,094,000 gallons in 1907-8; the town consumption being 50,576,300 gallons, as against 47,116,800 gallons. The mean consumption per head per day last year was 34'65 gallons, compared with 32'19 gallons. An important change was made at the works by the substitution of producer-gas plant for the old steam plant at the Heathcote Valley pumping-station. Before the new plant was adopted, it was estimated that there would be a probable saving of £290 per annum in fuel on the basis of pumping at that time. The anticipation has been fairly well realized. For the year ended March, 1908 (*i.e.*, the last complete year with the steam plant), 56 million gallons of water were pumped at Heathcote at a fuel cost of £381, or £6 16s. per million gallons; but since the new plant has been at work, it has raised 23 million gallons at a fuel cost of £36, or £1 11s. 3d. per million gallons. At March, 1909, the yearly pumping had risen from 56 millions to 59½ millions; and for the present year, with drainage requirements in full swing, a demand of not less than 64 or 65 million gallons may be anticipated, which, on the foregoing basis, represents a saving in fuel of £330 on the year's work. The whole plant, including the producers, engines, and pumps (all in duplicate), new brick building, and an additional rising main, represents a capital outlay of roughly £4500, in the proportion of £3000 for plant, £1000 for building, and £500 for main. The saving in fuel is sufficient to pay 4½ per cent. interest on the total capital expenditure, and then there remains a yearly surplus, which, if invested as a sinking fund on a 4 per cent. basis, would extinguish in 16 years the £3000 spent on the plant. Thus the Corporation have provided themselves with a pumping outfit capable of meeting any anticipated requirements for many years to come, without adding one penny to their yearly interest bill.

Under the title of "Sydney Willey and Co.," a business has been commenced at No. 18, Old Swan Lane, Upper Thames Street, E.C., for the supply of gas-meters, fires, cookers, &c. Mr. Sydney J. H. Willey (brother of the late Mr. H. A. Willey, of Exeter) is connected with the concern.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Hamilton Town Council on Tuesday, the Manager—Mr. J. Ballantyne—reported that the erection of the coal-handling plant would be completed at an early date, and arrangements were made for a formal opening ceremony. Bailie Anderson said that a question was asked at the previous meeting regarding the saving which had been effected by the railway siding. The Manager had since reported, bringing out a gross saving of £667, which would be increased by the coal-handling plant to £850. He thought the Council would agree with him that Mr. Ballantyne had kept well within bounds in his report. He was hopeful that by the end of the year better results would be reported. Ex-Provost Keith said he had gone into the matter quite independently; and the conclusion he arrived at practically confirmed Mr. Ballantyne's estimate.

The Gas Committee of the Denny Town Council on Tuesday reported that the Manager of the Banknock Coal Company had indicated that his Company were now inclined to consider favourably the proposal made by the Council in 1902 to extend the gas-mains to Dennyloanhead—a distance of $4\frac{1}{2}$ miles. The Committee instructed the Clerk to inquire whether the Company would be prepared to put gas-fittings into the houses belonging to them, and if they would favour the formation of a lighting district. The Colliery Manager had stated that the matter would require to develop slowly, and that he would bring it before his Directors. The subject was accordingly allowed to stand over.

The Dumfries Town Council last week were recommended by the Gas Committee to purchase for use during the year 4000 tons of Sanquhar splint, 2900 tons of Afton coking coal, 1500 tons of Belhaven splint, 2000 tons of Muirkirk splint, 500 tons of Knockshinnoch cannel, and 1000 tons of Ormiston cannel—in all, 11,900 tons; also 10,000 gallons of benzol. The total cost was £8254. The average price of coal was 13s. 6 $\frac{1}{2}$ d. per ton; and of coal and benzol almost 13s. 10d. The cost per 1000 cubic feet of gas was 1s. 5 $\frac{1}{2}$ d.; and the yield per ton was estimated at 9500 cubic feet. The recommendation of the Committee was adopted after discussion. The Council remitted to the Joint Managers to inquire and report as to the desirability of extracting the light oils from the tar, and to report as to the repair or rebuilding of the old retort-house.

The Sanquhar Town Council at their last meeting voted an honorarium of £18 to the Town Clerk, in consideration of the extra work he had had in connection with the gas-works during the past year. Plans were passed for a new retort-house and alterations at the gas-works.

The Cambuslang Gas Company, Limited, made a net profit for the past year of £2731. At the annual meeting on Wednesday, it was agreed to pay a dividend of 6 per cent., making 10 per cent. for the year; to place £550 to depreciation; £220 to reserve; and to carry forward £361.

The Comrie Gaslight Company have agreed to pay a dividend of 1s. per share, and to retain the price of gas at 6s. 8d. per 1000 feet.

The Directors of the Methven Gas Company have appointed a deputation to inspect and report on the Ceres Gas-Works, where they understand gas is being made from petrol by Mr. W. Key's process. The introduction of similar plant at Methven would, it is believed, enable gas to be produced at from 4s. to 5s. per 1000 cubic feet, as compared with the present price of 8s. 10d.

At a meeting of the Directors of the Turriff Gas Company, Limited, last week, a resolution was passed placing on record an expression of the great loss the Company had sustained, and the deep regret the Directors felt, by the death of their esteemed Chairman, Provost Hutcheon, who had been associated with the Company since 1858, who had ably acted as Chairman for about forty years, and to whose wise and careful guidance the Company were largely indebted for their present sound position.

In regard to the gas transfer which is under consideration in Carnoustie, it is reported that at a meeting of the Carnoustie Town Council on Monday Provost Soutar called attention to the fact that no reply had been received from the Gas Company with regard to the offer they were asked to submit to the Council as a set-off to the offer which the Council had made for the purchase of the Company's undertaking. He thought he was expressing the opinion of the Council when he said it was their desire to lay before the ratepayers the whole question, and to let them know exactly how they stood. He moved that they call a public meeting on the subject; and this was agreed to.

The Corporation of Kirkcudbright have let the contract for the erection of a new gasholder and tank, tar-column, boiler, engine, and exhaustor, to Messrs. Robert Dempster and Sons, Limited, of Elland, at the price of £974.

The Corporation of Dunbar are having extensions effected at the gas-works which are intended to fit them to meet the demand for gas for many years to come. The work entails the erection of a new telescope gasholder, with a capacity of 45,000 cubic feet, in place of one which had a capacity of only 18,000 cubic feet; also the installation of new purifiers, boiler, and engine and tar-extractor, a retort-bench of ten retorts, and a tar-storage tank.

The Committee appointed by the Fraserburgh Town Council to consider as to the acquiring of the control of the gas supply in the burgh reported to the Council recently that, after having fully discussed the subject at a special meeting, they had resolved that, in their opinion, the whole information which could be obtained to enable the Council to decide on the question was contained in the report supplied by Mr. W. B. M'Lusky, of Perth, in 1908, and that the Committee were advised: (1) That the action taken by the Town Council last year under the Burghs Gas Supply (Scotland) Act of 1876 would not preclude its adoption from being raised again at this or any later date; and (2) that the Council would have the right to establish and construct works for the manufacture or storage of gas at the site recently acquired by the Gas Company, without consulting, or obtaining the consent of, the owners of surrounding properties. In the Committee it was agreed, on the suggestion of Mr. G. Low, to report: (1) That, in the opinion of the Committee, it was expedient that the Town Council should acquire control of the gas supply; (2) to recommend and request that a special meeting of the Council be held on Monday, Sept. 6 next, to resolve

that the Act be adopted in, and applied to, the burgh of Fraserburgh, and to appoint a day for the holding of the second meeting of the Council on the subject; and to make all other necessary arrangements for the adoption of the Act. The Council unanimously adopted the report of the Committee.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 12.

There has been no recovery from the quietness which prevailed at the beginning of the month. Although deliveries continue on a fairly satisfactory scale, they are largely against contracts made in advance; and, new business being barely enough to remove available supplies, the tendency of prices has again been slightly in favour of buyers. The closing quotations are £10 18s. 9d. to £11 per ton f.o.b. Hull, £11 1s. 3d. to £11 2s. 6d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. The situation in the forward position is without much change. There is good inquiry for delivery up to the end of the year, but first-hand business has been limited. For delivery over the spring months, 1910, there is not much inquiry, the ideas of makers being quite out of reach.

Nitrate of Soda.

The market remains quiet at 10s. 4 $\frac{1}{2}$ d. per cwt. for 95 per cent., and 10s. 7 $\frac{1}{2}$ d. for refined quality.

Tar Products.

LONDON, June 14.

Tar products have been steady generally throughout the past week. Pitch is still firm, although the Continent do not appear to be very anxious buyers at present. The Belgium buyers in particular seem to be holding off the market, in the belief that the rise which has lately taken place is not warranted by the actual position of affairs. Seeing, however, that most of the makers are well sold for this year's delivery, and under no necessity to come again into the market until the end of the year, and that supplies of tar are decidedly less than usual for many reasons, they will probably regret this decision when they decide to purchase. Benzol is steadier, and prices have improved somewhat all round. Toluol is very quiet. Solvent is steady, but orders are scarce. Creosote is firm all round, with a fair amount of inquiry. Carbolie acid is quieter; and the majority of the consumers decline to offer for prompt or forward. Crystals are quiet and difficult of sale. Naphthalene and anthracene are unchanged.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 27s. 6d. to 28s.; east coast, 27s. to 27s. 6d.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d. to 6 $\frac{1}{2}$ d.; North, 5 $\frac{1}{2}$ d. to 6d.; 50-90 per cent., casks included, London, 7d.; North, 6 $\frac{1}{2}$ d. Toluol, casks included, London, 8 $\frac{1}{2}$ d.; North, 7 $\frac{1}{2}$ d. Crude naphtha, in bulk, London, 3d. to 3 $\frac{1}{2}$ d.; North, 3d. to 3 $\frac{1}{2}$ d.; solvent naphtha, casks included, London, 11d. to 11 $\frac{1}{2}$ d.; North, 10d. to 10 $\frac{1}{2}$ d.; heavy naphtha, casks included, London, 10 $\frac{1}{2}$ d. to 11 $\frac{1}{2}$ d.; North, 9 $\frac{1}{2}$ d. to 10 $\frac{1}{2}$ d. Creosote, in bulk, London, 2 $\frac{1}{2}$ d. to 2 $\frac{3}{4}$ d.; North, 2 $\frac{1}{2}$ d. to 2 $\frac{3}{4}$ d. Heavy oils, in bulk, 2 $\frac{1}{2}$ d. Carbolie acid, 60 per cent., casks included, east coast, 1s. 1d. to 1s. 1 $\frac{1}{2}$ d., west coast 1s. 0 $\frac{1}{2}$ d. to 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1 $\frac{1}{2}$ d. to 1 $\frac{3}{4}$ d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been quiet throughout the past week, and values are practically unchanged. The Gas Companies still quote £11 10s.; but it is possible to buy outside makes on Beckton terms at £11. In Hull, business is reported to have been done at £11 1s. 3d.; and in Liverpool, at £11 2s. 6d. to £11 3s. 9d. In Leith, business would be possible at £11 5s. to £11 6s. 3d.; but makers are asking more than this.

Quality of Gas at Cheltenham.—At a meeting of the Cheltenham Town Council some time ago, it was decided to forward to the Gas Company a memorial received from residents complaining of the inferior quality of the gas. The Directors have replied to the effect that the quality of the gas supplied in Cheltenham is practically the same as now generally adopted throughout the country. They feel assured that if suitable burners were used, and reasonable attention paid to them, the allegation in the memorial that the gas is less efficient and more expensive than formerly, would be found devoid of foundation. They add that they are willing, when requested by the consumers, to send an inspector to examine fittings and report gratuitously as to any defects; and they are also prepared to continue the free supply of suitable flat-flame burners in place of any old ones of that type still in use.

New Joint-Stock Companies.—The Kingston Lighting Company, Limited, has been registered as a private undertaking, with a capital of £1000, in £1 shares, to carry on the business of gas and general engineers, manufacturers of gas or other light and heat producing agents, incandescent lights, lamps, mantles, and appliances, &c. The registered office is at 52, Brook Street, Hull. The Liverpool Lighting and Heating Company, Limited, with a capital of £1000, in £1 shares, is to carry on the business of manufacturers of, or dealers in, incandescent lights, lamps, mantles, appliances, &c. Other Companies recently registered are the North British Lighting and Heating Company, Limited, of Hull, the Western Incandescent Supply Company, Limited, of Bristol, and the Western Lighting and Heating Company, Limited, of Bournemouth, each with a capital of £1000, in £1 shares. The British Patent Oxide Company, Limited, the capital of which is £12,000, in £1 shares, has been registered to adopt an agreement with Mr. J. Gill, and to acquire and turn to account certain patents for inventions relating to the making of red oxide of iron and other substances, &c.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade of the North-East is active for early shipment; but the high prices asked for forward delivery make such sales slight, with the uncertainty as to future working. In the steam coal trade there is a full shipment, and prices are firm—best Northumbrian steams being about 13s. per ton f.o.b. Second-class steams are 11s. per ton; and steam smalls are quiet at from about 5s. 3d. to 6s. 3d. The output is full at present, and it is well taken up. In the gas coal trade there is only a limited home demand; but the exports are very heavy. The tone of the market is firm; and for early delivery the prices are steady. Durham gas coals vary in quotation from about 9s. 6d. to 11s. per ton f.o.b., according to quality; while for the highest class—"Wear Specials"—about 11s. 6d. is the price. It is believed that very large quantities of gas coal are now being sent abroad to make up for deficient supplies in the winter, when frozen canals prevented delivery. As to contracts, it is reported that only a small portion of the Brussels gas coal contract will be taken from Durham; and the price is said to allow about 10s. per ton for second-class coal. Coke is steady, and gas coke is in fair demand; the output being now small, with fair exports. Good gas coke is from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.

Trade is more active than it has been for some time. The apprehension is seemingly growing that there may be serious trouble ahead. It is reported that manufacturers are now stocking coal. This has an influence on prices, which are quoted: Ell 9s. 9d. to 11s. 6d., splint 10s. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton, f.o.b. Glasgow. The shipments for the week amounted to 337,280 tons—an increase of 22,016 tons upon the preceding week, and of 8632 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,014,991 tons—an increase of 420,477 tons upon the corresponding period.

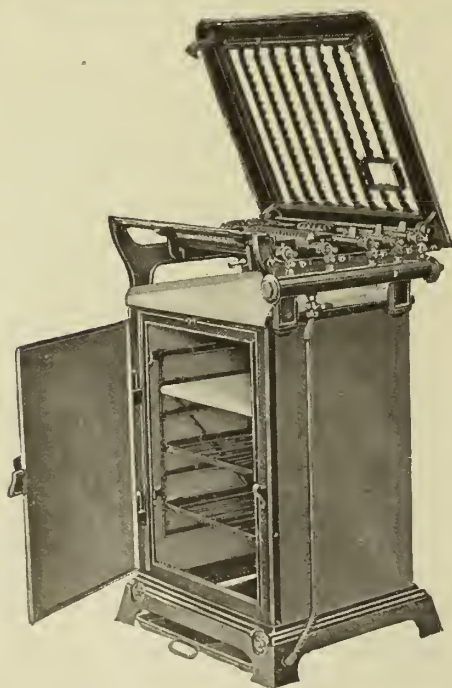
The gross profit of Messrs. Head, Wrightson, and Co. for the year ended April 30 last was £20,123, to which has been added the balance of £1166 brought forward; making a total of £21,289. This the Directors propose to apply as follows: In payment of interest on debentures for the year, £6750; dividend on preference shares to March 31 last, £9302; reserved for dividend on preference shares from March 31 to April 30 last, £845; Directors' fees, excluding management salaries, £2381; expenses of issue of preference shares (balance), £1463; and balance to be carried forward, £546. The Directors much regret that the result of the year's operations has not been so satisfactory as usual, owing to the general scarcity of work and the extreme competition; and they are therefore unable to recommend a dividend on the ordinary shares.

Reduction in Price at Leigh (Lancs.).—At a meeting last week of the Leigh Town Council, Alderman Cowburn said the profit on the gas-works for the past financial year was £3238; and after adding the balance of the previous year, they had a total of £4005. Out of this the Gas Committee suggested that the deficit of £1222 on the water undertaking be paid, leaving a disposable balance of £2782. They recommended that the price of gas be reduced 3d. per 1000 cubic feet. It was resolved that the recommendations of the Committee be approved. Particulars as to the past twelve months' working of the undertaking were given in the "JOURNAL" for June 1 (p. 594).

Middleton Gas Undertaking.—In moving the adoption of the minutes of the Gas Committee, Mr. Parker informed the Middleton Town Council that they had had a falling off at the gas-works during the past year of £1100, as compared with the previous year. The balance-sheet showed that they had a net profit on the past year of £1651. Naturally everybody would ask what they were going to do with it. They were not going to pay anything towards the rates. They had £422 owing in connection with the old debt that they were paying off. By Act of Parliament, they were bound to pay into the fund one-half of the remaining profits for the redemption of annuities. They would thus only have £600 left, and they were committed to spend £2000 in order to be ready for the foggy weather. Alderman Schofield, in seconding the minutes, said that the profit for the past year was, taking everything into consideration, very satisfactory. Mr. Ritchie moved an amendment to the effect that the minutes be passed with the exception of the one to the effect that all charges for hire of stoves be discontinued from June 3, 1909, and that the price of gas used for stoves be the same as that charged for lighting purposes. On being put to the vote, the amendment was defeated; and the minutes were then passed.

Sales of Stocks and Shares.—Last Wednesday, Messrs. A. & W. Richards sold, at the Mart, Tokenhouse Yard, E.C., by order of Directors, some £10 new ordinary 5 per cent. maximum shares in the Southend Water-Works Company at £10 to £10 2s. 6d. each; and new issues of £1000 of 4 per cent. perpetual debenture stock and £8000 of new ordinary stock of the Great Yarmouth Water Company at £103 10s. to £105 and £95 10s. to £96 respectively per £100 of stock. The £20,000 of 5 per cent. ordinary stock recently offered in our columns for sale by tender by the Directors of the East Hull Gas Company was considerably over-subscribed for at prices ranging from £105 (the minimum) to £107 10s. per £100 nominal of stock. Tenders for the purchase of £10,000 of 4½ per cent. preference stock of the Sutton District Water Company were opened last Friday, and amounted to £15,800, at prices ranging from £120 to £121 0s. 6d. per cent.; the latter being the price obtained. Some shares in the Eton Gas Company offered for sale by Messrs. Buckland and Sons at the Castle Hotel, Windsor, on Wednesday last, were sold as follows: 21 "A" original shares of £15 each, fully paid, at £31 per share; one "B" original share of £15, at £19 15s.; 8 new "B" shares of £15, upon which a call of £5 had been paid, at £7 and £6 17s. 6d. each.

HIRING POINTS



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For the Gas Company :
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Unprofitable Electricity at Loughborough.

Some time ago, the Loughborough Corporation decided to call in an expert to report on their electricity undertaking, which had proved somewhat of a disappointment to the town; and Mr. J. F. C. Snell, who was selected for the task, has now presented to the General Purposes Committee the results of his investigations. Dealing with the works themselves, he says the cost of repairs appears to have been "utterly abnormal" in 1908 for the size of the plant installed, and includes certain extraordinary expenditure which should not recur. One of the chief causes of the present *impasse* is that the average rate per unit sold is too low, and consequently every additional lighting consumer (at the equitably higher rate paid for lighting) is a step towards the self-supporting stage. An estimate has been made of the output that must be secured before this desirable end is reached; and the figure is placed at 500,000 units, or double the present quantity. The existing practice of the Gas and Electricity Committee, governing both the gas and electrical undertakings, is condemned by Mr. Snell as being unfair to the members of the Committee, to the ratepayers, and to the departments governed; and the formation of an independent Electricity Committee is recommended. In conclusion, Mr. Snell states that the report and analysis has been of the most difficult nature, and he regrets he has been unable to suggest any immediate improvement. He has indicated small alterations in the power-house which will result in some economies. These should amount to a total at the present rate of output of about £300 a year. It is not, however, in the cost of production that the present weakness lies, but in the small output and small revenue on the capital expended. This loss is made up of two factors—(a) The temporary disproportionate capital expended on which annual standing charges have to be met; and (b) the low charges made for energy supplied. This capital having been invested, it is only by an expansion of business on commercial lines that the department can become self-supporting. A serious loss is made upon the supply to power users. The General Purposes Committee decided not to adopt the recommendation that the electricity undertaking should be placed under the control and management of a separate committee.

Gas Tragedy at Leeds.—Annie Armitage, a Leeds widow, 50 years old, who had been in ill-health for some time, was found dead in her bedroom, with the gas turned full on. A mat had been placed against the door.

Automatic Public Lighting at Edmonton.—The Edmonton District Council has decided to enter into an agreement with the Tottenham and Edmonton Gas Company for the Company to light the district automatically with gas for a period of ten years from the 1st prox., and to supply lanterns and burners complete.

Suicide by Gas at Slattocks.—A verdict of "Suicide during temporary insanity" was returned by the Coroner's Jury who inquired into the circumstances attending the death of Mrs. Devereaux, aged 32, of Slattocks, who was found dead with a shawl round her head and a tube leading from a gas-pipe in her mouth; the gas being turned on. Her husband said she had previously, when out of her mind, tried to do a similar thing.

Water Supply of Bedale.—A Local Government Board inquiry has been held by Dr. Brightmore respecting an application by the Bedale Rural District Council for sanction to borrow sums amounting to £4000 for the purposes of water supply for the townships of Bedale and Aiskew, including the execution of works in the township of Rand. Mr. F. G. Fairbank, an Engineer, of York, said that the population of Bedale and Aiskew was 1400; and the proposed supply was 15 gallons a day per head, or 75 gallons per house, equal to a supply of 21,000 gallons. The gauging of the springs in the Keepers' Wood on four occasions since 1897 to last August showed that there were 61,000 gallons a day, even when taken at an exceptionally dry season, and when the flow of the springs was the lowest known for many years. The reservoir would be situated on the highest ground in the immediate neighbourhood. Mr. Horner, on behalf of the farmers in the district, objected to being saddled with the expenditure when they would reap no benefit from the scheme. Mr. Fairbank pointed out that it had not been definitely settled whether the cost should be borne by the whole district or by consumers only. He said it was the best scheme under all the circumstances. There would be almost twice the quantity of water that would be required. The Inspector said the Local Government Board could not sanction the scheme until the wayleaves were settled; so that the matter would have to remain in abeyance pending some final agreement being entered into.

Gas-Works' Results at Colwyn Bay.—At the last meeting of the Colwyn Bay Urban District Council, the Lighting Committee reported a make of gas for last year of 72,400,000 cubic feet. Of this, 61,061,500 feet were sold, 1,075,000 feet used on works, &c., and 10,263,500 feet unaccounted for. Mr. Dickin, the Chairman of the Committee, said some of the mains had been laid twenty years, which might have something to do with the leakage of 14 per cent. He had no doubt the Committee dealing with the matter would see that this leakage was reduced to normal proportions. The profit and loss account showed a serious loss; and, as things were, he considered it time the Council began to pay for the lighting of the town, instead of putting this expense on the gas and electric light concerns. The figures he had before him showed a loss of £1942 on the year's working. But the situation really was not so bad as it looked on paper, for during the past two years the Council had been spending a lot of money on the works, necessitating the borrowing of £20,000, and by way of interest and sinking fund they had to pay £1000 last year. In addition, they had to pay £550 in the shape of extra rates. Another £1000 was due to the expense of lighting the streets. In fact, the concern was never more prosperous *per se* than it was at present; for they were ready to supply every house that could be built. At the same time, his opinion was that the Council had not had good financing in these matters for a long time. As a Committee had been appointed to go into the whole question, he hoped the Council would let the matter be where it was till the Committee reported. The minutes of the Lighting Committee were adopted.

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The Proposed Pension Scheme at Coventry.

In a report to be laid before the Coventry Town Council at their next meeting, the Gas Committee state that they have gone carefully into the whole circumstances regarding the proposed establishment of a scheme for granting pensions to certain men who have served the department for long periods, and whose services it will be necessary to dispense with owing to the discontinuance of gas manufacture at the old works. The Committee state that they still consider the best way of dealing with the matter is by the establishment of a scheme for weekly payments on the lines of that presented to the Council at the last meeting. It is impracticable to adopt the suggestion which was made at the Council meeting, that arrangements should be entered into to retain the men in the employment of the department, as the staff is fully adequate for all requirements. The continued employment of these men would hamper rather than facilitate the work. The only course open, therefore, is to dispense with their services; and, this being the case, the Committee adhere to the opinion which they expressed in their former report that, though the Corporation are under no obligation in the matter, it will be equitable to make some provision for these men. The Committee think that probably a modification of the scheme presented at the last meeting will meet the views of the Council; and they have accordingly prepared an amended scheme, whereby the weekly payments in the case of all the three classes are reduced by 2s. Men who have served 25 years and over are to be paid 10s. per week; those who have served for 20 years but less than 25 years, 8s. a week; and men who have served 10 years and less than 20 years, 6s. a week. It has been ascertained that the number of men qualified to receive the benefits of the scheme is eighteen; and the total amount involved is £369, which represents the maximum annual cost of the scheme. This will, of course, become less as time goes on, and the number of pensions is diminished.

Purification of the Thames.—In the recently published annual report of the Conservators of the Thames, it is stated that during the past year sewage from twelve places, representing a population of 17,000 persons, was diverted from the river and the streams connected therewith. Works for the purification of drainage are now in operation at nearly all towns and centres of population; and where, in a few instances, pollution still reaches the streams, sewage-disposal systems have been carried out.

Gas Profits at Devonport.—In spite of the agitation and criticism which marked the history of the Devonport Gas-Works during the past year, the undertaking appears to have had a very prosperous time. At the meeting of the Town Council on Thursday last, Alderman Tozer, the Chairman of the Gas Committee, stated that the annual report was in preparation, and would be presented at the next meeting. It would show a net profit of £1612, which was more than double the amount realized last year.

Improvement of the Ashburton Gas-Works.—At the last meeting of the Ashburton Urban District Council, a discussion took place on the question of improving the gas-works. Mr. J. A. Gray, the Manager of the Teignmouth Gas-Works, had made an inspection at the request of the Gas Committee, and recommended a number of alterations and additions, with a view to effecting economy in the working. One of the main suggestions was the erection of a new and larger holder. The Council empowered the Gas Committee to enter into negotiations for a site for the holder, and also ascertain on what terms money could be obtained for carrying out the proposed improvements.

Street Lighting in Leeds.—The Street Lighting Committee of Leeds, in their annual report to the Corporation, state that the work of converting the ordinary lamps from single flat-flame to incandescent has been continued; and 563 lamps in various parts of the city have been so altered during the year. The Committee have under consideration the question of adopting a system of automatic lighting and extinguishing of public lamps. As an experiment, 100 automatic controllers have been purchased and fixed in various parts of the city. Electric arc lighting has been substituted for gas lighting as follows: Aire Street, 6 lamps; Whitehall Road, 25; Kirkstall Road, 22; Central Road, 4; subway from Whitehall Road to Gelderd Road, 4.

Gas-Lighting for Schools.—The Plymouth Education Committee, at their last meeting, had under consideration the question of improving the lighting of the schools. Estimates were submitted by the Corporation Electrical Engineer and the Superintendent of Street Lighting with reference to two of the schools. In the case of the Regent Street Intermediate School, the Electrical Engineer estimated the cost of installing electric light at £170; while the estimate of the cost of bringing the gas lighting thoroughly up-to-date was £54. The other case was that of the Corporation Grammar School, the estimates for which were: Electrical installation, £110 10s.; improved gas service, £25 10s. The Committee decided to have the gas service of both schools improved, and asked the Superintendent of Street Lighting to examine and report on the whole of the gas-fittings in the schools of the borough.

Alleged "Offensive Effluvia" from the Wrexham Gas-Works.—The attention of the Wrexham Gas Company having been called to complaints of smells in the neighbourhood of the sulphate works, the Secretary has written to the Health Committee pointing out that, as the Medical Officer had already reported, there was nothing prejudicial to health in such smells. He added a suggestion by the Directors that the complaint might arise from some other source—possibly the refuse destructor at the Corporation dépôt. When the letter came before the Committee, Mr. Williams said there was no doubt about the smells being noxious; for a large number of people intended to leave their houses in consequence of them. If this were so, it could easily be imagined what deterioration of property in the neighbourhood would follow. The Mayor (Mr. Thomas Sauvage) thought a letter like the one from the Gas Company ought not to be addressed to the Council. It was decided that the Medical Officer and the Sanitary Inspector should look out for a recurrence of the nuisance, and that they would report the matter, if necessary, to the Local Government Board.

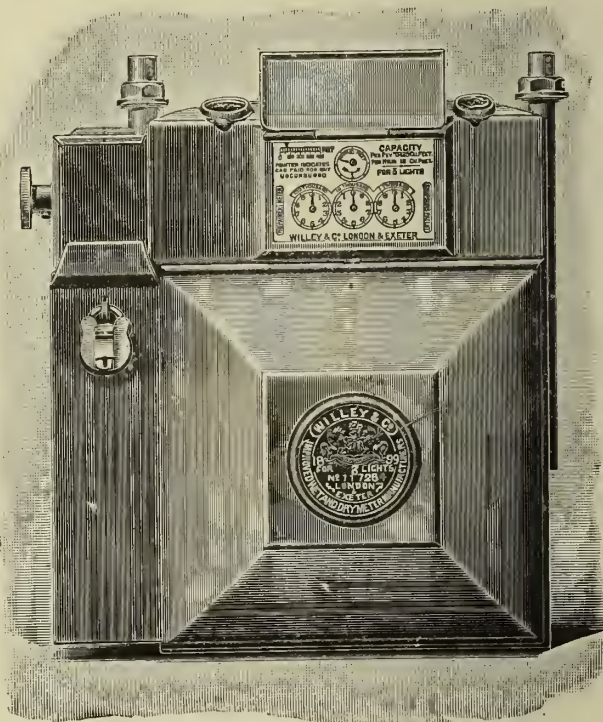
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AGENTS FOR SCOTLAND

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Messrs. Harold Nickson and Co., Limited, of Manchester, send a renewal of their glass paper-weight calendar, which was distributed some years ago.

Mr. F. H. Tulloch held an inquiry at Cymmer last Tuesday into a proposal by the Glyncoirwg Urban District Council to borrow £700 for the extension of their gas-works. There was no opposition.

A contract has been placed with Messrs. Willey and Co., Limited, of London and Exeter, by the Devonport Corporation for five 15-inch and two 10-inch Simpson's patent station governors, together with the necessary valves and connections.

Last Wednesday, gas-works were opened at Woodford Halse by Mr. G. A. Sheppard, who was supported by a large and influential body of parishioners. After the opening ceremony, a party of about fifty dined at the White Hart Hotel, as the guests of the promoters of the undertaking.

Messrs. C. & W. Walker, Limited, of Donnington, send us one of the hand-blotters which they are distributing among gas engineers and secretaries. On the front of the blotter are numerous views of work carried out by the firm; a glazed surface being provided along which the hand glides smoothly.

It is reported that the Hipperholme Urban District Council have secured a six months' option for the purchase of the Bailiffe Bridge Gas Company's undertaking. The Hipperholme district is at present supplied from Halifax; and the Council have been endeavouring to secure better terms from the Corporation.

On the recommendation of the Finance Committee, the Burslem Town Council have agreed that, in pursuance of resolutions passed by the Electric Lighting Committee and the Gas Committee, the Borough Treasurer be authorized to transfer the sum of £1700 from the electric lighting fund and of £5000 from the gas fund to the credit of the new public buildings fund.

The Paddington Guardians have prepared a statement showing the cost of gas and electric light in the several establishments under their supervision during the last ten years. In 1899-1900, the amount paid for gas was £754, and for electric light £245; in 1903-4, the figures had risen to £819 for gas and £540 for electric light; while in the year 1908-9, they were £740 and £617.

At the Parish Hall, Edison Road, Crouch End, under the management of the Hornsey Gas Company, an interesting and instructive exhibition is now being held. Among the exhibits are Richmond and Davis cookers; Bland lights; and high-pressure illumination and other specialities by Mr. W. Edgar. We may next week take an opportunity of referring more fully to what is to be seen.

The Brighouse Gas Committee have interviewed nine selected candidates for the position of Manager of their works, for which a commencing salary of £250 is offered; and as a result, the number was further reduced to two. The Committee then decided to send a deputation to visit the gas-works in which these applicants are at present engaged, after which the appointment would be finally made.

The Coleraine Urban District Council recently discussed tenders from thirteen firms containing offers for the supply of 33 different classes of gas coal. After careful consideration, it was resolved that the Council be recommended to accept the tender of Mr. Thomas Duncan for the supply of 1000 tons of Walker's silkstone double screened, delivered at Coleraine harbour, and also the tender of the Eveson Coal and Coke Company, Limited, for the supply of 1000 tons of Wrexham coal on the same conditions.

At the Jarrow Police Court last Thursday, Andrew Durham was sentenced to two months' imprisonment on each of two charges of being on enclosed premises for an unlawful purpose and doing wilful damage to a gas-meter belonging to the South Shields Gas Company. It was stated that early last Tuesday morning, Durham was found in the gas-works. He told a police constable that he was working on the night-shift; but as a matter of fact he was not employed by the Company at all. He had done some serious damage to a gas-meter with a hammer and chisel.

On the occasion of their annual outing recently, the employees of the St. Austell Gas Company visited Truro, and proceeded thence by steamer to Falmouth. While at Truro, they visited the gas-works, and were made welcome by the Manager (Mr. S. J. Ingram). At Falmouth, the party was joined by Mr. H. H. Hoare, the Manager of the Falmouth Gas-Works, and Mr. Gatheridge, the Manager of the Povey Gas-Works. Mr. H. E. Riley, the Manager of the St. Austell Gas-Works, was heartily thanked at luncheon for the excellent arrangements, and in reply commented upon the good relations existing between the Directors of the Company and their employees.

The output of the Ryde Water-Works has, in thirty years, risen from 100 million gallons to 220 million gallons; and in order to provide against any possible contingency, the Town Council last Tuesday, with only two dissentients, agreed to apply to the Local Government Board to approve a loan of £5000 for carrying out the first portion of an improved scheme, the plans of which were furnished by Mr. Matthews. Mr. Randall said they were prepared to run the risk of a little unpopularity, but they could not jeopardize their water supply for the sake of an increased yearly rate of 2d. in the pound. The new scheme includes the abolition of the upper reservoir, and placing the whole of the supply under ground. The opponents held that a smaller expenditure would meet the requirements of the district.

The "Barrow News" for the 12th inst. says: "We had the opportunity of inspecting a fire burning the new coalexld fuel at the Imperial Hotel, Barrow, last Wednesday. It had been alight for two hours, and was burning brightly and giving out great heat. This fuel gives a clean, bright red fire, does not produce smoke, and is only half the price of best coal. The process by which it is produced at gas-works enables gas companies to dispose of all the coke they produce at a higher price than is obtained for ordinary coke. In many of the big towns of the country it is being largely used, and is growing in popularity every day. Freedom from arsenic is one of the good features of the new comer, which, by the way, won a diploma of merit at the Smoke Abatement Exhibition in Sheffield last March."

MEETING OF THE INSTITUTION OF GAS ENGINEERS LONDON.

June 15 to 18, 1909.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MAINS SUPERINTENDENT (£400 PER ANNUM). South Metropolitan Gas Company. Applications by June 19.
WATER ENGINEER (BOMBAY). Applications to Messrs. John Taylor, Sons, and Santo Crimp, by July 1.
DRAUGHTSMAN. No. 5107.
ESTIMATOR (GAS, WATER, AND SEWERAGE WORKS). Applications to J. & H. Robus, Strand, W.C.
SHOW-ROOM SALESMAN. No. 5106.
GAS FITTER. Cradley Heath Gas Company.

Situations Wanted.

ENGINEER AND MANAGER OR ASSISTANT. No. 5104.
PRODUCER GAS AND AMMONIA RECOVERY WORKS. No. 5105.
SECRETARY, MANAGER, OR ACCOUNTANT. W. B. Miumack, St. Paul's Cray.
SULPHATE, LEADWORK, &c. 117, Galloway Road, Shepherd's Bush, W.

Correspondence Classes.

CORRESPONDENCE COLLEGE COMPANY. Department B., Cambridge.

Plant, &c. (Second-Hand), for Sale.

ASCENSION PIPES, &c., CONDENSERS, PURIFIERS, GOVERNOR, ENGINE AND EXHAUSTERS, WEIGHT-BRIDGE, &c. Draycott Gas Company.
EXHAUSTERS, &c. Stirling Gaslight Company. Tenders by June 30.
GAS-WORKS PLANT. Long Eaton Gas Company.
PURIFIERS, &c. Bridlington Gas Company.
PURIFIERS, &c. Sutton Gas Company.
STATION METER. T. G. Marsh, Manchester.
WASHERS, &c. Romford Gas-Works.

Stocks and Shares.

DRAKES LIMITED. June 18.

TENDERS FOR

Coal and Cannel.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by June 25.
BEVERLEY GAS DEPARTMENT. Tenders by June 24.
HUDDERSFIELD GAS DEPARTMENT. Tenders by June 23.
KESWICK GAS COMPANY. Tenders by June 23.
LIMERICK GAS COMMITTEE. Tenders by June 21.
MANSFIELD GAS DEPARTMENT. Tenders by June 19.
MARPLE GAS DEPARTMENT. Tenders by June 30.
NEWRY GAS DEPARTMENT. Tenders by June 25.
OLDBURY GAS DEPARTMENT. Tenders by June 26.
WOMBWELL URBAN DISTRICT COUNCIL. Tenders by June 30.

Engine (Gas).

SWADLINCOTE GAS DEPARTMENT. Tenders by June 30.

Exhauster, Governor, Valves, &c.

SWADLINCOTE GAS DEPARTMENT. Tenders by June 30.

Gasholder and Tank.

SWADLINCOTE GAS DEPARTMENT. Tenders by June 30.

Lime.

MANSFIELD GAS DEPARTMENT. Tenders by June 19.
MARPLE GAS DEPARTMENT. Tenders by June 30.

Tar and Liquor.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by June 25.
FARNWORTH AND KEARSLEY GAS COMPANY. Tenders by June 23.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 19.
MARPLE GAS DEPARTMENT. Tenders by June 30.
OLDHAM GAS DEPARTMENT. Tenders by June 22.
READING GAS COMPANY. Tenders by June 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 706.

Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue	Share.	When ex-Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½-18	..	5 11 1	561,000	Stk.	Feb. 25	10	Liverpool United A.	225-227	..	4 8 1
298,955	10		7	Do. 7 p.c.	12½-13	..	5 7 8	718,100	"	"	7	Do. B.	168-170	..	4 2 4
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98-100	..	4 0 0	306,083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
200,000	5	May 27	6½	Bombay, Ltd.	5½-5½	..	5 12 7	75,000	"	June 11	6	Malta & Mediterranean.	48-48*	..	6 3 1
40,000	5	"	6½	Do. New, £4 paid.	4½-4½	..	5 18 10	500,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100-102	..	4 7 5
50,000	10	Feb. 25	14	Bourne-) 10 p.c. . .	28½-29½	..	4 15 9	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101-103	..	4 7 8
51,810	10	"	7	mouth Gas B 7 p.c. .	16½-17	..	4 2 4	541,920	20	May 27	3½	Monte Video, Ltd.	12½-13	..	5 7 8
53,200	10	"	6	and Water) Pref. 6 p.c.	15½-15½	..	3 15 7	1,775,892	Stk.	Feb. 25	4½	Newcastle & Gt. Sth'd Con.	106½-107½	..	4 3 9
380,000	Stk.	"	12½	Brentford Consolidated	250-252	..	4 19 2	518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91-93	..	3 15 3
300,000	"	"	9½	Do. New . . .	193-195	..	4 17 5	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½-20	..	5 3 8
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	55,940	Stk.	"	7	Do. 7 p.c.	13-13½	..	5 3 8
206,250	"	June 11	4	Do. 4 p.c. Deb.	99-101*	..	3 19 3	300,000	"	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
220,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	212-214	..	5 0 6	60,000	5	Mar. 31	8	Ottoman, Ltd.	6-6½	..	6 8 0
246,320	"	"	7½	Do. A Ord. Stk.	154-156	..	4 19 4	31,800	53	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
467,000	20	Apl. 16	10	British . . .	42½-43½	..	4 12 6	60,000	50	"	13	Do. B.	129-131	..	4 19 3
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119-121	..	4 18 12	100,000	50	"	12	Do. C.	119-121	..	4 19 2
165,700	"	"	4½	Do. B 3½ p.c. . .	89-91	..	4 18 11	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
82,278	"	"	5½	Do. C 5 p.c. . .	108-110	..	5 0 0	398,490	5	May 13	7	Primitiva Ord.	6½-7	..	5 0 0
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½-14½	..	4 18 3	796,983	100	Jan. 28	5	Do. 5 p.c. Pref.	5½-5½	..	4 10 11
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	488,920	100	June 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
100,000	10	"	—	Cape Town & Dis., Ltd.	4½-5	..	—	1,000,000	10	Apl. 29	8	River Plate Ord.	14½-15½	..	5 4 11
100,000	10	"	—	Do. 4½ p.c. Pref.	5½-6	..	—	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	250,000	10	Mar. 31	8	San Paulo, Ltd.	13½-14½	..	5 12 3
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78-80	..	5 12 6	62,500	10	"	—	Do. 6 p.c. Pref.	11½-12½	..	4 18 0
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50½-51½	..	4 17 1
1,493,280	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk.	108-110	..	4 14 6	135,000	Stk.	Mar. 12	10	Sheffield A . . .	236-238	..	4 4 0
560,000	"	"	5	Do. 3½ p.c. do.	103-105	..	4 15 3	209,984	"	"	10	Do. B . . .	233-235	..	4 5 1
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83*	..	3 12 3	523,550	"	"	10	Do. C . . .	234-236	..	4 4 9
800,000	Stk.	"	7	Continental Union, Ltd.	96-98*	..	5 2 0	70,000	10	June 11	10	South African . .	13½-14*	..	7 2 10
200,000	"	"	7	Do. 7 p.c. Pref.	135-137*	..	5 2 2	6,420,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122-124	..	4 6 0
492,270	Stk.	"	—	Derby Con. Stk. . .	121-123	..	4 1 4	1,895,445	"	Jan. 14	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
55,000	"	"	4	Do. Deb. Stk. . .	103-105	..	3 16 2	209,823	Stk.	Mar. 12	8	South Shields Co. Stk.	152-154	..	5 3 11
148,095	"	Mar. 31	5	East Hull 5 p.c. Ord.	100-102	..	4 18 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
486,090	10	Jan. 28	12	European, Ltd.	24-24½	..	4 18 0	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
351,660	10	"	12	Do. £7 10s. paid.	18-18½	..	4 17 4	117,050	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
15,161,545	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0	502,310	Stk.	May 13	5	Southampton Ord.	110-112	..	4 9 3
2,600,000	"	"	3½	light 3½ p.c. max.	88-89	..	3 18 8	120,000	Stk.	Feb. 25	6½	Tottenham 5 p.c.	132-134	..	5 0 9
3,799,735	"	"	4	Do. 4 p.c. Con. Pref.	105-107	..	3 14 9	423,940	"	"	5½	and B 3½ p.c.	111-113	..	4 12 11
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	84-85*	..	3 10 7	149,470	"	Dec. 30	4	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
258,740	Stk.	Mar. 12	4½	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	182,380	10	June 11	8	Tuscan, Ltd.	8½-9*	..	8 17 10
82,500	"	"	6½	Do. do. 5 p.c.	118-120	..	5 4 2	149,000	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½-18	..	6 2 3	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	105-107	..	4 13 6
123,570	Stk.	Mar. 12	6½	Ilford A and C . . .	138-140	..	4 12 10	255,636	Stk.	Feb. 25	6½	Wands- } B 3½ p.c.	139-141	..	4 12 2
65,783	"	"	5	Do. B . . .	105-107	..	4 13 6	79,416	"	Dec. 30	3	worth } 3 p.c. Deb. Stk.	73-75	..	4 1 1
63,000	"	Dec. 30	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	395,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	121-123	..	4 5 4
4,940,000	Stk.	May 13	8	Imperial Continental	179-181	..	4 8 5	210,000	"	"	5	Do. 5 p.c. Pref.	125-127	..	3 18 9
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4								

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Apply to the SECRETARY, Gas Office, Sutton, SURREY.

LONG EATON GAS COMPANY.
FOR SALE—The Plant at the Sandiacre
Gas-Works.
Schedule and further Information may be had from
the undersigned.
G. STEVENSON,
Secretary and Manager.
Long Eaton, near Nottingham.

FOR SALE—Set of Four Water-Lute
PURIFIERS, 10 feet Square. Walker's 10-inch
Centre Valve, Travelling and Lifting Gear, Grids,
Connections, &c., complete. Being replaced by larger
ones. Will be sold Cheap for prompt removal.
JOHN KELLY,
Secretary.
Bridlington Gas Company,
June, 1909.

THE Romford Gas and Coke Company,
Limited, have FOR DISPOSAL: One LIVESEY
WASHER, 250,000 Cubic Feet per Diem, with 8-inch
Inlet, Outlet, and Bye-Pass Valves and Connections;
also One, Two-Chamber COCKEY'S WASHER with
10-inch Inlet, Outlet and Bye-Pass Valves and Con-
nections, each Chamber fitted with Patent Overflow.
All in Excellent Condition.
For Price and Particulars, Apply to Mr. W. D.
CHILD, Gas-Works, Romford, ESSEX.

DRAYCOTT GAS COMPANY.
FOR SALE—The Dismantled Plant at
the Castle Donington (near Derby) Gas-Works,
viz.: ASCENSION PIPES, ARCH PIPES, MOUTH-
PIECES, HYDRAULIC MAIN, CONDENSERS,
PURIFIERS, CENTRE VALVE, STATION GOVER-
NOR, EXHAUSTER, and CART WEIGHBRIDGE.
Also at Draycott Gas-Works, FOR SALE (but still in
use) FOUR PURIFIERS (nearly new), GAS-ENGINE,
EXHAUSTER, &c.
For further Particulars and to view, Apply to the
MANAGERS at the respective Works.

STIRLING GASLIGHT COMPANY.
FOR SALE—Two Rotary Exhausters,
with Valves and Compensator complete, each
capable of passing about 25,000 Cubic Feet of Gas per
Hour. Each Exhauster has a separate Steam-Engine.
The Exhausters are in Good Working Order, and are
being Replaced with larger ones. The Exhausters may
be seen working by Appointment with the undersigned.
Delivery about August.
Offers to be lodged with the undersigned not later
than the 30th inst.
JAMES D. SMITH,
Engineer and Manager.

Gas-Works, Stirling,
June 9, 1909.

WE have the following New and Over-
hauled Second-Hand PLANT FOR SALE:—
GASHOLDER (Two-lift), 50 ft. by 18 ft., in BRICK
or NEW STEEL TANK.
GASHOLDER (Two-lift), 50 ft. by 16 ft., in NEW
STEEL TANK.
GASHOLDER (8500 cub. ft.), in NEW STEEL
TANK (and smaller in stock).
Annular CONDENSERS, 8-in., 12-in., and 18-in.
diameter Connections.
Water-Tube CONDENSERS (set of Three), 6-in.
Connections.
Morris & Cutler CONDENSER, 8-in. Connections.
Pipe CONDENSERS, from 4 ins. up to 12 ins.
Clapham's WASHER-SCRUBBER, 6-in. Con-
nections.
Tower SCRUBBERS, 7 ft. by 55 ft., 4 ft. by 16 ft.,
3 ft. 6 ins. by 16 ft., &c.
EXHAUSTERS and ENGINES (Single and Com-
bined) 2000 to 60,000 cub. ft.
PURIFIERS, 6 ft., 8 ft., 12 ft., and 20 ft. Squares.
In sets of 2's or 4's.
STATION METERS, 4 in. to 18 ins., New Drums,
Governors, 4 ins. to 10 ins.
TAR and LIQUOR PUMPS, for Hand Working
and Steam Power.
BOILERS, TANKS, VALVES, and all Requisites
for Gas-Works.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, Dewsbury, YORKS.

FOR SALE—Square Station Meter,
10,000 feet per Hour (New Drum by Braddock),
Replaced by larger size Rotary Meter.
Apply to T. G. MARSH, Mawson Chambers, 28, Deans-
gate, MANCHESTER.

THE Directors of the Keswick Gas Com-
pany invite TENDERS for the Supply of 2000
Tons of Best Screened GAS COALS or NUTS, to be de-
livered at Keswick Railway Station between the 1st day
of July, 1909, and the 30th of June, 1910, in such Quan-
tities and at such times as may be required.
Tenders, stating Price per Ton, endorsed "Tender
for Coal," to be sent to the undersigned not later than
the 23rd inst.
The Directors do not bind themselves to accept the
lowest or any Tender.
No Form of Tender supplied.
J. H. BRODIE,
Secretary.
Main Street, Keswick,
June 11, 1909.

THE Directors of the Keswick Gas Com-
pany invite TENDERS for their Surplus TAR
and AMMONIACAL LIQUOR for Twelve Months from
the 30th inst., at per Ton delivered into Contractors'
Tanks at Keswick Railway Station.
Tenders, endorsed "Tender for Tar," or "Liquor,"
will be received by the undersigned on or before the
23rd inst.; but the Directors do not bind themselves to
accept the highest or any Tender.
Forms of Tender are not supplied.
J. H. BRODIE,
Secretary.
Main Street, Keswick,
June 11, 1909.

BAKEWELL URBAN DISTRICT COUNCIL.
TENDERS are invited for the Supply
of GAS COAL (1300 to 1500 Tons), and 200 Tons
of CANNEL for One Year, delivered at Bakewell
Station (Midland).
Forms of Tender and Particulars can be obtained
from the undersigned, to whom Tenders must be sent
by the 25th of June.
Also for the Purchase of Surplus TAR and LIQUOR
during Twelve Months from July 1 next, Delivery free
in Purchasers' Tanks at Bakewell Station (Midland).
Endorsed Tenders to reach the undersigned by June
25.
V. R. COCKERTON,
Clerk.
Bakewell.

FARNWORTH AND KEARSLEY GAS
COMPANY.
THE Directors are prepared to receive
TENDERS for their Surplus Make of TAR and
AMMONIACAL LIQUOR for a Term of One or Two
Years commencing the 1st of July, 1909.
Sealed Tenders to be addressed to James Fletcher,
Esq., J.P., Chairman, Gas Offices, Cross Street, Farn-
worth, and delivered not later than Wednesday, the
23rd of June next.
Forms of Tender and any further Information may be
obtained from Mr. H. Pickford, Manager.
W. BROMLEY,
Secretary.
Gas Offices, Farnworth,
June 8, 1909.

MARPLE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)
COAL, CANNEL AND LIME.
THE Gas Committee of the above
Council invite TENDERS for the Supply of
GAS COALS, CANNEL, and Best Hand-Picked Buxton
LIME, as required at their Gas-Works, Marple Bridge,
during the period ending March 31, 1910.

TAR AND LIQUOR.
TENDERS are also invited for the Pur-
chase of the Surplus TAR and AMMONIACAL
LIQUOR produced at the Gas-Works during the period
ending March 31, 1910. The Tar and Ammoniacal
Liquor will be required to be taken direct from the
Works by the purchaser.
Forms of Tender (for Coals and Cannel only), and
Conditions upon which Tenders only will be received,
may be obtained on Application to Mr. Jas. K. Law,
Gas Manager, Marple Bridge, near Stockport.
Tenders, endorsed "Coals," "Lime," &c., as the
case may be, and addressed to the Chairman of the
Gas Committee, to be delivered at the Council Offices,
Marple, by Four o'clock p.m., on Wednesday, June 30,
1909.

CHARLES F. JOHNSON,
Clerk to the Council.
Public Offices, Marple, Cheshire,
June 11, 1909.

READING GAS COMPANY.
TENDERS FOR TAR.

THE Directors of the Reading Gas
Company invite TENDERS for the Purchase of
their Surplus CARBURETTED WATER-GAS TAR,
for One Year, commencing on the 1st of July next.
Specifications for the Contract will be forwarded
on Application to the Engineer and Manager, Mr.
Douglas H. Helps, Assoc. M.Inst.C.E.
Under the Conditions of the Contract, an allowance
will be made for all Water that may be found in the
Tar in excess of 5 per cent.
Railway and River Communication direct to the
Works.
Tenders, endorsed "Tender for Tar," and addressed
to the undersigned, must be delivered not later than
Monday, the 21st inst.
The Directors do not bind themselves to accept the
highest or any Tender.
A. CANNING WILLIAMS,
Secretary.
159, Friar Street, Reading,
June 2, 1909.

URBAN DISTRICT COUNCIL OF NEWRY.

TENDER FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the Supply and Delivery of about 5000 Tons of GAS COAL, Screened and Unscreened, for Twelve Months commencing July 1 next.

Specification and Form of Tender may be obtained on Application to Mr. B. Gibson, Gas Manager.

Sealed Tenders, endorsed "Coal," to be forwarded to the Chairman, Gas Committee, Town Hall, Newry, not later than Friday, the 25th of June, 1909.

The lowest or any Tender not necessarily accepted.

Wm. M. Cronin,

Town Clerk.

Town Hall, Newry,
June 11, 1909.

COUNTY BOROUGH OF HUDDERSFIELD.

TENDERS FOR GAS COAL.

THE Gas Committee of the Corporation are prepared to receive TENDERS, from Colliery Proprietors only, for the Supply and Delivery of Unscreened GAS COAL.

Full Particulars and Form of Tender may be obtained on Application to Mr. Edward A. Harman, M.Inst.C.E., Engineer and Manager, Gas-Works, Leeds Road, Huddersfield.

Sealed Tenders, endorsed "Tender for Gas Coal," must be delivered, free of charge, addressed to the Town Clerk, Town Hall, Huddersfield, not later than noon on Wednesday, the 23rd day of June, 1909.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,

J. HENRY FIELD,

Town Clerk.

Town Hall, Huddersfield,
June 10, 1909.

URBAN DISTRICT COUNCIL OF OLDBURY.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for the Supply of 12,000 Tons of Best Screened GAS COAL, for Delivery during the Year ending July 31, 1910, in such Quantities and at such times as ordered, delivered free at (1) Oldbury Basin (Great Western Railway), and (2) London and North Western Railway, Bromford Lane, Oldbury.

Further Particulars and Tender Forms may be obtained on Application to the undersigned.

Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered to the undersigned not later than Saturday, June 26, 1909.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,

A. COOKE,

General Manager.

Gas-Works, Oldbury,
June 12, 1909.

MANSFIELD CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL, CANNEL, AND LIME,
AND
TENDERS FOR SURPLUS TAR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 12,000 Tons of Best Screened GAS COAL, delivered at Mansfield Station for One Year from the 1st of July, 1909, to the 30th of June, 1910.

LIME.

For the Supply of about 150 Tons of best Hand-Picked LIME. Delivered as above.

TAR.

TENDERS for Surplus TAR made from the 1st of July, 1909, to the 30th of June, 1910.

Tenders, endorsed "Coals," "Lime," or "Tar" as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before June 19, 1909.

Particulars and all other Information from the undersigned.

NOTE: No Special Forms of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,

Engineer and Manager.

Gas-Works, Mansfield,
June 8, 1909.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the Supply of not exceeding 6000 Tons of Screened GAS COAL or GAS NUTS, for use at the Gas-Works, Beverley, for a period of Twelve Months, to be delivered as from time to time directed, and at the expense of the Contractors, i.e. at Keadby or at the Pits, or at the Railway Station, Beverley, according to Terms of Contract. The Coal to be of the best kind, well Screened, free from Bats, Bind, Refuse, and Dirt, and to be weighed 20 cwt. to the Ton, upon the Corporation machine. The Seam from which the Coal is raised to be stated.

Payments will be made from time to time so long as the Contractors shall duly fulfil the Contract.

The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide the Contract as they think fit.

Further Information and Forms of Tender may be obtained of the Gas Manager, Mr. F. W. Oldfield, at the Gas-Works, Beverley, and Tenders, endorsed "Tender for Coals," must be delivered at my office not later than Ten a.m. on Thursday, the 24th day of June, 1909.

J. WILLIS MILLS,

Town Clerk.

Town Clerk's Office,
31, Laigate, Beverley,
June 3, 1909.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the Surplus TAR to be produced at their different Gas Stations for a period of One Year, commencing the 1st of July next.

The Yearly make of Tar is about 8000 Tons.

Particulars and Forms of Tender can be obtained on Application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, June 22, 1909.

J. H. HALLSWORTH,

Town Clerk.

Oldham, June 3, 1909.

WOMBWELL URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council invite Tenders for the Supply of 5000 Tons (more or less) of Best Screened GAS COAL during the Eleven Months commencing Aug. 1, 1909, and ending June 30, 1910.

Forms of Tender, with Conditions of Contract, may be had on Application to the Gas Manager, Mr. P. D. Walmsley, B.Sc., at the Gas-Works, Wombwell.

Tenders, Sealed and Endorsed "Tender for Coal," must be delivered to me, the undersigned, on or before Wednesday, the 30th day of June, 1909.

PERCY MILNES WALKER,

Solicitor,

Clerk to the Council.

Town Hall, Wombwell.
June 10, 1909.

TENDERS FOR COAL.

THE Gas Committee for the City of Limerick are prepared to receive TENDERS for the Supply and Delivery of Best Screened and Unscreened GAS COAL, to be Delivered as required by the Engineer at the Gas-Works, Dock Road, Limerick.

Full Particulars, with Form of Tender, can be had on Application to the Engineer and Manager, Mr. H. Hawkins, Gas-Works, Dock Road, Limerick.

Sealed Tenders, endorsed "Coal," to be delivered at the Gas Office, William Street, Limerick, addressed to the Chairman of the Gas Committee not later than Four p.m. on the 21st inst.

The Committee do not bind themselves to accept the lowest or any Tender.

No Tender will be considered only on the Forms Supplied.

By order,

H. HAWKINS,

Engineer and Manager.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council are prepared to receive TENDERS for: Spiral-Guided GASHOLDER, 36 feet diameter, 12 feet deep, in STEEL TANK. 5000 per Hour EXHAUSTER, COMPENSATING GOVERNOR, VALVES, CONNECTIONS, &c. GAS-ENGINE to drive the above, all delivered and fixed Complete.

Forms of Tender and other Information may be obtained from Mr. G. B. Smedley, Engineer and General Manager, Gas-Works.

Tenders, addressed to the Clerk, must be delivered, not later than Twelve noon on the 30th inst., on Official Form and in Envelope supplied.

W. A. MUSSON,

Solicitor, Clerk to the Council.

Council Offices: Swadlincote,
near Burton-on-Trent,
June 9, 1909.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 23rd of June, 1909, and RE-OPENED on the 1st of July 1909.

By order of the Board,

ERNEST W. DREW,

Secretary.

6 & 7, Queen Street,
London, E.C., June, 1909.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the FOUR PER CENT. PERPETUAL DEBENTURE STOCK of this Company WILL BE CLOSED from the 17th of June to the 30th of June, 1909, both inclusive.

By order,

VICTOR V. VICK,

Secretary.

Offices: Stockbridge Road,
Chichester, June 10, 1909.

To Close a Trust.

TO BE SOLD BY

MR. H. SAVILE JOWETT, at the Old Cock Hotel, Halifax, on Friday, the 18th day of June, at 7.20 o'clock in the Evening precisely.

FIVE DEBENTURE SHARES, OF £50 EACH, IN DRAKE'S, LIMITED.

1000 PREFERENCE SHARES, OF £1 EACH, IN DRAKE'S, LIMITED, FULLY PAID.

1000 ORDINARY SHARES, OF £1 EACH, IN DRAKE'S, LIMITED, FULLY PAID.

For further Particulars, Apply to the AUCTIONEER, at his Offices, Warwick Chambers, Southgate, HALIFAX; and for Inspection of the Special Conditions of Sale to JOHN MITCHELL, Solicitor, 11, Fountain Street, HALIFAX.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

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VOL. CV.

OF THE

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Above the Average in Weight and Quality
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CITY ROAD, LONDON, N.Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
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GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
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These are cast in one piece, without Chap-
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FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
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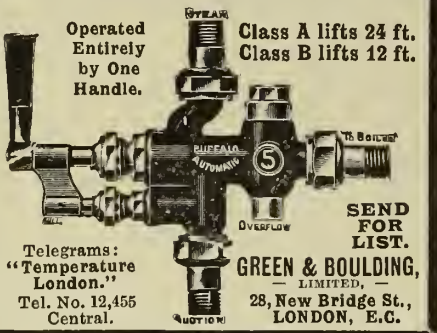
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Sperm Value 878.85 lbs. per Ton.

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RAYENSTHORPE, NEAR DEWSBURY.**

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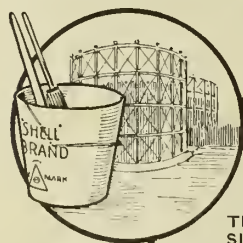
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More liquid Tar.

Stopped Pipes unknown.

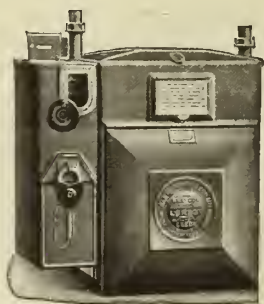
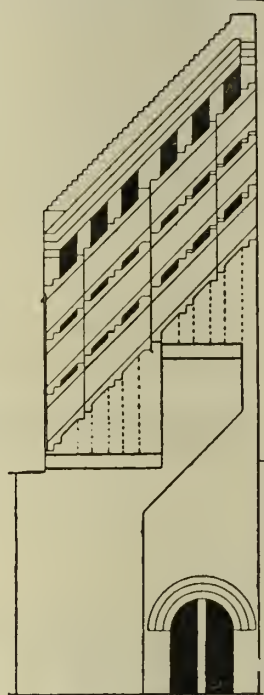
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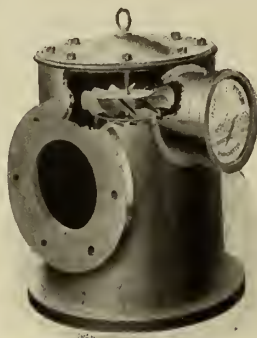
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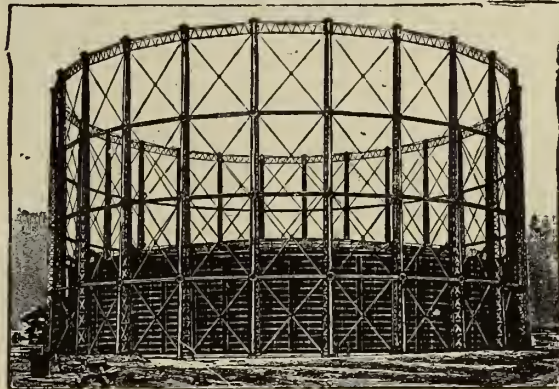
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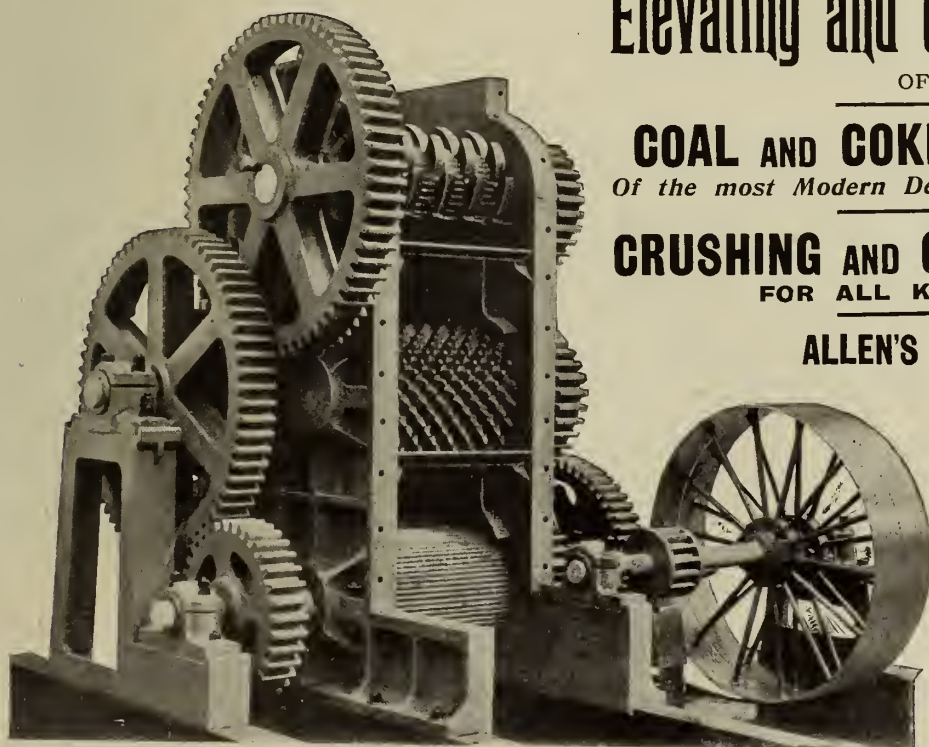
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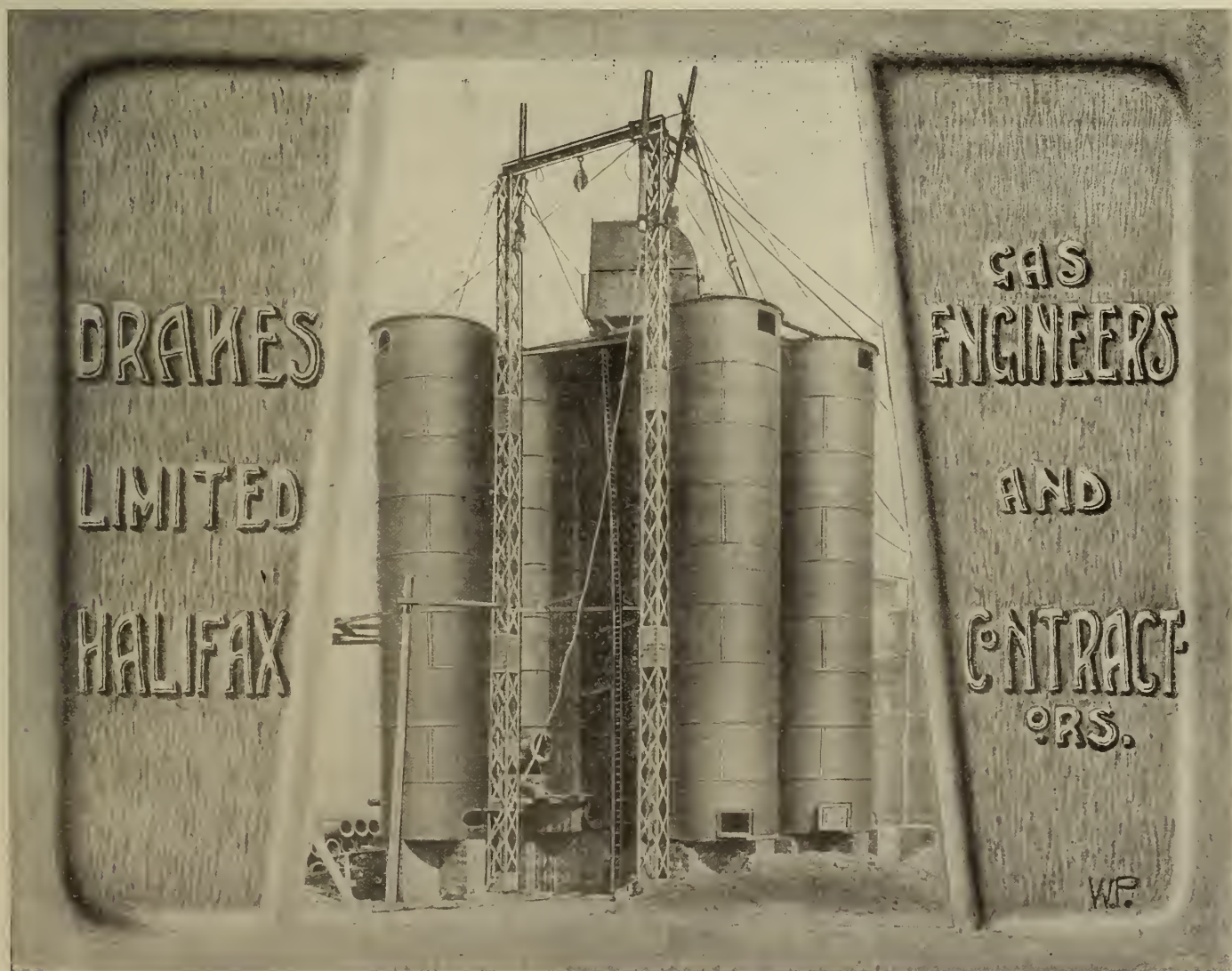
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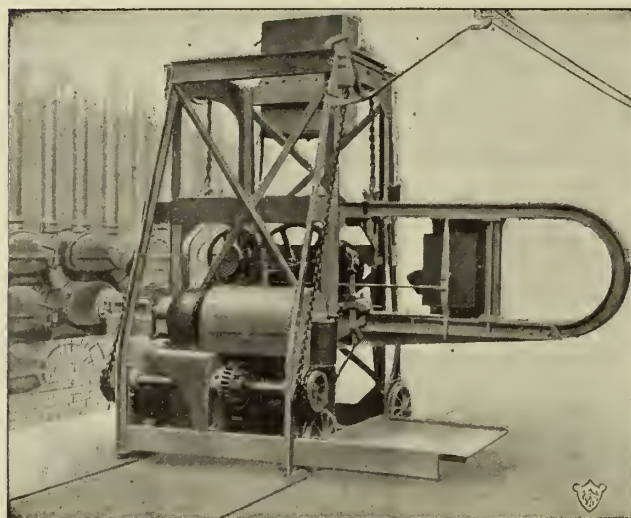
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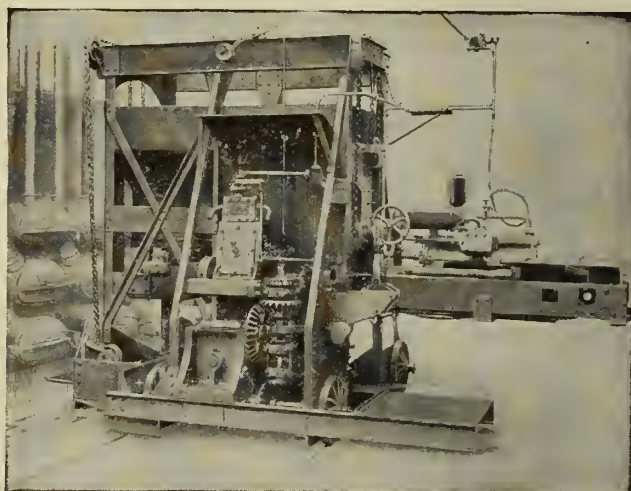
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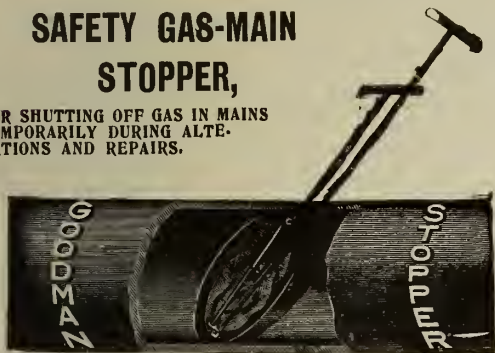
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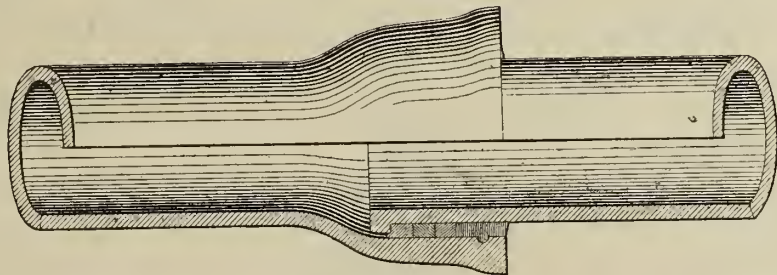
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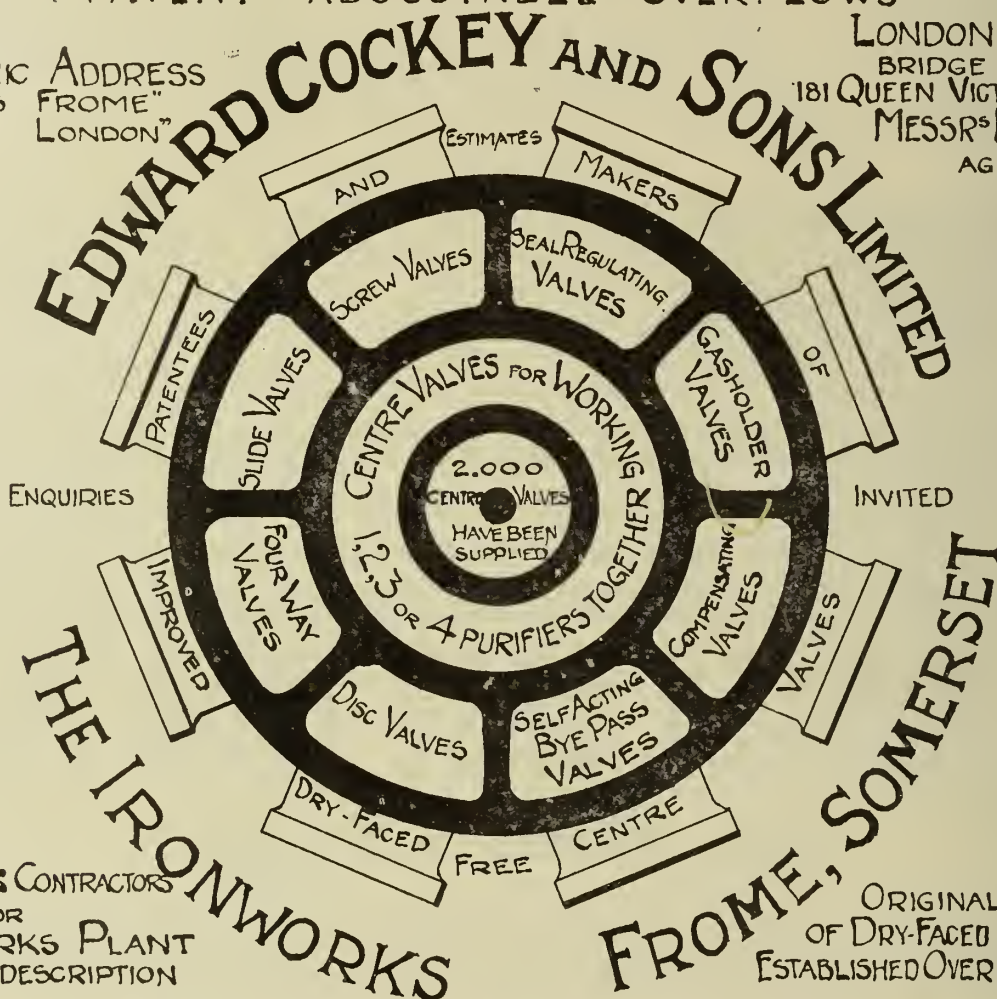
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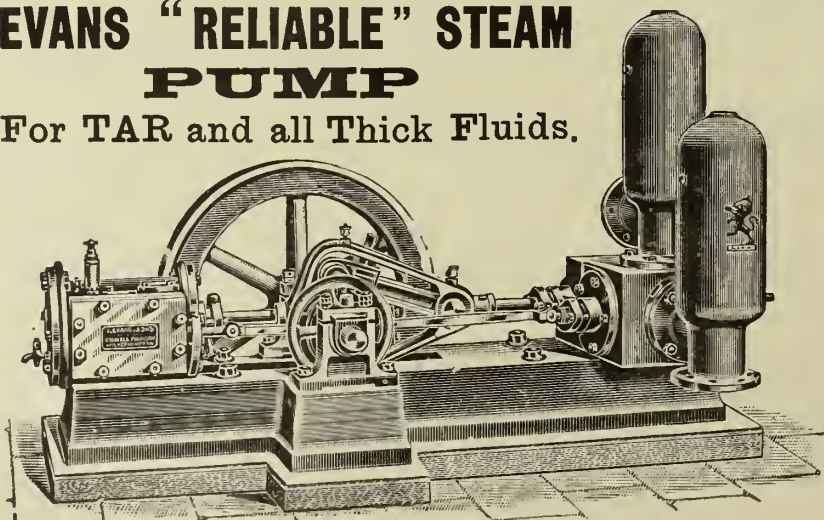
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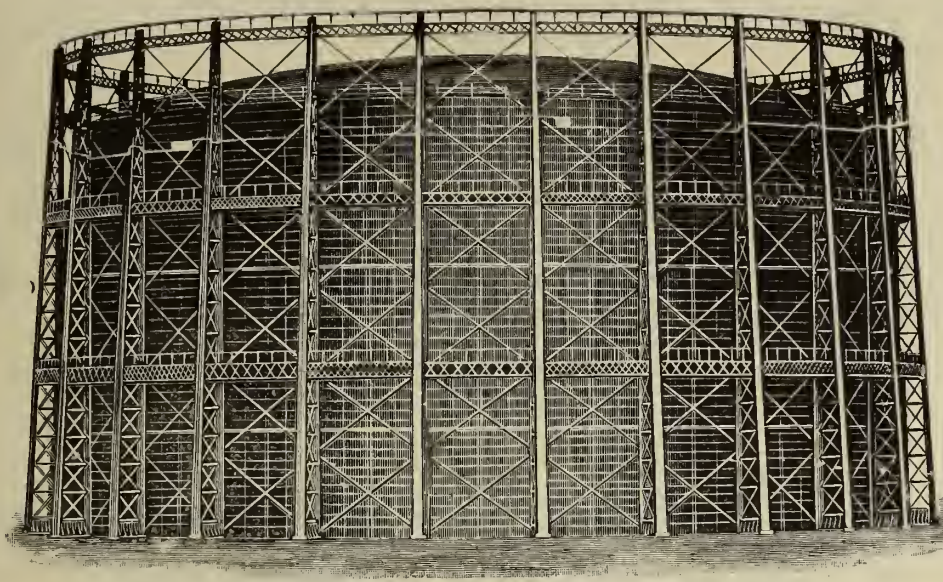
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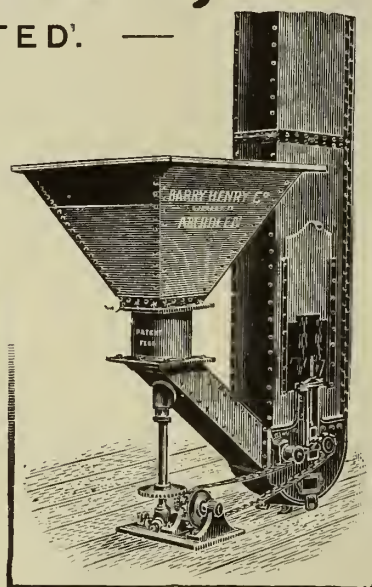
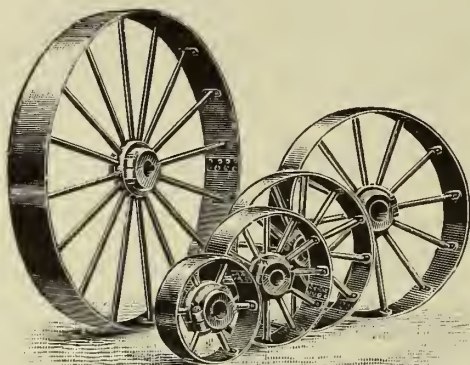
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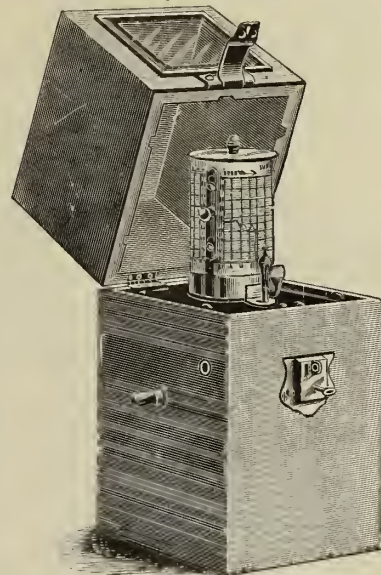
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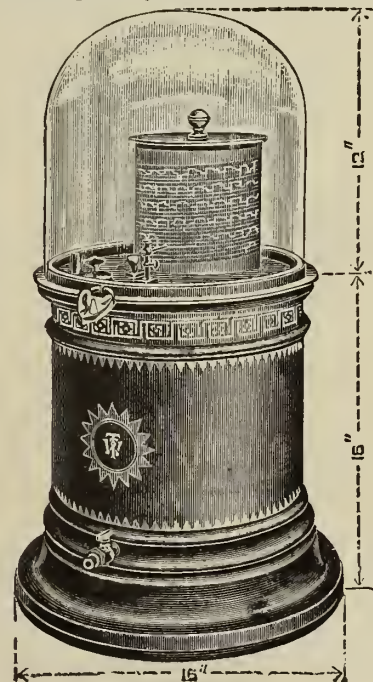
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Dry Meter in Tin-Plate Case, fitted with Attachment.

Price changed *in situ* by means of
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DURABLE,
RELIABLE,
SIMPLE.



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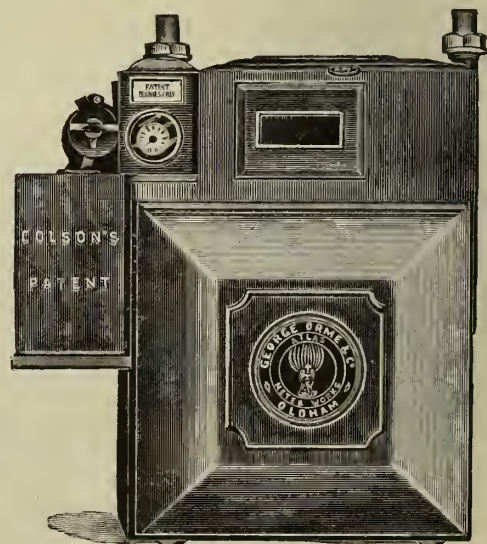
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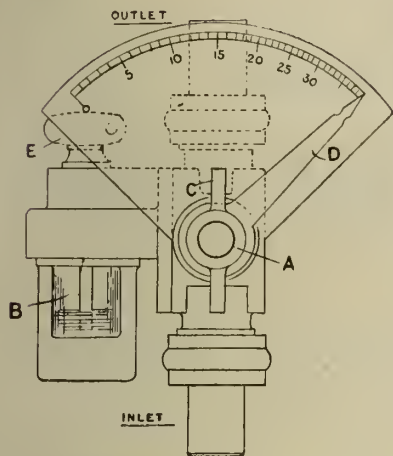
It shows rate of Leakage at a glance. Always ready for use.

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BEST QUALITY.

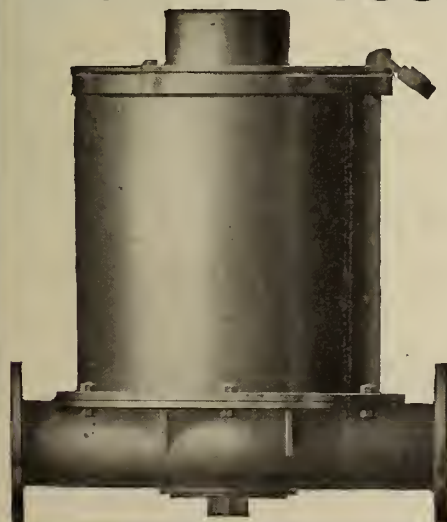
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Scottish Warehouse: 148, TRONGATE, GLASGOW.

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WE have specially designed this Governor for use in places where it has been found necessary to raise the pressure in Gas Mains to several pounds per square inch, in order to meet the increased demands in districts where the Gas Mains are small.

This Governor is correctly compensated, and is so accurately adjusted that it will work as an ordinary low pressure Governor so long as the Inlet pressure is at least five-tenths more than the required Outlet pressure. This is particularly useful in the event of the Main being used as an ordinary low pressure distribution Main. The Governor is usually supplied for Inlet pressure of up to 5 lbs. per square inch, and Outlet pressure of from Zero to 6 inches; but, of course, it can be specially prepared to suit any desired range of pressure.

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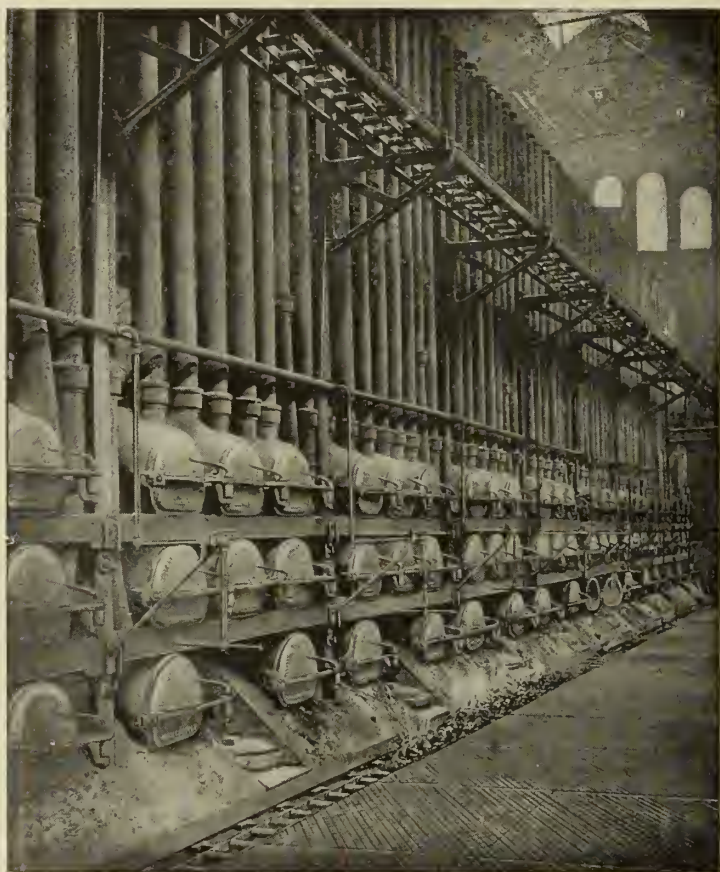
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SPECIALISTS IN CARBONIZING PLANTS FOR GAS-WORKS

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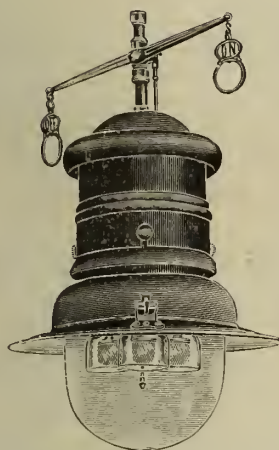


Fig. 623. Welsbach Inverted Storm-Proof Arc Lamp, giving 400 Candle Power, 52/6.

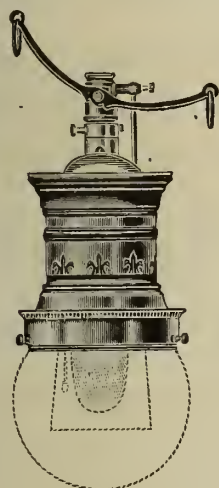


Fig. 5120. The Welsbach "Aurora" Inverted Arc Lamp for Interior or Lobby Lighting. With Porcelain Body, Gold Relieved, or with Pierced Brass Body, 4/3 complete. Bye-Pass 1/- extra.



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The prettiest as well as the most efficient Inverted Burner on the Market. Complete as shown. Price 4/10½.

¶ are the Tests of the Efficiency of Modern Lighting Systems. Applied with thoroughness they leave Welsbach Lamps and Mantles in a position of pronounced and indisputable superiority.

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¶ Welsbach Mantles are a perfect combination.

¶ No Black Shadows darkening the remoter parts of a Room or depriving Goods of the Light that Sells in Shop or Show-Room.

¶ Welsbach Lighting exemplifies reliability absolute and unqualified. The Retailer has to Offer no excuses. Satisfaction is spread by dealing in the Goods as the Goods themselves spread light—in uniform Quality and Quantity.

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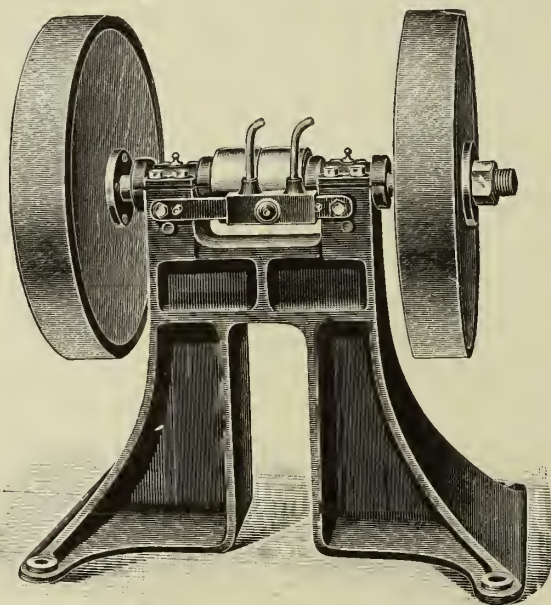
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LABORATORY ANALYSIS: By Messrs. J. & H. S. Pattinson.

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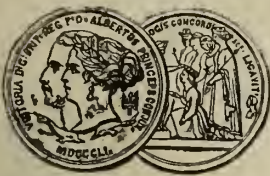
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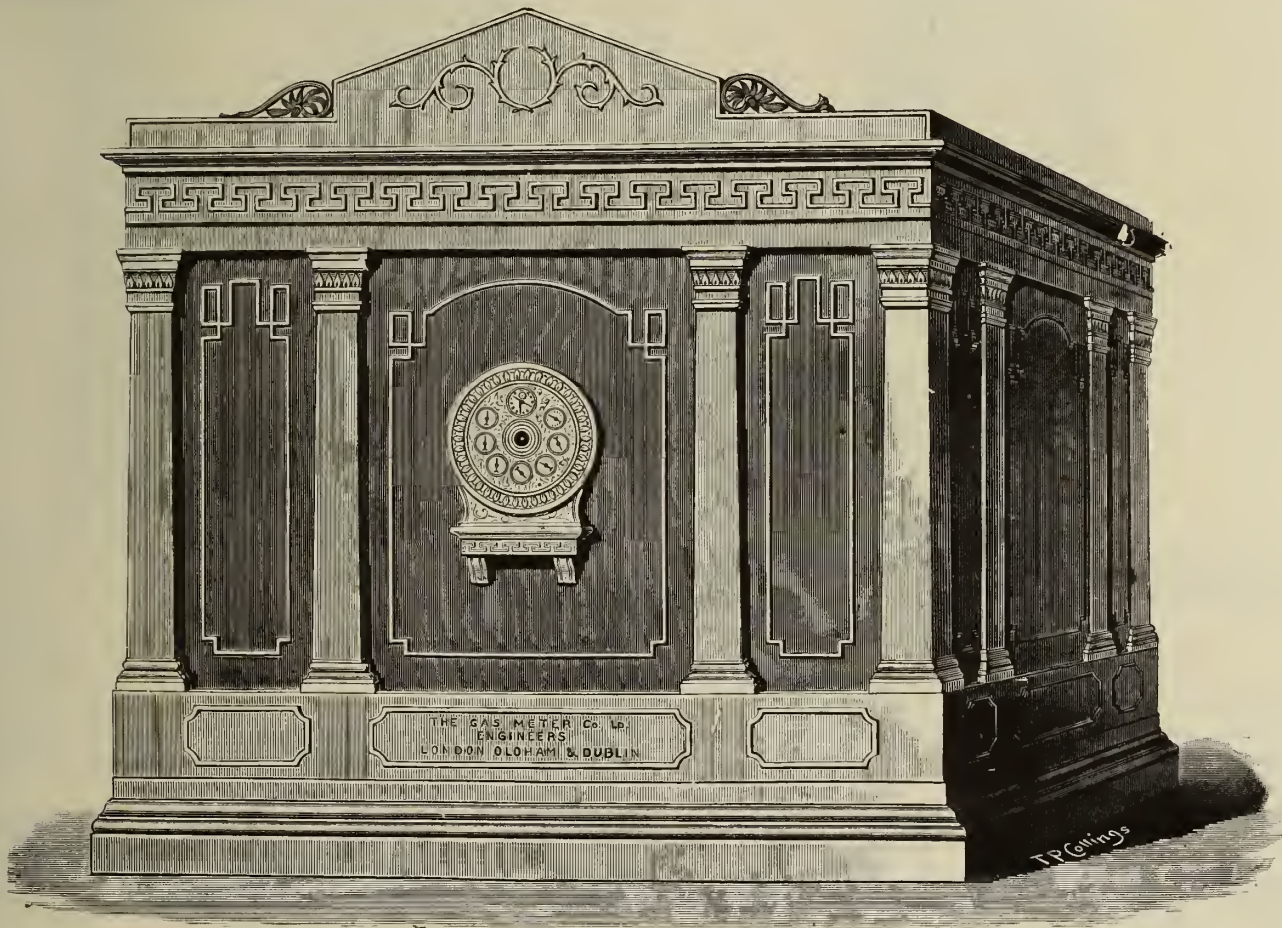
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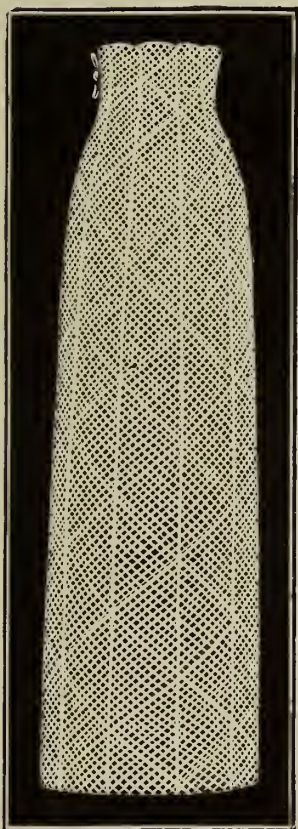
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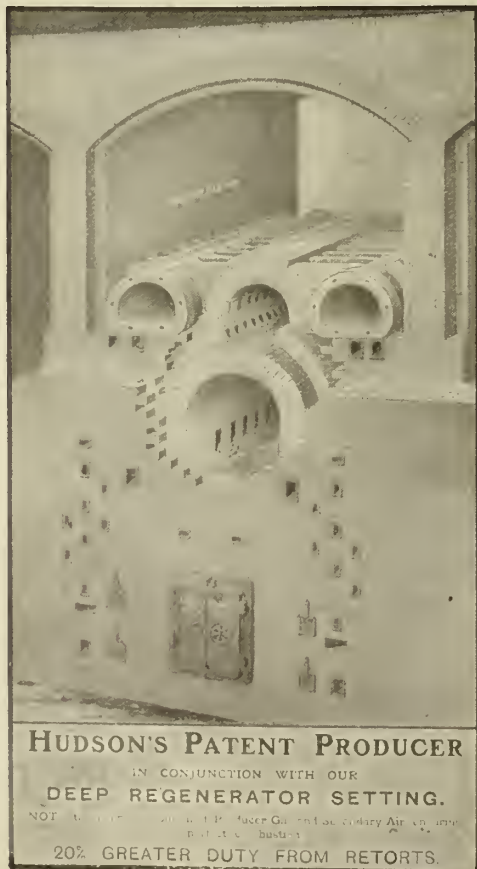
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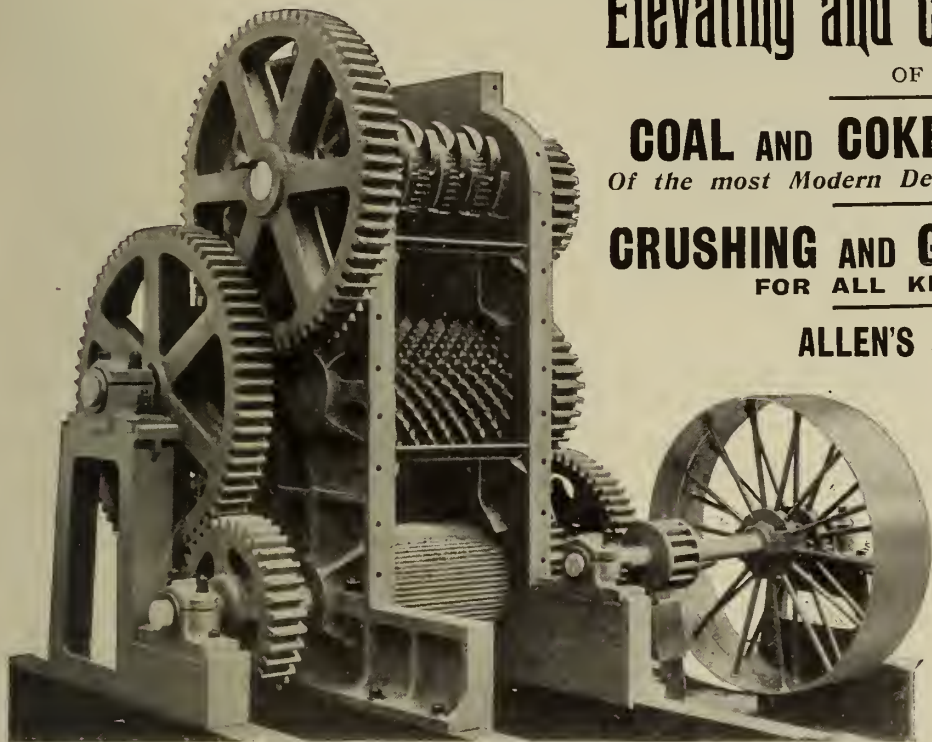
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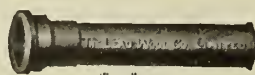
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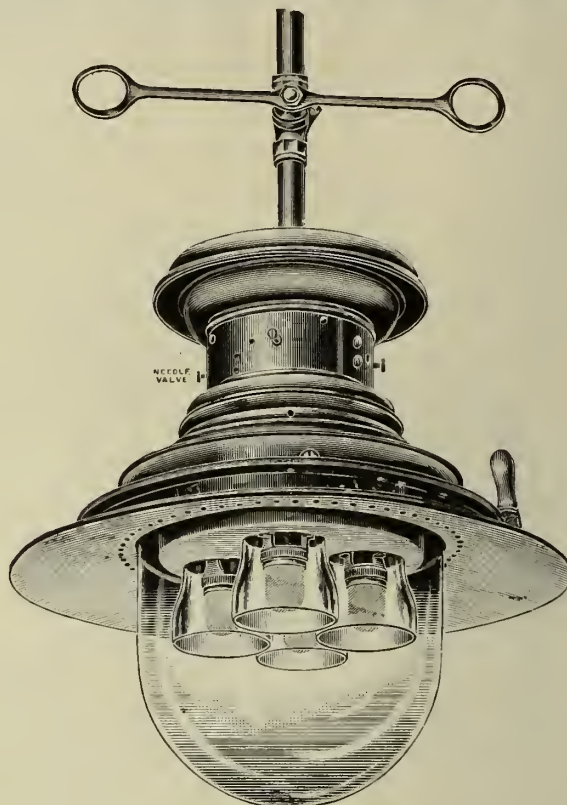


Fig. 1. 586.

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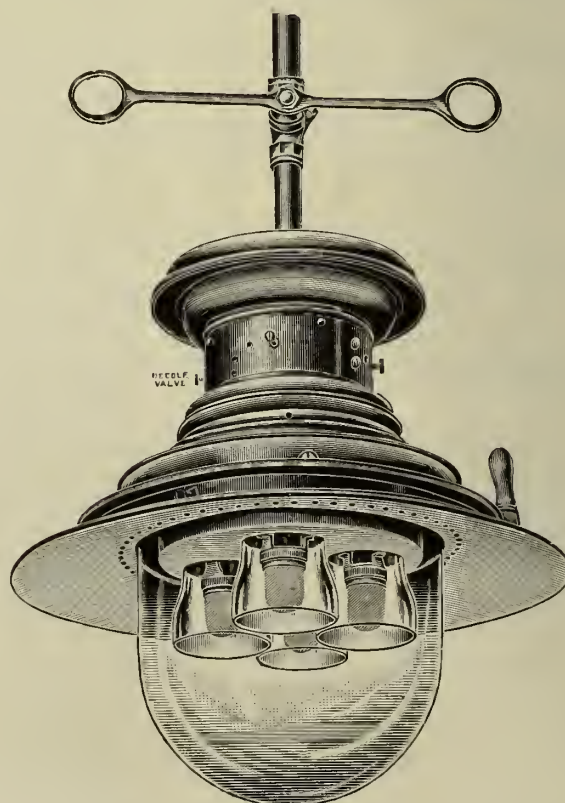
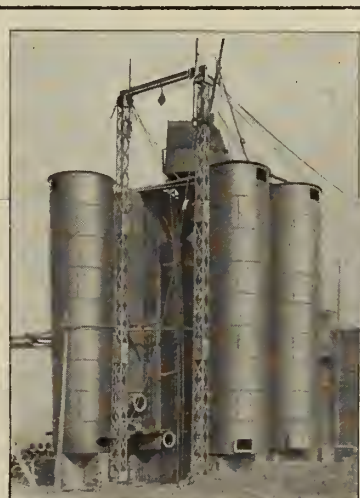
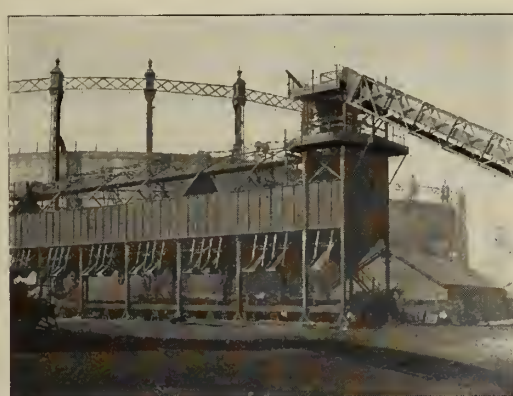


Fig. 1. 586.

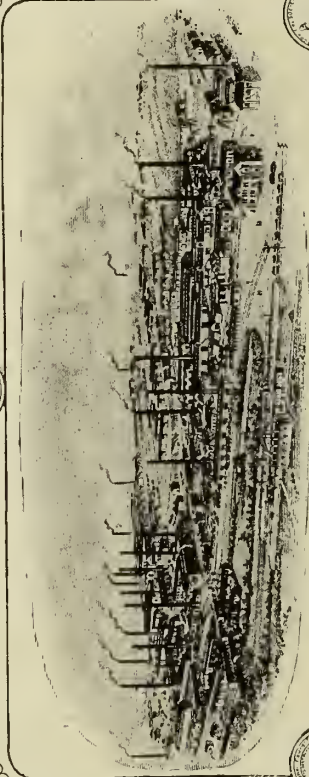
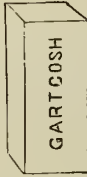
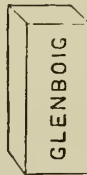
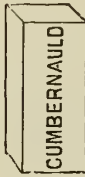
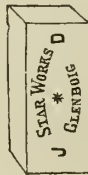
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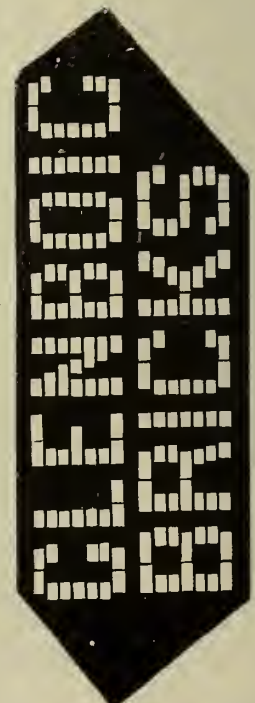
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The DESSAU System has been adopted at **45** Gas-Works and up to the present date **3882** Retorts have been ordered.

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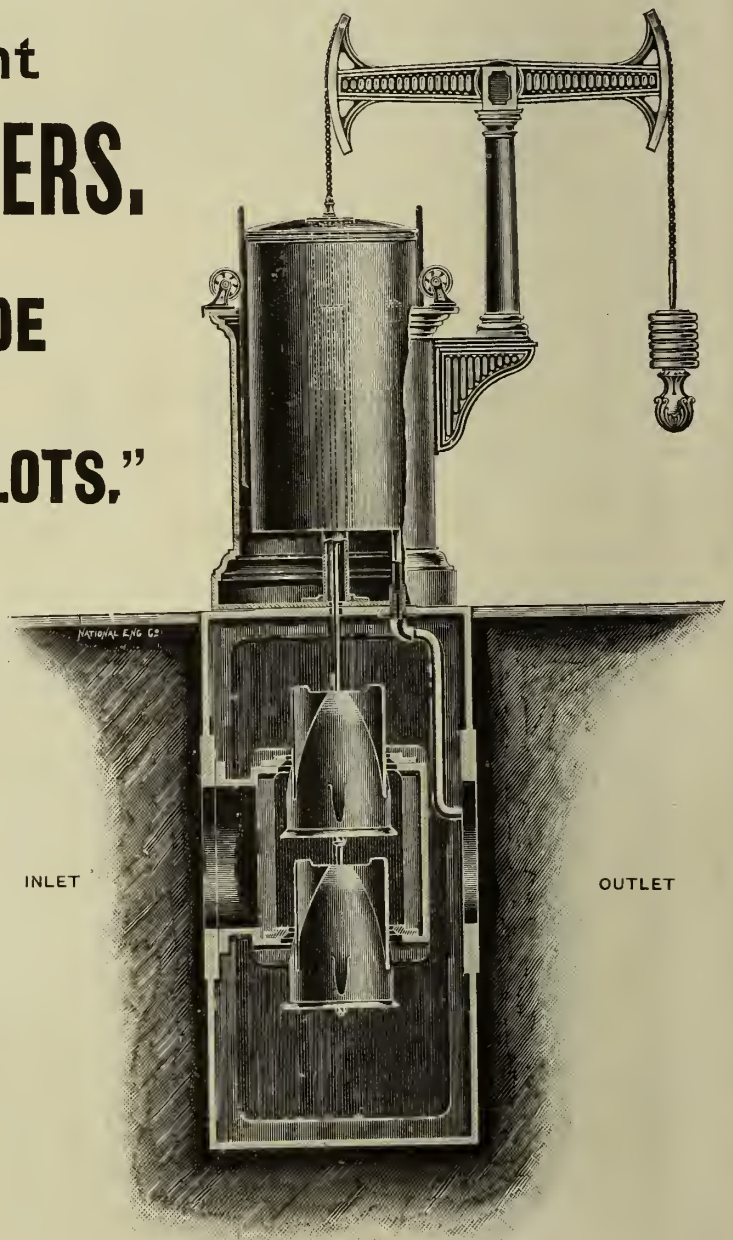
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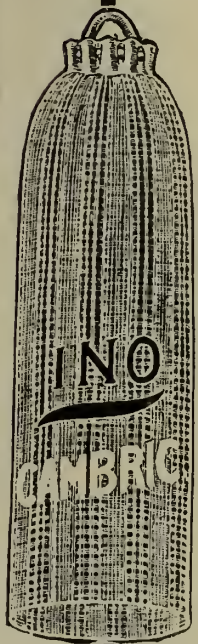
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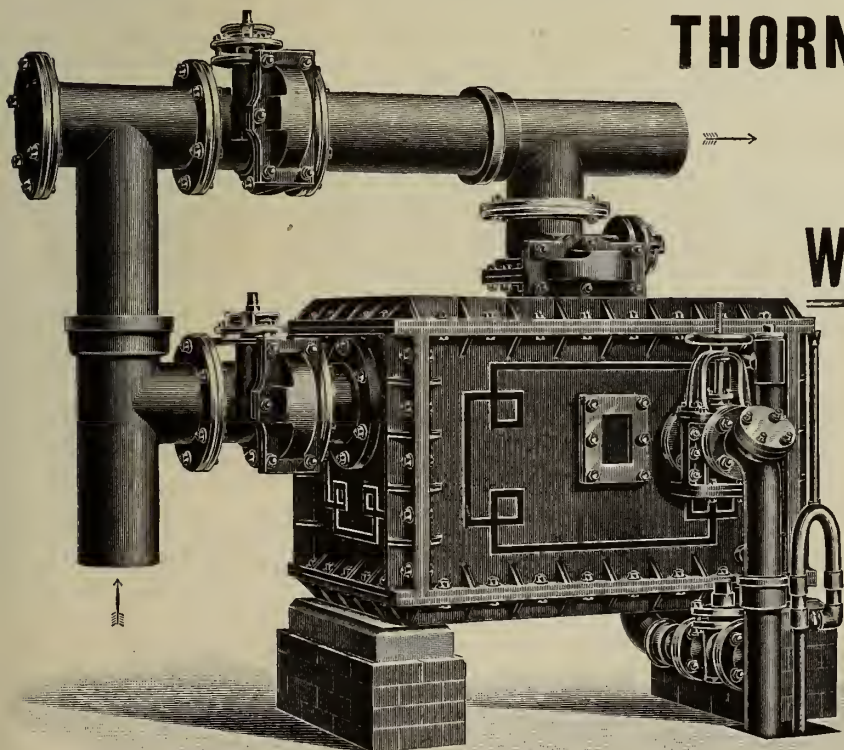
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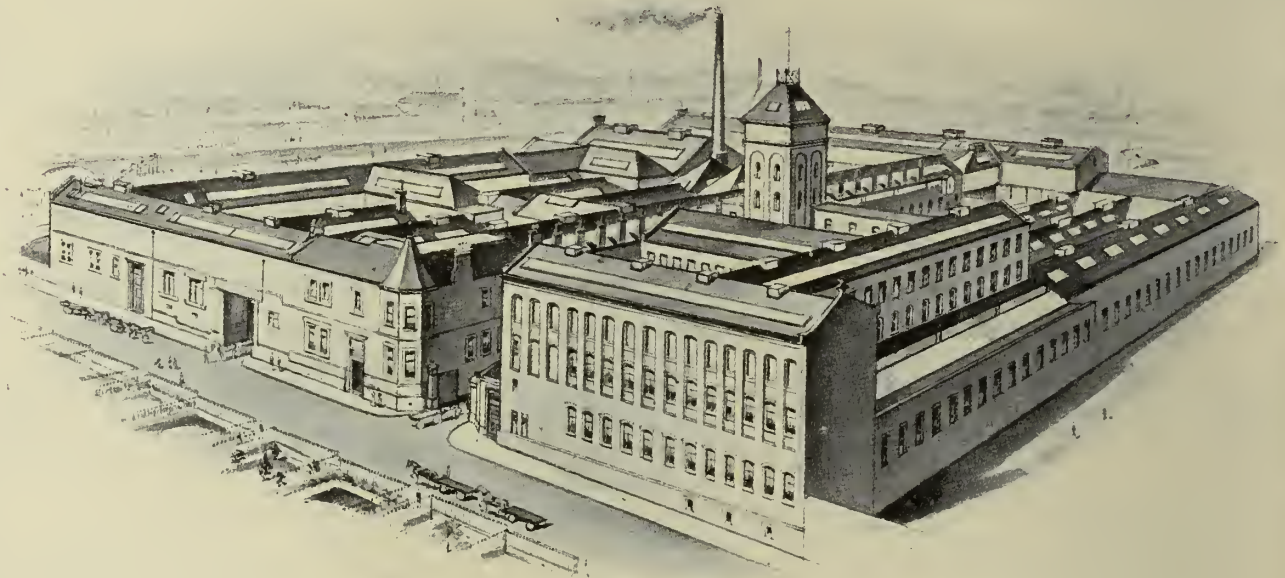
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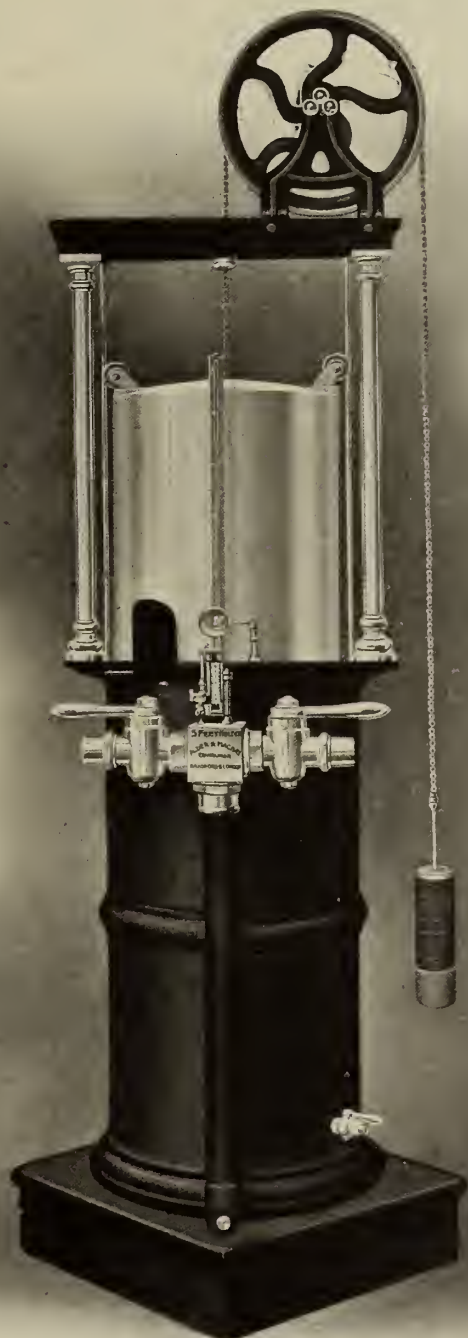
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ALL SIZES.

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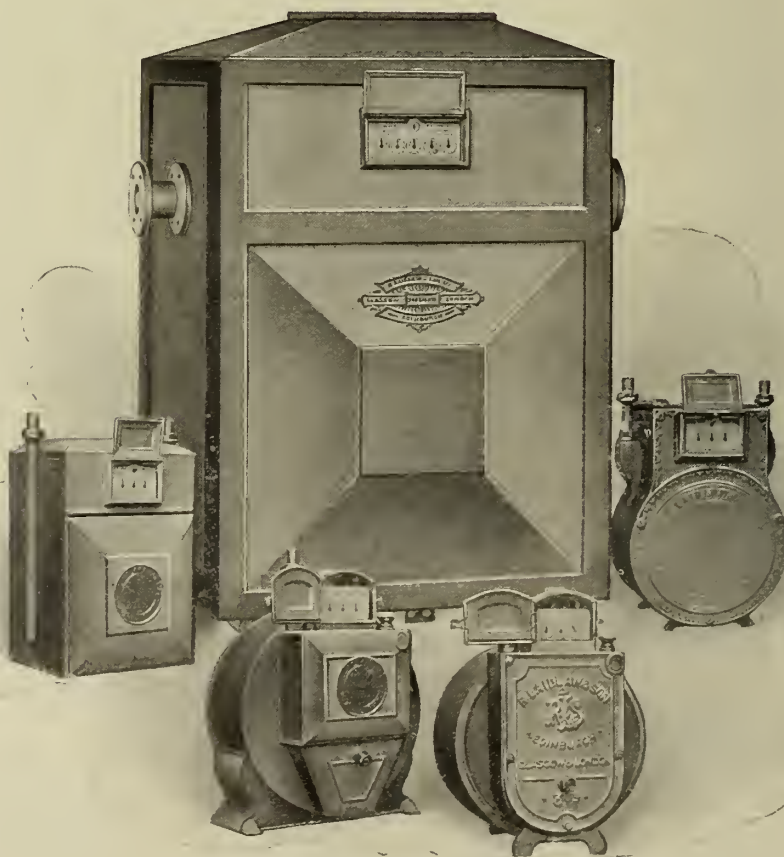
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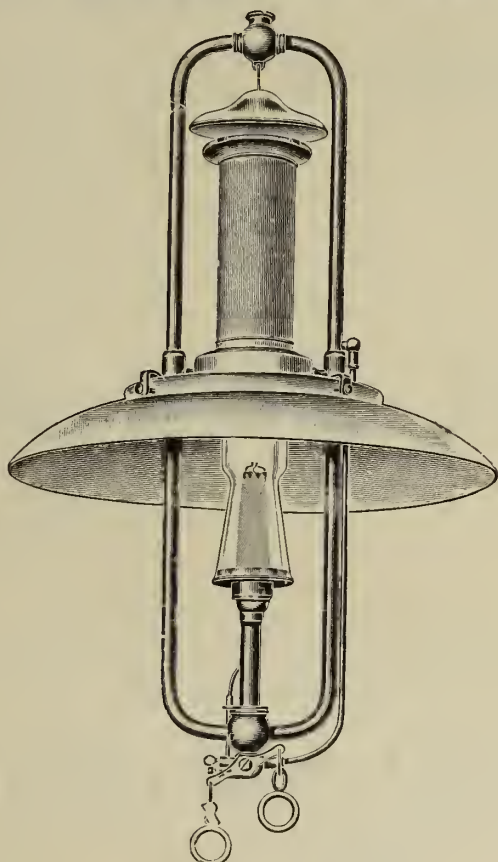
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FOR ALL COUNTRIES.

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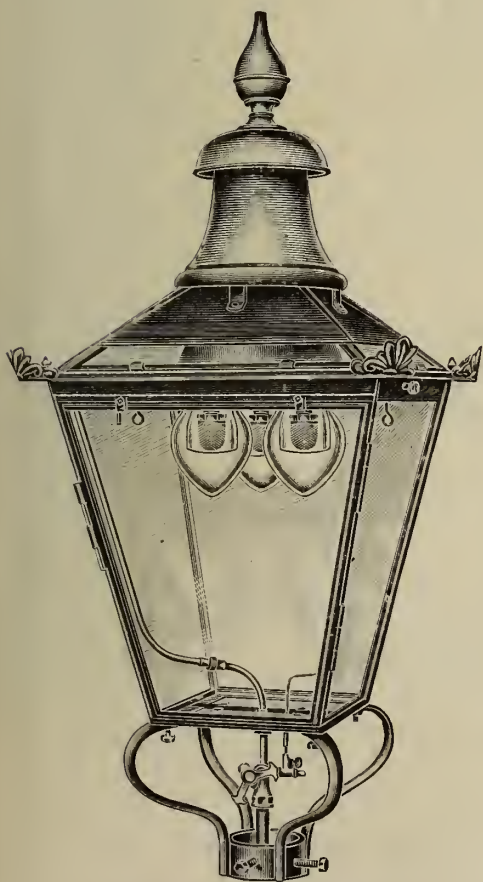
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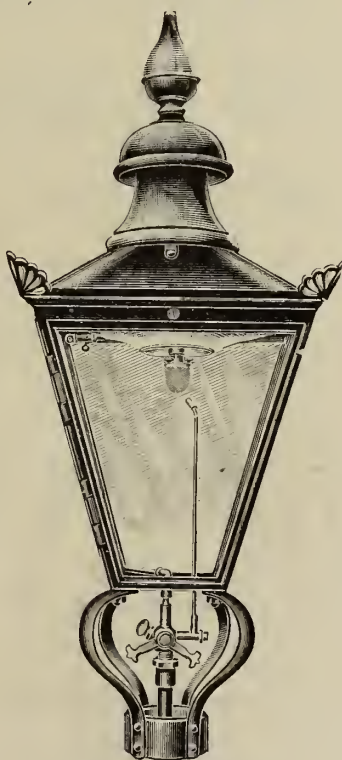
No. 6 A. Fig. 6 Series.
Length over all, 2 ft. 3 in.

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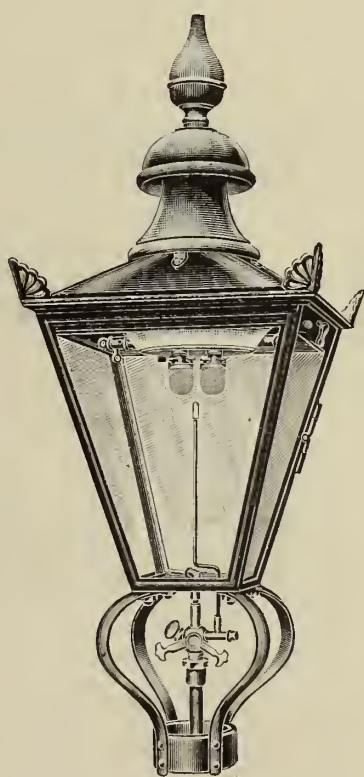
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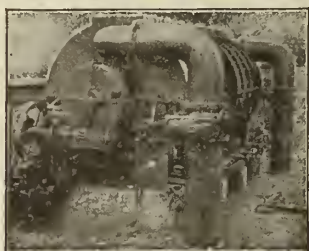


Porcelain Reflector.



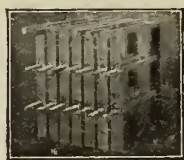
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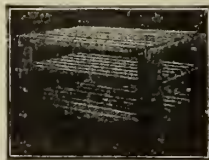


WASHER-SCRUBBER.

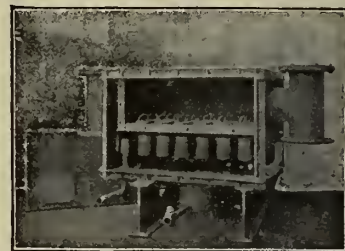
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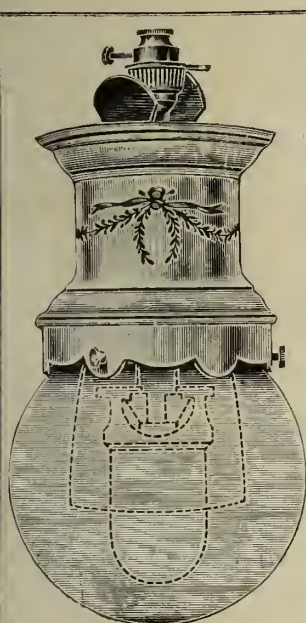
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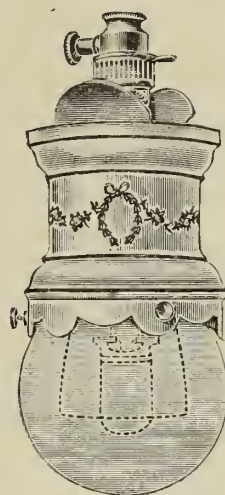
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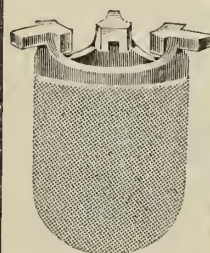
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Commercial (3rd) . . .	1,250,000	Maidenhead (2nd) . . .	225,000	Tilburg, Holland . . .	400,000
Commercial (4th) . . .	2,000,000	Maidstone . . .	500,000	Torquay . . .	350,000
Copenhagen . . .	700,000	Malines, Belgium . . .	500,000	Tottenham . . .	750,000
Copenhagen (2nd) . . .	2,500,000	Malmö, Sweden . . .	350,000	Tottenham (2nd) . . .	750,000
Courtrai, Belgium . . .	250,000	Malta . . .	400,000	Tottenham (3rd) . . .	350,000
Coventry . . .	600,000	Manchester . . .	3,500,000	Tottenham (4th) . . .	1,000,000
Coventry (2nd) . . .	600,000	Manchester (2nd) . . .	3,500,000	Tottenham (5th) . . .	1,000,000
Cracow, Galicia . . .	200,000	Marlborough . . .	100,000	Tottenham (6th) . . .	1,250,000
Cracow (2nd) . . .	200,000	Mayence, Germany . . .	700,000	Tunbridge Wells . . .	1,000,000
Crefeld, Germany . . .	500,000	McKeesport, Pa. . . .	500,000	Utrecht, Holland . . .	1,000,000
Croydon . . .	1,250,000	Merthyr Tydfil . . .	300,000	Utrecht (2nd) . . .	1,000,000
Croydon (2nd) . . .	625,000	Middlesbrough . . .	1,250,000	Verviers, Belgium . . .	1,000,000
Croydon (3rd) . . .	625,000	Namur, Belgium . . .	175,000	Vienna . . .	3,500,000
Croydon (4th) . . .	550,000	Nelson . . .	400,000	Vienna (2nd) . . .	2,500,000
Debreczin, Hungary . . .	100,000	Newburgh, N.Y. . . .	600,000	Waltham . . .	400,000
Deventer, Holland . . .	150,000	New York . . .	5,200,000	Wandsworth & Putney .	1,800,000
Deventer (2nd) . . .	200,000	Nietheroy, Brazil . . .	250,000	Watford . . .	300,000
Dorking . . .	150,000	North Middlesex . . .	150,000	Watford (2nd) . . .	350,000
Dublin . . .	2,000,000	North Middlesex (2nd) . .	200,000	Wellington, N.Z. . . .	350,000
Dublin (2nd) . . .	2,000,000	North Middlesex (3rd) . .	75,000	West Ham . . .	1,500,000
Dublin (3rd) . . .	650,000	Norwich . . .	1,000,000	West Ham (2nd) . . .	800,000
Dundee . . .	1,500,000	Norwich (2nd) . . .	300,000	Weston-super-Mare . . .	350,000
Dunedin, N.Z. . . .	150,000	Norwich (3rd) . . .	500,000	Weston (2nd) . . .	350,000
Dunedin, N.Z. (2nd) . .	275,000	Nottingham . . .	1,000,000	Wexford, Ireland . . .	100,000
Durham . . .	200,000	Nuneaton . . .	125,000	Wiesbaden, Germany . .	850,000
Düsseldorf, Germany . .	1,000,000	Oberhausen, Germany . .	175,000	Winchester . . .	225,000
Eastbourne . . .	1,250,000	Oldenburg, Germany . .	200,000	Winchester (2nd) . . .	125,000
Edinburgh . . .	2,000,000	Ostend, Belgium . . .	100,000	Wolverhampton . . .	1,500,000
Epsom . . .	225,000	Ostend (2nd) . . .	200,000	Zwolle, Holland . . .	200,000
Falmouth . . .	150,000	Perth, W.A. . . .	125,000	Zwolle (2nd) . . .	200,000
Faversham . . .	200,000	Poole . . .	1,500,000		

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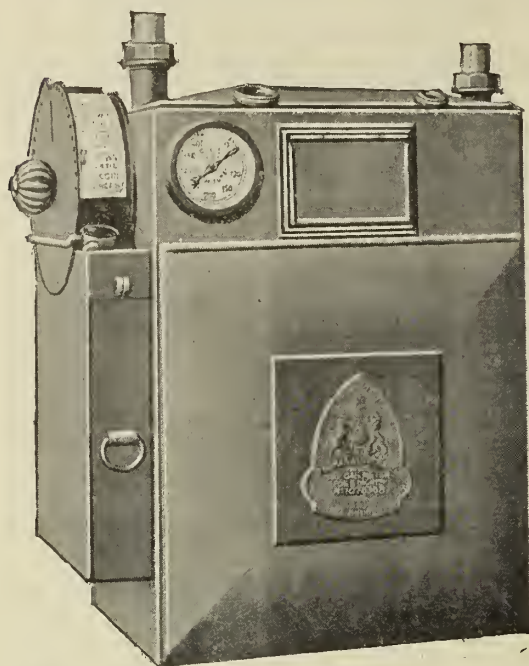
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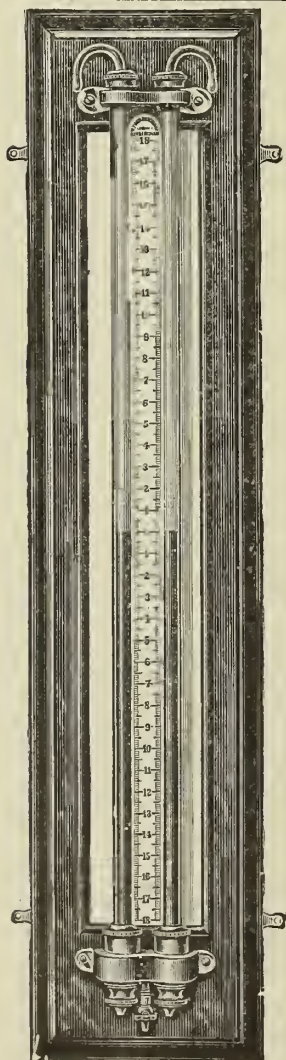


Fig. 10.



Fig. 2.

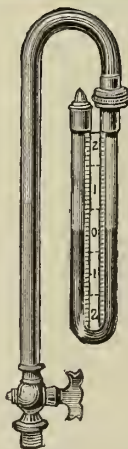
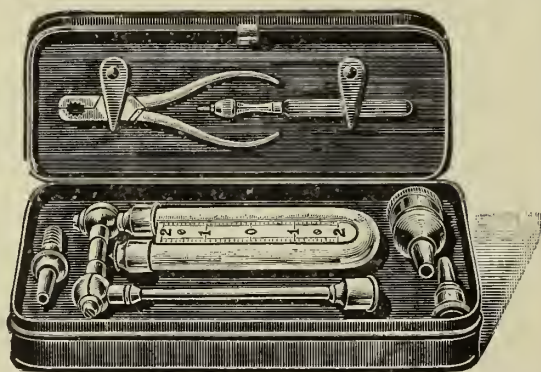


Fig. 6.



Fig. 9.

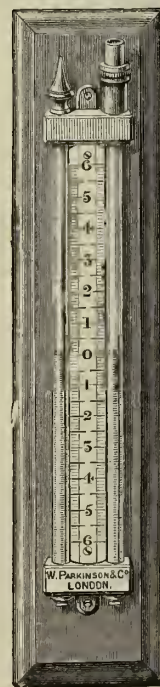


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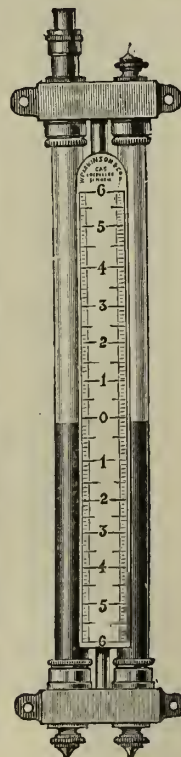


Fig. 3B.

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VOL. CVI., No. 2406.—TUESDAY, JUNE 22, 1909.

EDITORIAL NOTES—GAS, &c.

The Meeting of the Institution.

MANY impressions crowd upon one when thinking over the events of last week's meeting of the Institution. Foremost, the President (Mr. Thomas Glover) has won fresh laurels, not only as an earnest student of the affairs of the industry, but for the ability he displayed in the conduct of the week's proceedings. Then the meetings were so well attended throughout (excepting for a brief space on Thursday morning) that it may be said, without fear of contradiction, that in this respect they have never been excelled. The technical matter brought under the consideration of the members, too, was all very good, and much of it distinctly fresh, though in part suffering from inconclusiveness. Nevertheless, we firmly believe that the meeting inaugurates a new order of things in regard to the character of the papers offered for discussion. The association of the Institution with the Leeds University is unquestionably going to influence for good, and with broadening degree as time goes on. If this prediction be true, then it must be, speaking generally, that the tone of the technical contributions at the meetings will be raised, though in saying this we are not unmindful of, nor are we depreciating, the practical and valuable character of the papers that have gone before. There was a great amount of interest taken in the two papers emanating from work that has been conducted (in conjunction with, or through the instrumentality of, the Institution) at the Leeds University, and over which work Professors Smithells and Bone have been exercising a supervisory and directive interest that cannot be too highly appraised. The records of the work at Leeds should henceforth serve to supplement the technical programme at the annual meetings; and there can be no doubt that they will have a stimulating influence, from year to year, on individual research. There will thus be both a sensible and insensible elevating influence. One small point while on this subject. It was apparent in the discussion on the Gas Heating Research Committee's report that some of the members have not had the advantage that many younger members have had, through the present-day existence of technical schools and colleges, of receiving a training in physics; and perhaps it would not be a bad thing if the Committee, in their next report, would briefly define the differences between radiation, convection, and conduction. That they are not commonly understood is clear.

Still on the question of the papers, a number of manufacturers of gas stoves and burners were present at the meeting for the purpose of assisting with their views on the two papers bearing upon the articles they produce. Admittedly, time pressed; and all who desired to speak could not do so. We hope that these gentlemen, on the particular subjects which interest them practically, will continue to be invited by the Council to the meetings. But it is a pity, when they are so invited, and come to the meetings prepared to speak, that opportunity is not found for them to do so. There was not one burner maker called upon to make any remarks in connection with the paper on gas illuminating efficiencies; and only two gas-stove manufacturers on the gas-heating research report. Still, there is no doubt that the papers in which the representatives of practical work in the production of goods were concerned, supplied to them interest, matter for thought, and probably the germs of suggestion; so that the time spent in attending the meetings, it is to be hoped, is not regarded by them as having been fruitlessly expended. If any still desire to state their views on the papers in which they are concerned, our columns are at their service. One point is clear—that, with the increased application of scientific standards to efficiency, manufacturers will have to base their claims on, and prove their claims by, those higher standards. That is the trend of things; and it will be well to recognize it early.

It was with supreme gratification that the members heard the announcement at the meeting that the Livesey Memorial Fund now exceeds the minimum sum the promoters set out to accumulate. But the fund is not yet closed; and, after this meeting of the Institution, there may be others who will be desirous of contributing to it. This is an appropriate opportunity for saying that, upon the Advisory Committee that will soon be formed in conjunction with the endowment of the chair of Gas Engineering and Fuel at the Leeds University, there should be not only representatives of the gas profession drawn from the Institution, but the manufacturing section of the industry should be also represented by a nominee or nominees of the Council of the Society of British Gas Industries.

There have been many important happenings during the past Institution year. From among them projects the much-deplored loss of one who did much beneficent work for the industry. In reviewing the proceedings of this annual meeting, it seems more certain than ever that the good he did for the industry will be continued, through his loss, in other directions. No better form of memorial could any man desire; and it is as he whose memory is being perpetuated would have it be. The life in technical work as reflected by the proceedings last week augurs well for the future; and it is with much satisfaction that all associated with the industry may look ahead.

Presidential Address—Preparing for Future Residuals Competition.

A BROAD and philosophic reasoning lay at the base of the address delivered by the President at the opening sitting. It is a commonplace, and a somewhat conventional compliment, to say that *ex cathedra* utterances furnish food for reflection; but the phrase applied to the address by Mr. Glover carries with it a full meaning. The keynote was "looking forward." The problems of the gas industry, both of internal and external origin, are in the present too great to permit of much time being spent in looking backward by those with the responsibilities of the industry upon their shoulders. But looking forward, the signs of the times, and the reading of what they forebode, are the only helps that lie at hand in shaping our visions as to what futurity has in store, to meet which preparation has to be made. It is necessary in these days, when humanity, in individual and corporate state, is striving to get the better the one of the other in the issues of life's struggle, to be, as far as it is humanly possible so to be, in advance of the times. That is where the President would have the workers and work of the gas industry be. Take his address as a whole, he opens up to us the conceptions of a thinking mind as to the increasing variety of the sources of competition. He brings before us visions as to the future; but they are visions of the intellect, and not of the volatile imagination. We have to prepare for the future, viewing our work in its entirety, from production to the ultimate destination of the produce. From the big reserve of scientific truth, there has to be evolved fresh laws which have to be orderly arranged and applied, from the beginning to the indefinable end of the profitable use of the products of the industry. In this work, the gas industry has recently called in the aid of a special department of the University of Leeds; and, in doing this, it is at the same time commemorating the labours of one of the most sentient workers the industry has ever produced—a worker who was not content only to look to the needs of the passing day, but was ever taking thought for the morrow when he should be gathered among those upon whose active work the final seal had been set. If more of the gas administrators of to-day had been possessed of the same perceptive power, the Livesey Memorial Fund would not have required six months to have brought it to the sum required for the endowment of the chair of Gas Engineering and Fuel. Those who have not subscribed to the fund will

be glad enough to, and will take care that they do, participate in the enjoyment of the fruits whatever they may be of this closer union of the gas industry with special scientific activity. What the outcome of the union will be, time alone can show. The President cannot predict; he can only surmise. In his view, the greatest value to be derived from the new University Department will probably be through an indirect influence upon the whole industry rather than by a direct and visible productivity. But we rather think the directive influence, which we would willingly place under the title of "visible productivity," will be of the greatest value to the future of the industry. No one who listened to the President's address, no one who has read it in our columns of last week, can help concluding that the conjunction is a good one, and a necessary one, and that it is being brought about none too soon.

It is in the commercial competition of the times that the President principally perceives the causes and the need for the reshaping of our ways in the gas industry. It is the natural order in the existence of things, that there should be increasing competition. Every development in any direction exposes the pre-existing to some fresh attack; and the measure of the success of the pre-existing energizes in corresponding degree the competition. The President did not take as his point of observation the narrow one of electricity being the only competitor. He went farther afield. And there is the warning underlying his words to take "Time by the forelock," and to get as far in advance as possible of the minatory rivals, and not wait to take action until they begin to strip more freely from the commercial position and opportunities now enjoyed by the industry. It is a question of preservation, and in good time; and it would be little short of suicidal to refuse to augur from the omens, and to act upon what is seen. Year by year, from coal carbonization in coke-ovens a greater amount of the very secondary products the gas industry yields, and from which a considerable proportion of revenue is derived, is being thrown upon the market, and brought into direct competition with the produce of the gas industry. The figures the President submits are significant. No less than 18 million tons of coal are carbonized annually in coke-ovens; but at present only $3\frac{1}{2}$ millions are treated in recovery processes. The makers of coke for metallurgical purposes are not going to continue the wasteful system of non-recovery; and step by step more of the remaining $14\frac{1}{2}$ million tons will be contributing to the products for sale. It is difficult, the President reflectively observes, to imagine this being done without disastrous effect on the markets for bye-products. Let us suppose the whole 18 million tons of coal carbonized in coke-ovens are eventually subjected to recovery processes, the tonnage of raw material so used would be 3 millions in excess of the amount of coal now carbonized in gas-works. The increased production of sulphate of ammonia and tar has not yet had any appreciable influence in depreciating prices; but all increased production makes greater the difficulty of appreciating prices. Already the coke from coke-ovens is competing with gas-works coke in industrial districts, and in others where a harder coke is required for furnace purposes. Even the fruit growers of Norfolk, who take a large proportion of the Norwich Gas-Works coke, are finding out that, by building somewhat larger furnaces, and using a keener draught, they can employ to greater advantage a harder coke than is obtained from ordinary gas-works practice. Again, in the coal and iron trade districts, the surplus gas from the coke-ovens is being employed for the generation of electricity. These things, we say, are significant. They need not create any alarm; but they must not be ignored. The gas industry is now in a strong and flourishing position; but big figures extracted from annual returns must not prevent us taking thought of the morrow.

It is this swelling competition for which we have to provide. Whatever is done will not prevent competition; but the industry can do its best to mould its practices and ways to the most effective form, in each locality, for resisting the competition by producing what is locally required in the way of gaseous and solid fuel, both for industrial and domestic purposes, at a price that will put at a disadvantage those in competition whose geographical situation is already against them. The paramount lesson that we extract from the President's address is that in the future, in our carbonizing systems, there must be no slavish acceptance of a, so to speak, uniformity of practice. The carbonizing plant of the future in a gas-works will have to be varied to meet the local conditions; the ambition of gas manufac-

turers in the future must be to become the providers of all local requirements for gaseous and solid fuel for industrial and domestic uses. The solid hard fuel that is needed by industry is not the type of solid fuel demanded for domestic purposes. To meet the two independent requirements as to quality, the carbonizing plant must be varied; and the major part of the plant that will be of greatest value in an industrial area may not be the best suited for the needs of a purely residential district. To provide the harder coke for the Norfolk fruit growers, and to resist extraneous coke competition in this direction, is the primary reason for the experiment with the three-feet deep chambers at the President's works, and the success of which in meeting a local requirement would alone, without other considerations, justify their extension. Their working will discourage others from sending hard coke into the district in competition, and from building plant to meet the requirement. Competition cannot be killed outright. But it can be checked; and it is the means to be adopted for this purpose to which the President devoted much attention.

The discussion of the revival of work in the carbonization field on lines that are running farther and farther from the long ruling practices, occupied a considerable place in the address. The study of the phenomena of carbonization and of the governing laws has long had possession of the President. In this connection, he made his first public utterances on the latest of his work with three-feet deep horizontal carbonizing chambers. From them he gets 12,000 cubic feet of gas per ton of coal, using South Yorkshire washed pea nuts; and he meets the local requirement (as already mentioned) for a harder coke than that produced in his ordinary horizontal retorts. From the experience with the chambers, sufficient has been learned to encourage the belief that there is nothing to fear in adopting larger ones where the size of the units, corresponding with the capacity of the works, is not unwieldy for meeting the varying demands for gas. The open mind is visible here; and, in fact, in treating of carbonization, there was almost throughout a non-committal attitude on the part of the President. In one place, however, there was one ray of light as to a preference in vertical working for the continuous system. "High ideals" are usually difficult of attainment. But evidence is not "wanting to show that substantial progress has been made; and the pioneers who are now successfully emerging from their difficult tasks are deserving of our sincere appreciation and congratulations. Provided there are no unforeseen collateral disadvantages to outweigh the many obvious advantages attached to the continuous system, the outcome promises to be not unworthy of the best traditions of British conception and initiative." But a deserved and generous recognition was made of the work of German colleagues both in intermittent vertical retort and chamber carbonization, in the latter of which (the President thinks) there is a possible means whereby gas-works in industrial areas may meet the competition of coke-ovens in the supply of a hard solid fuel. And in the production of the solid fuel for household use, the President suggests that the claims of the Coalite system should not be rejected without consideration. In such ways, the broad views of the President were spread before his hearers. To meet all requirements, we have to go from the single practice in carbonization to double and perhaps triple practices. Will it pay? The systems that will ultimately survive will be those that will give "greatest value in products of the quality to suit local conditions, accompanied by the least total expenditure of fuel for heating, labour for operating, and capital expenditure." The final test commonly applied to processes is that of pounds, shillings, and pence. But it must not be overlooked that, important as economy is, the degree of success in repulsing competition and in retaining trade is subject to the character of the produce being meet to local requirement.

On leaving the subject of the exercise of foresight in preparing to encounter the enlarged competition already well upon the horizon, the President carried the members on to several other topics. The changed circumstances in connection with gas supply were of other subject-matter—including, even in a city like Norwich, the large proportion of gas now used for day consumption. Statistics prove an approximate average of 50 per cent. consumption before the hours of lighting set in; and when it is considered that the consumption as fuel for domestic and industrial purposes has not ended then, and that so large a proportion of the gas is now consumed in bunsen burners for incandescent lighting,

the argument for the total supersession of the illuminating power standard by a calorific power one gains strength. The necessity for extended propaganda work in connection with residuals was emphasized; and especially was support asked for the propaganda work abroad of the Sulphate of Ammonia Committee. The intelligence was conveyed that the Committee are now joining a combination of producers abroad for this purpose; and it is believed that, in this direction, there are offered openings for preventing prices falling to a low level. But in all the operations of the gas industry, the loyalty and interest of all ranks of workers are required. In securing that loyalty and interest, no man did more than Sir George Livesey. The address fitly opened with an appreciation of a noble life spent and ended. The loss was industrially the greatest and the most saddening event of the Institution year. He gave us much technically and administratively; he showed the way to humanize and intellectualize the workers. Has it occurred to all the administrators of the gas industry how, in the detail of the gas business, the responsibilities of the workers have been increased by the growth of the business and its changed character? The intelligent interest and co-operation of these workers are now more than ever necessary. How best are they to be gained? The answer is found in Co-partnership. The future of the industry depends upon the wise appreciation of the position in the present. Contentment with the present and apathy as to the future must not be allowed to cloud reason and judgment.

Gas Heating Research.

THE Committee appointed by the Institution of Gas Engineers, in conjunction with the University of Leeds, to make researches on gas heating, presented a report at the meeting which constitutes a record of much valuable preliminary work, and of the results of a set of completed investigations on a typical form of open gas-fire. The original work was started by Dr. Drugman in November, 1907, and continued after his resignation, in October, 1908, by Mr. E. W. Smith, M.Sc., who has made the set of investigations referred to.

The work done by these gentlemen, under the supervision of the Committee, has afforded results of sufficient importance and value to warrant a continuation and extension of the research. The ground has now been cleared by many months of preliminary work, and by the experience gained in the course of the investigation now reported; and subsequent researches should be conducted with far greater ease, certainty, and rapidity. It is eminently desirable that research on similar lines should be pursued with a view to determining the relative radiating efficiency of the different types of gas-fires, and of the effects of these fires on the air of rooms which they may be employed to heat. Having regard to the widely differing conditions in which gas-fires are installed, it is very difficult, if not impossible, to assess precisely the relative merits of two different types of fire without the use of what we may term a standard room for the comparative trials. The first work of the Gas Heating Research Committee was to establish such a room in a building adjacent to the Fuel Department of the University of Leeds. The room in question was built of double wooden walls, which were made as nearly as possible air-tight, so that the whole of the ventilation could be absolutely controlled by the observer. Similarly, the walls were designed to prevent exchange of heat between the experimental room and the outer room in which it was erected. The room was therefore in no sense comparable with an ordinary living room; and on this ground care must be taken that improper inferences are not drawn from the results, which obviously are not forthwith applicable to any ordinary conditions. The standard room merely affords a means to the observer of ascertaining approximately absolute values for the heating effects of the stoves examined; and, having regard to its circumscribed area—it is a 9 feet cube—it may be questioned whether, even in this respect, cumulative effects were not realized which would have been absent had a room of larger cubical contents been available.

For instance, the air of the room in some of the tests attained a temperature of over 85° Fahr., and results obtained from a gas-fire burning in an atmosphere of this temperature cannot be translated into corresponding figures for more ordinary temperatures. Obviously, the percentage humidity of the atmosphere of a room is largely affected by the temperature at which the room is maintained; and it

would be entirely misleading to conclude that the air of a living room with the same type of stove would have even approximately the same degree of humidity as the air of the standard room which had been maintained for many hours at a temperature of over 85° Fahr., the drying effect of which on the walls and contents would clearly be quite abnormal. *Apropos* of humidity, it seems that the determinations in the experimental room were made by means of the ordinary wet and dry bulb hygrometer. If this is so, the humidity values must on this account also be considered unreliable. It is not long since the National Physical Laboratory had to report that a long series of investigations on the relative values of different standards of light under varying atmospheric conditions had been vitiated through the observations of humidity in the photometer-room having been made by the ordinary wet and dry bulb hygrometer, which, it has been well known for many years past, is unreliable in so far as indoor observations are concerned. ["JOURNAL," Sept. 15 last, p. 713.] It is a little surprising that the representatives of the University of Leeds on the Committee did not see that reliable means of estimating the humidity of the room were used. As it stands, we fear that no significance can be attached to the humidity determinations and the inferences which have been drawn in the report therefrom.

The rate of air change in the room was rightly estimated from determinations of the amounts of the carbon dioxide present in the outer air and in the flue gases, and the amount produced by the complete combustion of unit volume of the gas consumed; the rate of consumption also, of course, being known. The analytical methods employed are not stated in sufficient detail to enable an opinion to be formed as to their being appropriate and accurate enough for the purpose. The vague statement made in the report as to the mode of carrying out gravimetric determinations of carbon dioxide as a check on the volumetric method used is certainly unconvincing. Protest must be made against the pedantic fashion of stating the rate of consumption of gas and the calorific value of the gas in terms of unit volumes measured at 0° C., 760 mm., and dry. The ordinary English standard conditions of 30 inches, 60° Fahr., and saturated, should certainly have been followed for expressing the rate of consumption of the gas-fire used, and the calorific value of the gas. The two columns in Table I. of the Appendix to Mr. Smith's report, in which the rate of consumption and the calorific value are stated, as they stand, need translating into ordinary English terms before they will convey their real meaning to English gas men. It is also absurd in this country to state the temperature of a room in degrees on the Centigrade instead of the Fahrenheit scale. In these and some similar points, the members of the Institution on the Research Committee should see that academical modes are not allowed to detract from the general utility and value of the report. Consistency even is not displayed in this matter in the present report, for the weight of water vapour in the air is stated in grains, and not in terms of the metric system of weights. If the Committee realized that the metric weights in this case would not be readily followed by readers of their report, they should also have seen the futility of using other units based on the metric system, such as millimetres and calories.

The most valuable part of the report is clearly that which deals with the method of estimating the proportion of the total heat of the gas consumed which is radiated into the room, and the results of the estimations thus made. The figures obtained show that upwards of 35 per cent. of the total heat of the gas is radiated into the room. The mean figure is about 32 per cent.; and it is worth noting that the experiments lead to the conclusion that this figure is unaffected by the amount of air passing through the room. About 30 per cent. of the heat of the gas, however, was found in the experimental conditions to pass into the flue. Notwithstanding that these conditions were not altogether normal, it may be accepted that this figure represents approximately the proportion of heat ordinarily expended, when a room is heated by a gas-fire, in maintaining the draught of the flue, in order to secure the proper removal of the products of combustion and adequate ventilation of the room. It may, perhaps, be doubted whether, from the hygienic standpoint, this apparently large proportion of the total heat of the gas consumed is to any considerable extent wasted. Its curtailment, which is not in fact a difficult matter, would doubtless result in complaints of stuffiness by those accustomed to the free ventilating action of the

open-grate coal fire. There is a curious suggestion made by Mr. Smith—namely, that the pre-heating of the gas consumed in a gas-fire should be attempted as an alternative to the pre-heating of the air supply, which is more or less completely carried out in certain types of gas-fires. Having regard to the small volume of gas compared with that of the air required for its combustion, it does not seem probable that Mr. Smith's suggestion would lead to economy worth serious consideration.

It is to be hoped that the experiments will be continued under the guidance of the Committee, and comparisons made between various types of gas-fires, and, in particular, different kinds of radiating materials. For instance, comparative figures as to the radiating efficiency of the iron frets, which the late Mr. Thomas Fletcher found to be 50 per cent. superior in this respect to the ball "fuel" of his day, would be most valuable. There are many other types of "fuel," which it is unnecessary to particularize here, which should be tried in comparison with the typical "fuel" used in the gas-fire on which the present trials have been made. Also the Siemens type of reflecting stove which is so popular on the Continent should be included in the comparative tests. We opine that it would not show to advantage; and authoritative figures on this head would be most valuable in furthering the adoption of gas-fires of the English type and of English make in Continental countries. The Committee, however, should consider the advisability of altering their experimental room so that only a normal living-room temperature is reached, and also of securing determinations of humidity which shall be of greater value. They might with advantage secure the addition to their number of a chemist or physicist having a special knowledge of this class of research work. But already valuable work has been done by Mr. Smith under the guidance of the Committee; and it is only—we hope the Committee will accept the assurance—with a view to securing an enhancement of the value of their future work that the suggestions and criticisms here made are offered.

Carbonization and Conveying.

THE mass of material referring to retort-house operations presented at the meeting, and the interest taken in it all by a big auditory, indicated how completely the subject has a hold of gas engineers and managers dealing with all grades in magnitude of operation—from the large works down to the small. We speak of carbonization being now in the transition stage. It is a long bridge over which crossing is being made; and matters are still in such an unsettled and inconclusive condition that it is difficult—nay, impossible—for many men to determine which of the new methods of working will eventually prove the superior. We have still to wait for installations of certain of the systems giving, on an ordinary working scale, a sufficient and reliable account of themselves. Even then, unless the conditions of working as between system and system are comparable, and the results are set forth in uniform manner, decision must still be difficult. What is wanted to clear the air are testings of some long duration on similar coals in the various types of setting. Results are presented from Durham, Yorkshire, and Derbyshire coals, Lancashire slacks, and unnamed British coals, used in different systems of working; but while the coals show, as a rule, improved results in vertical retorts over those usually obtained with horizontal retorts, it is impossible to place the figures side by side, and draw conclusions from them on which absolute dependence can be placed. Until we pass from this condition of chaos to a state in which workings are co-ordinated, so supplying the wherewithal for comparison, the means will not be available for adequately judging whether one system has an ultimate superiority over another, or whether the systems have equality, in working results, costs, and so forth, or whether one system has special applicability to one's local conditions.

However, the report presented to the Carbonizing Committee by Dr. Lessing, his paper on heavy charge chamber settings, and Mr. J. Ferguson Bell's communication on the results obtained by working large and long-hour charges in horizontal retorts, have set before us a great deal of interesting matter; but the utmost it has all done has been to show the extensive activity prevailing on the Continent and in this country in investigating new methods of carbonization. A careful examination of the material, however, does not disclose anything that can be said to add to the knowledge existing before the meeting, though we are grateful to Dr. Lessing and Mr. Bell for focussing, in an impartial way, within the limits of their opportunity, the work that

is being done at this particular juncture. It is the view in Germany that the days of horizontal and inclined retorts are numbered, and that vertical retorts and large carbonizing chambers will be the things of the future. It must be admitted, too, that it is a recognition of a superior advantage in the vertical retorts that, since their advent, or rather since the publication of the first results of their working, British gas engineers have had their eyes opened to the fact that they can immediately improve both gas and coke production by the use of heavier charges in their horizontal retorts; and Mr. Bell's paper is illustrative of the point. In fact, to such an extent has this been proved that British gas engineers will be in no particular hurry to pull out their horizontal and inclined retorts in order to adopt verticals or any other form of setting. There are, however, advantages collateral with gas production in certain of the new systems that will, we believe, lead to an extensive adoption for replacement and entirely new installation work.

As between vertical retort settings and large carbonizing chambers, the recommendations so far to hand for the latter are not such that any feelings of preference can yet be aroused in this country on their behalf; and their only chance here seems to be—confessedly looking to the future only from the standpoint of present knowledge—in districts where gas-works are, for self-protection, compelled to preserve their industrial coke market by producing a much harder fuel. Even then, to save the large degradation of the illuminating power of the gas shown by Dr. Lessing to be the result of spacious chamber work, there will be a strong inclination towards smaller bulk carbonization, such as is being pursued by the President at Norwich, or in one or other of the vertical retort systems. Gains and losses have in these days to be seriously and comprehensively considered. Dr. Lessing recognized this—in fact, he was perfectly impartial in his presentment of the position of large chamber settings in Germany and elsewhere; and from all the information at his command, he declined to go the length of committing himself to any advocacy in their favour. Illuminating power, heavy capital expenditure, the wear and tear on structures by dumping in such heavy charges and by the strains set up on the chamber walls through the cooling effects of such large bulks of materials, the largeness of the carbonizing units, and the immense difficulty in the event of machinery breakdown in dealing with such quantities of coal and coke, are all disadvantages of large bulk carbonization that will weigh heavily as against the advantage of labour in the minds of British gas engineers. There is sufficient here, apparently, to neutralize any gain in labour; and labour economy can be purchased too dearly. It must also be borne in mind that the farther one departs from a reasonable weight of charge, the more one loses that exact control of operations and conditions that is so very essential with gas as the primary product of the operations.

The paper by Mr. Robert Watson on the advantages and disadvantages of conveying plant was a studious effort that deserved much more consideration than it received through being linked-up with the carbonization papers. It includes a no small amount of original investigation work; and its purposes were to prove that conveyors are profitably applicable to works of smaller capacity than has hitherto been regarded as feasible, and that the conveyor *per se* has hitherto had allegations levelled against it that are not justified by experience. Mr. Watson takes us beyond bare monetary considerations as between conveying and barrowing, and brings out subsidiary advantages of conveying that, though their value cannot be financially assessed, are such that they contribute to the economies of working. Conveyors have been much maligned as excessive breeze makers. Mr. Körting proved in our columns some time since, from the working at Berlin, that these adjuncts of the retort-house have more charged against them in this respect than is their due. Mr. Watson's paper confirms this. The conveyor is not the sinner; but the methods of dealing with the coke subsequent to its removal from the retort-house are at fault where there is excessive breeze production. It is to those subsequent methods that the engineer must direct his attention; and then he will find that breeze production submits itself very largely to engineering control.

The Best Gas for Incandescent Lighting.

THE paper presented by Mr. Arthur Forshaw, M.Sc., the Institution Research Fellow in the Department of Gas Engineering and Fuel of the University of Leeds, deals with a fundamental question in the supply of gas for lighting

purposes—viz., the nature of the gas affording the highest illuminating duty with the Welsbach mantle. His investigations so far have only touched the fringe of this tremendous problem; but already they are valuable in confirming the view held by most thoughtful gas experts that flame temperature is at least as important as calorific value in incandescent gas lighting. The supreme difficulty in determining the relative illuminating values of different gases with incandescent mantles lies in the circumstance that each gas requires for the development of its maximum illuminating duty a burner specially designed for it, and a mantle specially shaped to fit the flame given by the particular gas in that burner. It is just this difficulty which has caused prolonged series of researches such as those carried out by M. Sainte-Claire Deville of Paris, and by Messrs. White, Russell, and Traver in the United States, to lead to comparatively inconclusive or even contradictory results. The investigators just named also had only to consider the upturned type of incandescent burner; but it is obvious that in future more importance will attach to the illuminating efficiency of a gas consumed in an inverted burner. So far Mr. Forshaw appears, like previous investigators, to have studied only the relative efficiencies of two gases in the upturned incandescent burner; and it is practically certain the results obtained regarding the latter are not directly applicable to the inverted burner.

Having regard to the greater importance at the present day of the inverted system of incandescent lighting, we need not discuss at length Mr. Forshaw's efforts to obtain a standard burner of the upturned type with which to make comparisons of the relative illuminating efficiencies of carbon monoxide and hydrogen. He selected a burner which could be adapted for either the No. 0 or the No. 2 Welsbach mantle, and found, as was to be expected, that, when it was adapted to consume carbon monoxide to the best purpose, it was wholly unsuitable for the combustion of hydrogen. He desired to measure the internal air supply to the bunsen flame for each gas, and adopted for the purpose a meter, with governor, supplied with air through reducing-valves from storage cylinders, in which it was compressed at 200 atmospheres. The air supply was fed at a rate measured by the meter into the burner's mixing chamber, which was closed to the outer air. This arrangement must surely have required a great deal of care and watchfulness, to ensure the internal air supply of the burner being at even approximately atmospheric pressure; and we do not see that Mr. Forshaw mentions what gauge he used in order to ascertain that the air did flow into the mixing chamber under the prevailing atmospheric pressure. Any deviation from the atmospheric pressure for the internal air supply of incandescent burners causes so serious a departure from the normal conditions of the combustion of gas in such a burner, that erroneous deductions are very liable to be drawn from the results obtained. Once the pressure of the air supply of an incandescent burner is varied, however slightly, from the natural atmospheric pressure, the conditions of combustion and the liability of the flame to strike-back to the nipple are seriously affected. We cannot but think that Mr. Forshaw would have been well advised to have adopted Winkler's method of measuring the internal air supply to a gas-burner, with either a smoke or torsion-vane gauge, as described some time since in the "JOURNAL" [Sept. 20, 1904, p. 803, and Sept. 3, 1907, p. 625].

Assuming, however, that Mr. Forshaw was able, with his less satisfactory arrangement, to regulate the air supply to the standard experimental burners exactly to atmospheric pressure, the results he obtained are very interesting. For hydrogen, he found it necessary to design a form of burner which, as he points out, is very far removed from anything which is likely to be used in actual practice, as the burner-head was provided with a water circulation for cooling purposes. No doubt very many forms of burner were tried before this type was evolved and chosen as the most suitable; for it is stated that several months of experimental work were devoted to modifying the construction of the head of the burner, in order to secure good aëration of the hydrogen flame without its striking-back. An account of this experimental work might indirectly furnish some valuable hints to makers of incandescent burners. It has so often in the past been assumed that the bunsen burner could not be adapted for a particular purpose—such as for inverted lighting, and for the consumption of acetylene—and subsequent investigation has proved the assumption to be entirely groundless, that we are reluctant to believe that a practicable bunsen burner for the consumption of hydrogen for

incandescent lighting is not feasible. We wonder whether Mr. Forshaw has followed the evolution of the modern incandescent acetylene burner. The significance of these remarks lies in the fact that comparative results of the illuminating efficiencies of the two gases are of little value unless both gases have been consumed in the burner and with the mantle best qualified to afford the maximum illuminating duty from each. It is palpable that the same burner and mantle are not likely to be equally suitable for two gases of such widely different physical and chemical properties as carbon monoxide and hydrogen.

It is, however, permissible to take another view of the question, and to hold that mantles, and, in a smaller degree, burners, have now become standardized in respect of form and size, and that the comparative illuminating efficiencies of different gases must be judged solely by reference to their performances when consumed in the typical consumers' burner with a mantle of the most usual size and shape. If this view were adopted, it would probably be right to accept the Welsbach "C" burner and mantle for the comparative tests of different gases. Investigators seem hitherto to have started their tests with the intention of following this plan; but, as soon as they have departed from the use of gas approximately of the same character and quality as that supplied to towns at the present time, they have been impelled by the course of their investigations to diverge from it. Mr. Forshaw, almost from the outset of his work, gave up the consumers' burner; but he seems to have adhered throughout to mantles of stock size and form. It is hard to see why, once departure from the ordinary consumers' equipment is admitted, it should be confined to the burner and not be extended to the mantle also. The view that the comparisons should be made with a stock typical burner and mantle may, of course, be logically upheld; but little defence can surely be offered of the intermediate method followed by Mr. Forshaw of varying the burner but not the mantle. We think, however, that it would be a great mistake to assume that any burner or size or form of mantle may be regarded as a stereotyped pattern to which any illuminating gas which it may be desired to employ should adapt itself. The span of time required to effect a complete transformation of the burners used by a gas-consuming community is after all but short, as will be realized by a consideration of the decade which witnessed the displacement of the flat-flame by the upturned incandescent burner, and of the subsequent decade, in which we now are, which is witnessing the supersession of the upturned by the inverted burner. It would, therefore, seem certain that, if it were shown that the only obstacle in the way of the adoption of a new illuminating gas was that, for the development of its highest illuminating efficiency, a new burner or a new form of mantle was requisite, the obstacle would not avail to prevent its adoption. Consequently, in an investigation of the intrinsic illuminating duty of a gas with the Welsbach mantle, the greatest latitude should be admitted both in the type of burner and in the form and size of mantle, consistently with the idea that any such burner or mantle tried should be of such a nature that it could be produced if necessary on a manufacturing scale, and manipulated without difficulty by an unskilled consumer. Within the limits of variation of the burner accepted by Mr. Forshaw, he has shown that carbon monoxide is unquestionably a superior component of a gaseous mixture intended for use for illumination with upturned incandescent burners. We hope that he will shortly demonstrate whether the same conclusion holds good in regard to inverted burners.

The bearing of the experiments with the two gases, carbon monoxide and hydrogen, on ordinary gas supplies, has not, we think, been sufficiently indicated or emphasized in Mr. Forshaw's paper. It is not merely a question of whether one or other of these gases in the free or elemental state should preponderate in lighting gas. If it were not otherwise, apparently the aim of the gas-works' engineer, who primarily considered the requirements of the incandescent burners in his district of supply, would be to suppress as far as possible the amount of hydrogen in his gas, and to increase the amount of carbon monoxide. Disregarding for the nonce the objectionably toxic character of the latter gas as a component in large proportion of a popular gas supply, it would be no difficult matter to effect this variation up to a certain point by modification of gas-works' plant and processes. Actually, however, much more than this is involved in the question as to the relative illuminating efficiencies of the two gases. All the

combustible constituents of ordinary heating or lighting gas other than carbon monoxide and hydrogen may be regarded as sources of these two gases in the bunsen flame. Thus the hydrocarbons may be regarded as breaking up in the flame into a water gas consisting of hydrogen and carbon monoxide, the relative proportions of which in the water gas vary according to the ratio of carbon to hydrogen in the particular hydrocarbon.

Consequently, it would appear to be demonstrated that the hydrocarbon which would thus afford the greatest proportion of carbon monoxide to hydrogen would be the most suitable component of an illuminating gas. Having regard to the fact that the hydrocarbon in question must be gaseous at the prevailing temperature and in the degree of dilution in which it occurs in the lighting gas, it would seem established that acetylene or benzene would be far superior hydrocarbons to ethylene or ethane for incorporation in lighting gas. Hazarding a conjecture (which we hope Mr. Forshaw may eventually prove or disprove), it seems probable that an almost ideal gas for lighting with the Welsbach mantle, having regard solely to illuminating efficiency, would be a mixture of carbon monoxide and acetylene, or, in default of that, carbon monoxide and a small proportion of benzene. The real difficulty this problem presents to the gas maker is to find a more satisfactory diluent than the hydrogen that at present predominates in both coal gas and water gas. In coal gas the deleterious influence of the hydrogen is offset by the presence of a considerable amount of methane. In water gas, there is no such counteracting influence; but the carbon monoxide is in higher proportion.

Working Costs and Capital.

THERE were two papers read (they were the final ones) dealing with the finances of gas undertakings—the one, by Mr. Herbert Lees on a study of working costs; and the other, by Mr. Arthur Valon, in which he made a suggestion for the redemption of capital by gas companies, in order to reduce the capital account and charges per unit of output. Mr. Lees' paper traverses so much ground, and shows so much industry, that it is impossible to do more here than make a few cursory comments upon certain of its features. His study shows that there has been progress in working economy all round, but that the working economy has been largely nullified by increased expenses in other directions. Wages have gone up, distribution expenses have increased, rates and taxes have also advanced, and coal has risen in price, and is likely to maintain a higher normal level than hitherto. In company working, the best of administration and ingenuity could not have obviated any of these increased expenses. But in connection with municipal trading concerns, the considerable extent to which labour dominates the actions of the governing bodies, and the prodigal administration of many authorities, have had effect upon the expenditure of their own undertakings; and this, in turn, has borne heavily upon private enterprises, among them gas-works. But speaking of the expenditure of gas undertakings generally, it is obvious from the paper that, had it not been for improved working, and the adoption of mechanical means of operation, it would have been a bad thing for the gas consumer, therefore for the progress of the gas industry, and consequently for labour. The workers in the gas industry, it is clear, have nothing of which to complain; economy in the industry has been their defence, and has widened the field of employment.

Among the many points brought out by Mr. Lees is also this, that the make per ton of coal is an illusory basis on which to institute working comparisons, unless the character of the coal used is known. The ultimate surplus revenue per 1000 cubic feet of gas sold, having regard to the price charged for gas, is a safer one. It is in many cases an economical proceeding to buy cheap local coals of a low gas-yielding variety, rather than purchase from a distance a superior coal of a high gas-yielding quality; and in those cases, there are examples of concerns with low gas yields per ton exhibiting a better ultimate financial return than others with higher makes. The largest profitable gas yield from the coal that it is the most economical for him to purchase is, of course, the aim of every gas man; but the point as to the ultimate yield of a low gas-producing coke is one that is frequently overlooked in discussions where makes per ton are quoted. There is one thing before leaving Mr. Lees' paper to which we should like to call his attention; and it is that had he taken the London Companies' figures for

1908, instead of for 1907, the comparisons of the workings would, generally, have been more favourable to them.

Regarding Mr. Valon's proposition as to redemption of gas companies' capital, we are in full agreement with him that a low capital is conducive to a low price for gas; and that the lower the capital in future, the better will it be for the concerns. The question, however, is which is the preferable way, under the circumstances of the time, to reduce the capital expenditure—by a fixed setting aside to a redemption fund, or by charging as much as is legitimate and proper to revenue account for replacements, maintenance, and depreciation, and, whenever the occasion is favourable, reduce the price of gas, and so create new business. The addition of the obligation of a redemption fund to what companies, or wisely administered ones, are already doing, would operate to defer reductions of price; and this would make it all the more difficult to expand and consolidate business in competition with other illuminants. To both present and future consumers, and to both the present and future interests of the companies' undertakings, this would be prejudicial. Nor would it be fair to compel the shareholders to forego any portion of their present dividends. The yield on gas investments to-day is not more than the holders are entitled to; and, looking down our stock and share list, it strikes us that some of the holders would not think it at all amiss if their returns were a little higher. The reduction of capital in the way proposed by Mr. Valon would, we feel certain, be an advantage at present to competitors, and that would be a "sacrifice" we at all events are not prepared to advocate. Nor do we think many gas companies will be willing to endorse Mr. Valon's view.

There is another point. The difference existing between the capital of companies and local authorities per million cubic feet of gas sold is partly due to the big proportion of small companies compared with municipal undertakings; and these are just the companies whose capital requires reducing, but who would be injured most by Mr. Valon's method of effecting the reduction. He says that capital redemption for companies would be much the same thing as the sinking fund for municipalities. It would not now be for many companies. The geographical and the trading conditions of the majority of the municipal gas undertakings of the kingdom is altogether different from those of a very large number of the company undertakings. The operation of their sinking funds commenced many years ago before the undertakings had grown to their present dimensions, and before competition was so rife as it is to-day. Several of the undertakings more recently transferred are suffering greatly from the necessity of having to provide the money for sinking fund, which causes comparatively high prices for gas to obtain. The fact of the matter is that Mr. Valon's proposal has come—shall we say?—some thirty or forty years too late. What he desires must now be obtained by another method. Moreover, in view of the restrictions that Parliament has been putting during the last two sessions upon gas companies in the matters of appropriations from revenue and the amount carried forward, there would be, we fancy, some difficulty in persuading the authorities to allow the creation of the additional fund proposed. In the case of the Gaslight and Coke Company, there were special reasons for the wiping-out of part of their capital.

The Design of Atmospheric Burners.

In another column of to-day's issue of the "JOURNAL" will be found an exceedingly interesting communication from Mr. Alfred Mansfield, of Liverpool, on "The Design of Atmospheric Burners." The writer points out that one of the many problems arising in this connection is the relation of one orifice to another; and he says he does not know of any tables which give this information in a manner that will be serviceable to busy men. He has been obliged to work them out in his own laboratory, and he publishes them in the hope that they will be of service to others. He gives clear directions for the use of the tables. He claims for them that they facilitate the correct calculation of the relationship between the issuing orifices and the mixing-tube of a burner; and that when once a satisfactory burner has been designed, a smaller or a larger one can be produced which will give exactly the same efficiency. Another feature of the tables is that if the consumption of gas of a certain quality by one burner is found, the consumption for any other size can be calculated with exactitude for the same quality of gas.

The Gaslight and Coke Bill.

At length, the Gaslight and Coke Bill has been released from the obstruction of Mr. William Thorne; and it has now been read the third time and passed. Mr. Thorne did not give in. He carried his opposition to the utmost limits, and challenged a division, with the result that he got badly beaten in a comparatively thin House. This was on Thursday, and what then took place will be found fully reported in our "Parliamentary Intelligence." Mr. Thorne made many statements, several of which were sufficiently incorrect to have been misleading if submitted to an unintelligent audience. In effect, he asked the House for a verdict on an *ipse dixit* statement containing conclusions entirely opposed to the findings of Mr. Mooney's Committee after a thorough and impartial trial of the proposals of the measure in all their bearings, and after a thorough investigation on the part of, and settlements with, the City Corporation, the London County Council, and the East Ham and other Borough Councils, but not the West Ham Council, who stood alone discontented. Upon that Council is Mr. Thorne, and many others who think like him, and have only one object in view in their public and political life. Mr. Thorne suggested that the Bill had been "rushed;" he also used the word "artful," and suggested that nearly everybody had been "squared." The rushing process has been a wearisome business. To get the Bill forward to its present stage has been something like the "rush" experienced in punting against a swift stream. If Mr. Thorne had only thought a little more before he spoke, it might have occurred to him that the terms "rushing" and "squaring," as used by him, do not run together. "Squaring" councils is slow work; and such "squaring" as there had been amounted to satisfying local authorities by giving as much as could reasonably be conceded in the interests of ratepayers and consumers. The whole secret of Mr. Thorne's opposition on third reading (he did not oppose on second reading) was because the West Ham Corporation did not get all they irrationally wanted the Select Committee to give them. But they did get a considerable part of what they asked for through the consent of the Gaslight and Coke Company to substantially continue as before the Bill was introduced the works at West Ham for a further ten years. Sir Daniel F. Goddard (whose lifelong interests in the gas industry are well known), Mr. Mooney, and Mr. A. C. Morton all exposed to the House the hollowness of the case put before it by Mr. Thorne; and the House showed its sense of the position, and the value of the statements made by the mouthpiece of the opposition, by rejecting the amendment by 203 votes to 43. Parliament has before declined to reverse the decisions of Select Committees on the superficial declarations of individual members; and this is an added instance.

Co-Partners and the Budget.

The Chancellor of the Exchequer is going to have no mercy on those of the workmen shareholders in co-partnership concerns who have accumulated a little capital. Mr. Joynson Hicks, one day last week, put it to Mr. Lloyd George whether he did not think the dividends of such workers were purely earned money, and whether in that case he could not see his way to allow the dividends to be treated as earned income rather than as unearned income for purposes of differentiation in income-tax. The Chancellor of the Exchequer announced that he was unable to extend special treatment to these particular shareholders. So that a few of the more "bloated" capitalists among the co-partnership gas workers will have the privilege of paying a little into the National Exchequer at the 1s. 2d. rate in the pound.

A National Miners' Conference.

For the purpose of considering, among other matters, the position created by the coming into operation of the Mines Eight-Hours Act, and the attitude of the employers in regard thereto, a national conference was held in London last week of the Miners' Federation of Great Britain. The proceedings lasted two days; and though from the very commencement the men's leaders seem to have fully realized the seriousness of the position in which they now find themselves, one or two of them at the conclusion of the meeting expressed themselves as still hopeful of a peaceful solution—though there is still a firm determination not to give way on the sixty-hours' and double-shift questions. In the first place,

the conference agreed that the President and Secretary of the Federation, together with a member of the Executive, be appointed to assist the miners' representatives of South Wales in their endeavour to arrive at an amicable settlement of their dispute. This does not amount to very much as a step in the direction of peace; but it is at any rate to be hoped that it will not still further complicate matters. There is, however, a chance that it may do so, in view of the contention of the employers that the circumstances of the South Wales coalfield differ so much from those in the North of England, that they cannot allow any interference from the outside. The conference also decided that an effort should be made to arrange a joint meeting of coal-owners of Great Britain and the Federation, to consider generally questions arising out of the new Act; but in view of the resolution of the South Wales owners just alluded to, it seems hardly likely any good can result from this proposal. Perhaps the most important conclusion come to was the confirmation of the following resolution passed some six weeks ago: "That this conference, after hearing the reports of the districts upon the question of the introduction of the Eight Hours Act, resolves that it be an instruction to each district affiliated to the Miners' Federation of Great Britain to decline to accept any reduction in wages demanded by the coalowners consequent on the coming into operation of the Act; and should any district be attacked upon the wage question, or upon the question of extending working hours from eight to nine under the sixty-hours clause, a national conference is to be convened to decide what defensive action is to be taken." The only inference to be fairly drawn from this is that the men are just as determined as ever to stand firm; while there is, on the other hand, no indication that the employers are intending to recede from the position which they have taken up—or which, as they urge, has been forced upon them by the Eight Hours Act. Meanwhile, the existing position of affairs is summed up in the report that "business is at a standstill; and further examples of how trade is being diverted to other markets by the prevailing uncertainty were afforded by the placing of an order last Friday with a German Kiel firm for the supply of 18,000 tons of Westphalian coal to German warships, and the placing of a French order for 50,000 tons also with the Germans."

Progress in Constructional Gas Engineering in Germany.

It may be remembered that early this year two articles under the above title appeared in the "JOURNAL," calling attention to a fine album which the Berlin-Anhaltische Maschinenbau Actien Gesellschaft had recently issued, containing more than 700 illustrations of plant and apparatus constructed by them within the past six years. The illustrations, with the brief explanations (in German) accompanying them, filled about 300 pages; and the album constituted, as claimed by the important firm issuing it, "a general review of modern gas-works machinery." We refer to the articles again to mention that an English edition of the album has now been issued, bound in a style similar to its predecessor; and we have no hesitation in qualifying it as one of the most handsome catalogues of gas-works plant that have ever come under notice.

English Capital Invested Abroad.

An interesting account of the large sums of money that have during recent years been invested abroad by British capitalists was given at the Royal Statistical Society last Tuesday by Mr. George Paish, Joint Editor of the "Statist." He said the Commissioners of Inland Revenue set forth in detail the amounts received from certain classes of investments, amounting in all to about £80,000,000—a sum which he considered to be under-estimated by about £3,000,000. They did not include, however, investments in public companies. In order to amplify the information published by the Commissioners, the author obtained the reports of as many miscellaneous companies who have raised capital publicly in this country as he could; and, after analyzing them, he concluded that British income from these sources amounted to nearly £58,000,000 a year, bringing up the total to £138,000,000. In this are included £1,200,000 for gas-works, and £400,000 for water-works. To obtain an income of about £140,000,000 per annum, Great Britain has invested something like £2,700,000,000, and is obtaining an all-round return of 5.2 per cent.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 914.)

A NARRATIVE of the course of events on the Stock Exchange during the past week might almost be confined—not unfittingly in Ascot week—to the more “sporting” markets, the American, South African, and Mining. Business in the others was at no time active or at all interesting. In the vivacious lines indicated there was no lack of excitement, especially as the tendency varied upwards or downwards. The opening day found the tone favourable in good investment stocks, and Consols had a slight advance, while Railways were firmer. But the Foreign Market was uneven, and South Africans weaker. Tuesday was another quiet day; and the tendency in many markets was irregular. Wednesday was dull; the predominant influence being the weakness of speculative lines recently rushed up, to account for which various causes were put forward. This weakness was again apparent on Thursday; but the gilt-edged class was stronger. Consols rose $\frac{1}{16}$. Uneasiness regarding coals was a lowering factor in Railways. Friday maintained the strength of Consols and their like; but it was a bad day for the speculative markets. On Saturday the positions were reversed; the losers and the gainers of the previous day entirely changing places. In the Money Market, conditions were easier owing to a reduced demand; and rates for short loans and discount closed lighter. Business in the Gas Market was on a considerably reduced scale, and not a single issue (with the possible exception of South Metropolitan) was up to its recent average of activity. But the tendency was very favourable, and a good many quotations were advanced. Gaslight and Coke ordinary was unchanged, though prices pointed rather downward, with transactions at from 103 to 103 $\frac{3}{4}$. In the secured issues, the maximum realized 88 $\frac{1}{2}$ and 88 $\frac{3}{4}$, the preference from 105 $\frac{1}{4}$ to 106, and the debenture from 84 $\frac{3}{4}$ to 85 $\frac{1}{8}$. In South Metropolitan, prices ranged from 122 to 123 $\frac{1}{2}$. The debenture made 85 $\frac{1}{2}$. In Commercial, the only bargain was in the 4 per cent. at 109 $\frac{3}{4}$. In the Suburban and Provincial group, Alliance and Dublin new changed hands at 12 $\frac{3}{4}$ and 12 $\frac{13}{16}$, Brentford new at 196 (a rise of 1), British at 42 $\frac{3}{4}$ and 43 $\frac{1}{4}$, and West Ham at 121 and 121 $\frac{1}{2}$. Quotations rose in Brentford old and debenture, in both Ilford, in Liverpool A, in Newcastle debenture, in Tynemouth, and in West Ham preference. In the Continental companies, Imperial was quiet, at from 179 to 180, ditto debenture made 97, Malta 4 $\frac{3}{4}$, and Union from 96 $\frac{1}{2}$ to 97 $\frac{1}{4}$. Both European issues advanced without business being done. Among the undertakings of the remoter world, Buenos Ayres realized 13 $\frac{3}{4}$ to 14 $\frac{1}{2}$, Melbourne 4 $\frac{1}{2}$ per cent. 101 $\frac{3}{4}$, Monte Video 12 $\frac{1}{2}$ and 12 $\frac{7}{8}$, Primitiva 6 $\frac{3}{4}$ to 6 $\frac{1}{2}$, ditto preference 5 $\frac{3}{4}$ and 5 $\frac{5}{8}$, River Plate 14 $\frac{3}{4}$ and 15, San Paulo 14 $\frac{1}{8}$, ditto preference 12 $\frac{1}{8}$.

IMPORTANT RETURN ON MUNICIPAL TRADING.

THERE were issued last week, in compliance with an order of the House of Commons, two instalments of a return in relation to municipal trading in the United Kingdom which was moved for as long ago as Dec. 20, 1906, by Mr. Chiozza Money, the Member for North Paddington. The return was to show for the London County Council, the Corporation of London, the Council of each of the Metropolitan Boroughs, and the Corporations of a number of Provincial towns, including those of Edinburgh, Glasgow, Dundee, and Aberdeen, the nature and extent, and, for each of the last four years for which figures were available, the financial results of reproductive municipal undertakings, including for each separately “a short description, the date and terms of its original acquisition or establishment or its subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of relief or burden to rates, number and salaries of the chief paid officials, number of workpeople, rate of wages paid in the chief classes of labour, and prices charged for products or services supplied or rendered.” It will be acknowledged that this was a “very large order;” and probably no surprise will be expressed at the length of time which has elapsed between the giving of, and the compliance with it, when it is stated that the present issues, which are only the first and sixth instalments of the complete return, extend to 110 and 83 foolscap pages respectively, and yet the particulars presented relate only to the Corporations of Bradford, Halifax, Huddersfield, Leeds, and Sheffield—all situated in the West Riding of York, and the Corporations of Edinburgh (including the Edinburgh and District Water Trustees and the Edinburgh and Leith Gas Commissioners), Glasgow, Dundee, and Aberdeen.

A Memorandum which precedes the statistics for the English towns gives a good idea of their scope. The municipal boroughs in England and Wales mentioned in the order are all those which at the date of the Census of 1901 had populations of upwards of 90,000, with the addition of the municipal boroughs of Stockton-on-Tees and Blackpool, the populations of which were 51,478 and 47,348 respectively. The aggregate population of these boroughs and of the Metropolitan areas mentioned was 12,183,163 in 1901, and their aggregate area was 400,694 acres (land and inland water only), allowing for alterations of area that have taken place since that date. The total population of England and Wales was then

32,527,843, and the area 37,327,479 acres. The average population per acre in the places in England and Wales to which the return relates was therefore 30.4, compared with 0.6, the average for the rest of England and Wales.

With a view to securing uniformity in the classification of the numerous details required, the local authorities were invited to group together the particulars in respect of each undertaking under its head, and to subdivide them as follows: (1) Capital, (2) income and expenditure, (3) scales of prices charged, (4) number and remuneration of officials and workpeople employed, (5) nature and extent of the undertaking, (6) system of management, (7) observations as to entries contained in any of these divisions. The plan thus outlined has been followed in compiling the return, with the exception that, in cases where the local authority carried on more than one undertaking, the particulars relating to the capital of the several undertakings have been printed in one table for each area. Those furnished by each local authority are brought together and are prefixed by a table (prepared by them) showing the acreage of the area on March 31, 1906; the rateable value of the area at the same date; the estimated population in June, 1905; and the total number of members of the town or other council in the year 1905-6.

It was not practicable to secure that all the entries relating to the capital, income, and expenditure of the several undertakings should be made on a uniform basis in the return. It was therefore left to the officers of the local authorities concerned to place their own interpretation, for the most part, on the terms of the resolution of the House. With a view to avoiding undue divergencies of method, however, detailed forms were issued by the Local Government Board on which the entries referred to could be made. Further, explanatory instructions as to filling up the forms were afforded from time to time, as was found necessary. In order to give effect to the general intention of the resolution, particulars not specifically required are included in the return.

The Memorandum under notice is signed by Sir S. B. Provis, K.C.B., Permanent Secretary to the Local Government Board; the statistics relating to the places beyond the Tweed being preceded by one signed by Mr. James M. Dodds, C.B., Under-Secretary for Scotland. The former remarks (though this is scarcely necessary when one merely glances at the mass of tabulated statistics) that the preparation and verification of the statements contained in the return imposed considerable labour and trouble upon the officers of the local authorities concerned; and the Board express their appreciation of the services rendered in this matter by those officers. Whether all this labour and expense will be of permanent value to those who have to pay for it, we need not stop to consider, seeing that, by sanctioning the return, the Legislature evidently thought it would.

Carbonization in Bulk.

As bearing upon the subject of carbonization in bulk and the production of residuals, which was dealt with by Mr. Thomas Glover in his Inaugural Address at the meeting of the Institution of Gas Engineers last week, Mr. Charles Hunt has sent us the following extract from the paper, entitled “Notes on Residuals,” which he read before the former Institution in 1896: “Although carbonizing in bulk may at first sight appear to be but remotely connected with the subject of residuals, it will, upon consideration, prove to be intimately associated with it. When the Simon-Carvès system of coking was introduced into England some years ago, the author was led to hope that in some such plan might be found a solution of the labour question as affecting gas manufacture; and he so expressed himself in his presidential address to the Gas Institute in 1881. The idea, however, seemed at that time to be almost too venturesome to follow up. But without being at any time actually abandoned, it has been revived by the rapid and practical advances in the same direction which have been made on the Continent during recent years, and which are, in a great measure, the cause of the fall in value of tar products and ammonia. When on a visit to Belgium, with the Iron and Steel Institute during the autumn of 1894, the author was enabled to realize, by actual observation, the large scale on which the recovery of residuals is being pursued there in connection with the manufacture of coke for metallurgical purposes; and it was but natural to contemplate what might be the effect upon the values of gas residuals of an extension of the system here, where many million tons of coal are annually used in this industry. In what light, then, ought the system to be regarded? Ought it to be approached as a possible ally, keeping in view its advantages in the saving of labour, or must its advances be watched at a distance, as those of, to all outward appearance, an intractable competitor?”

The Munich Chamber System.—We are informed that the Coke Ovens and By-Products Company, Limited, of Nos. 141, 142, and 143, Palace Chambers, Westminster, S.W., have entered into a contract with the Ofenbau Gesellschaft M.B.H. of Munich as sole licensees to construct the Munich chamber-furnaces in Great Britain and the Colonies. There are built, and under construction, chambers of a capacity equal to 2000 tons in 24 hours. At present, all these are on the Continent, and include Munich, Hamburg, Leipzig, Paris, Rome, Berlin, Hanau, and Regensburg (two installations). The new chambers at Munich and Rome have each a capacity of 6 $\frac{1}{2}$ tons, or 19 $\frac{1}{2}$ tons per setting of three chambers.

THE INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE SEVENTH ANNUAL GENERAL MEETING,

HELD AT THE

INSTITUTION OF MECHANICAL ENGINEERS, STOREY'S GATE, LONDON,

JUNE 15, 16, and 17, 1909.

MR. THOMAS GLOVER, OF NORWICH, IN THE CHAIR.

REVIEW OF PROCEEDINGS.

(For full Report see page 817.)

GLOOMY meteorologically though the morning of the opening sitting of the members of the Institution was—though to be accurate be it said there was a fitful breaking through of the sun's rays—there was no gloom in the animated throng that one met outside and in the vestibule of the Institution of Mechanical Engineers. In a body of professional men of the same calling, and situated as are the officials of the gas industry—all possessing common aims and ambitions—there are no piquant animosities, no dividing rivalries or partizan adherencies; and nothing but goodwill need prevail. The heartiness of the abounding greetings was the manifestation of the general goodwill and of the recognized community of interest that unite one and all in the bonds of friendship. Not only was the home profession well represented, but there were among the visitors friends in the calling from across the sea. The genial face of Dr. A. H. Elliott, the Engineer-Chemist of the Consolidated Gas Company of New York, was noticed; and the members felt more than honoured that Mr. A. F. P. Hayman, of Berlin, had come so far to receive the medal awarded him for his paper last year. And from Copenhagen on this occasion came Mr. Wissing, the Manager of the Valby Works, a description of which Mr. Irminger, the Chief Engineer of the Copenhagen municipal gas-works, gave to the members last year. Mr. Leonard G. Barber, Assistant to Mr. James C. Watson, the Engineer and Manager of the Oriental Gas Company, Calcutta, was also present. But apart from the personal interest attached to this first stage in the reunion, there were on view certain interesting models in the vestibule, together with a copy of the bust of Sir George Livesey from the deft hands of Mr. Sydney March; and this attracted a considerable amount of attention. Just inside the lecture hall was the oil-painting of Sir George, by Mr. Edward March, which has been purchased by the Directors of the South Suburban Gas Company for their Board-room. On all hands, it was agreed that in features, expression, and attitude, the artist had caught with wonderful truth the characteristics in these respects of the late leader of the industry.

Punctuality is the soul of business; and the President—Mr. Thomas Glover—numbers this principle among his virtues. The hands of the clock had only just passed the stroke of 10.30 when he entered, accompanied by a long line of the Council; and the members gave them a vocal greeting, both general and cordial. Immediately to the right and left of the President were those upon whom the honours and responsibilities of the chief office will in due season fall—the Vice-Presidents, Messrs. James W. Helps and Alex. Wilson—and with them were the Honorary Secretary (Mr. S. Y. Shoubridge), and the unremittingly energetic Secretary, Mr. Walter T. Dunn. The introductory business formalities were negotiated almost before some of the members were fully aware that the proceedings that marked another stage in the Institution history had commenced. Then the Council's report was presented; and it was imagined from the pause that followed the inquiry from the President as to whether any member wished to remark upon it, that the report would pass without comment. Not so. Mr. Carr was on his feet, desiring to ask a question as to a paragraph. The President suggested that Mr. Carr should read it. Mr. Carr replied that there was no occasion to do so, whereupon there was a ripple of laughter all through the hall. Everyone

present knew that there was only one subject to which Mr. Carr was likely to refer, and that was the one as to the deputation to the Board of Trade on the question of unifying the standard burner for gas testing throughout the British Isles, and the suggested promotion of a Bill for the purpose. The members are beginning to look upon this as a sort of foible of Mr. Carr. But be it said he spoke, on this occasion, in perfectly friendly tone. The promotion of such a Bill he believed would be strenuously opposed by local authorities, and would involve the Institution in very heavy expense. In his opinion, if the Council had followed a course of non-intervention in this matter, it would have been distinctly better. But then Mr. Carr went further, declaring that, while he had no objection to the "Metropolitan" No. 2 burner, he had an objection to the burner being used to throw dust in the eyes of gas consumers and local authorities. The remark to this effect was vigorously assailed from all parts of the hall with cries of "No, no." Then Mr. Carr rashly provoked further contradiction by declaring that the burner had reduced the standard sperm candle to the level of a farthing dip. A smile flickered over the face of Mr. Charles Carpenter who was an interested listener from a seat just under the oil painting of Sir George Livesey. Mr. Carr knows that in this matter, he occupies a position of almost absolute isolation, and he declined to move an amendment to the report, as he wisely and candidly confessed that he did not think he would be able to carry it. Cause for unification of the standard burner was shown by the President; and there was no manner of mistake about the endorsement of the meeting when he remarked, "I am sure the Council have the sympathy of this meeting." Their object has been to do something to induce the Board of Trade to promote legislation to gain a desirable object; and there is no intention on the part of the Council of the Institution—either alone or in conjunction with the Gas Companies' Protection Association—to promote a Bill. Issue with Mr. Carr was joined by Mr. Walter Grafton over the "farthing dip;" and then the report was adopted.

The meeting enjoyed the little intervention by Mr. Carr; and thereafter the members prepared themselves to approve—and this they did very handsomely—the choice of the Council in the matter of the awards of medals for the papers read last year. Mr. Harold Woodall must have felt, by the applause that accompanied him to the platform, that there is a wide appreciation in the profession of his work, in collaboration with Mr. A. M'D. Duckham, on continuous carbonization in vertical retorts. To him the "London" gold medal was awarded for the paper he read last year; and with a characteristic trait of those whom we all know of the same cognomen, he gave a full share of the honour to Mr. Duckham. The influence of the paper on "Refractory Materials" that Mr. F. J. Bywater read at the meeting a year ago bids fair to be lasting and widespread, by the filip it has given to investigation into the rational and scientific treatment of refractory materials; and Mr. Bywater deserved all the good things that were said of him by the President, as well as the tangible recognition of the Institution silver medal. The meeting thought so too. Then Mr. Hayman was called up to receive the Institution bronze medal for the paper he read last year recounting the progress made with the Dessau vertical retort system in Germany; and generous indeed was the applause. While he prefers to regard the award as a mark of appreciation

of the work done in Germany in connection with the vertical retort system, the members feel their indebtedness to Mr. Hayman, as well as to his chief, Mr. E. Körting.

The Presidential Address.

The interesting item of award presentations having been disposed of, the President was again on his feet. There was generous applause. The most critical time and act in the presidential year are always accounted the occasion and delivery of the presidential address. The reception of the members can give heart or otherwise. If it were required, it would have had the former effect on this occasion. The President's style and delivery were excellent; and meaning was greatly enhanced by his well-chosen emphasis and by clearness of tone and pronunciation. There was an impressive silence indicative of the deepest sympathy as the President read the terms of his appreciation of the life work of Sir George Livesey—whose death, unhappily, marks the past year. He sketched the attributes that culminated in the high position Sir George attained in the gas industry long before he went to his final rest. Co-partnership received the President's encomiums for its several and generous effects; and, all present knowing Sir George, were in acquiescence with the remark that Sir George's own wish would have been that his life's work should be remembered by no other scheme than this. The reasons for the original introduction of the system the President finds are not so weighty now as then; but he might have gone farther and said that, in the gas industry, this is largely due to the battle waged against the tyranny of militant labour organization at the time of the inauguration of the scheme in its primitive form. But the President rightly sees that there are other reasons now existent as weighty as those that then prevailed, for bringing the interests of the workers into closer identity with the business that gives them employment. Among those that he enumerated is not found the spread of the vicious and disturbing doctrines of Socialism. That is an oversight. The Livesey Memorial Fund, and the purposes to which it is to be applied, were touched upon in manner approved by the hearers. To traverse this and other parts of the address, however, is quite unnecessary. The text of the deliverance was published last week; and what may be regarded as—touching upon the future of the industry—the chief considerations to be drawn from it are treated upon in our editorial columns this week. On the technical and commercial necessities of the future, the address was full of thought; and in the former connection the President gave the members the first account of his working at Norwich with the three-feet high horizontal chambers (with a carbonizing capacity of 21 cwt.). When the President remarked upon gas-works becoming the centres for the preparation of smokeless fuel both for industrial and for domestic uses—solid and gaseous—of the future, there was laughter at his manifestly intentional humorous suggestion that a hard-pressed Chancellor of the Exchequer should consider the question of taxing consumers of the bituminous coal, gas-works excepted. The figures he gave as to the ratios of day to night consumption of gas are worthy of the closest study. The proportion the day gas business has now assumed to the whole is truly remarkable; and in Norwich, Great Yarmouth, and possibly many other places, there is little doubt that we are within measurable distance of the old order of things being completely reversed, and the day consumption exceeding the consumption of the hours of darkness. Possibly, too, as Mr. Glover said, at the present time, in Norwich, less than 10 per cent. of the gas is used in feeding luminous flames. Of 28,000 houses in the city, 20,000 have cooking-stoves fixed in them. The rate of progress in the fixing of appliances in which gas is used for heating is shown by the following figures for 1907: 1104 cookers, 841 fires, 116 geysers, 728 boiling-rings, and 77 grillers. Is it to be marvelled at that the President is looking forward to the time when the illuminating power standard will be superseded (if we are to have a standard of quality at all) by a calorific power one. Interest in the various other themes was sustained to the very end; and when the final words came: "May we blithely go to our business all the day, and come to our resting-places weary and contented and undishonoured," there was an outburst of applause from the packed audience—an audience surely unexcelled in numbers at Institution meetings—that in itself was more eloquent than the richly-deserved compliments that fell from the lips of Mr. William King and Mr. J. Horsley Palmer (Chairman

of the British Gaslight Company and of the Imperial Continental Gas Association), and Mr. H. E. Jones, in proposing, seconding, and supporting respectively the vote of thanks. It is rarely that a President has, on such an occasion, the felicity of hearing, as did Mr. Glover, an expression of appreciation from his own Chairman, with such qualifications as Mr. Horsley Palmer possesses in eminent degree as an experienced gas administrator. Few and modest were the words of the President in acknowledgment of utterance, and of the ratification of the members.

Livesey Memorial Fund—£10,154 Subscribed.

Three weeks ago we appealed in the "JOURNAL" for the filling up of the Livesey Memorial Fund by the opening day of the annual meeting; and this was supported by a letter from the President in the following issue. In the course of his address, the President was able to announce that the fund had reached the sum of £9970 16s. 7d. The announcement was heartily cheered; and a little later Mr. H. E. Jones made himself personally responsible for the balance if it did not come in before the close of the meeting. Still later in the morning, Mr. C. F. Ruggles (President of the Eastern Counties Association) announced that he had been authorized by the members of the Association to say they would be pleased to augment the fund by 20 guineas. But though the minimum amount the promoters of the fund originally set out to obtain is in hand, there is no official announcement that the fund is closed. There have, of course, been incidental expenses attached to its promotion; and there is no reason whatever why the fund as it stands to-day should not be substantially augmented by those who still desire to subscribe.

Following the President's address, and an announcement as to the position of the fund by the Hon. Secretary (Mr. S. Y. Shoubridge), Professor Arthur Smithells, as representing the University of Leeds, spoke of the honour the authorities there feel that the University has been selected as the place in which the memorial to the lost leader of the industry is to be set up, and of their determination to do all in their power to make the memorial worthy of the great man whose memory it is to perpetuate.

On the last day of the meeting, it is convenient to mention here though out of chronological order, the President announced that the fund had reached the sum of £10,154. There were hearty cheers. He also made it clear that the fund is still open; and that the £10,000 named is merely the minimum sum required.

Gas-Fire Efficiency.

Appropriately the first technical matter to engage attention after the presidential deliverance was the report of the Gas Heating Research Committee, the Institution members being Messrs. John Bond, J. H. Brearley, and Charles Wood, in association with Professors Arthur Smithells (Chairman), William A. Bone, and Julius B. Cohen, of the Leeds University, and Mr. E. W. Smith, M.Sc., as Research Chemist. Mr. Smith represented the Committee on the platform; and, in fact, the larger portion of the report that he had to present is from his pen. As the members were fully aware, the object the Committee have had has been to make a scientific investigation of the efficiency of the gas-stove as a heating appliance, and to ascertain the facts in regard to certain hygienic questions that arise in connection with heating by gas. An inquiry such as this demands an immense amount of preliminary work. But in this report we have now some definite results; and it appears from it that the Committee are fully justified in the tribute they pay to the skill in the experimental work of their Chemist, who, by the way, succeeded Dr. Drugman. After hearing or reading the report, the hope expressed by the Committee that the work may be continued cannot be otherwise than heartily supported. There are several suggestive courses in which further research can be profitably made—such as the efficiency of different kinds of burners and arrangements of radiating materials (their composition, size, thickness, and shape), the methods for securing ventilation, and a few others are presented in our editorial columns.

Mr. Smith did not read his report; but he gave a sketch of its contents, illustrated by numerous lantern slides. In what he had to say, there was much that is not included in the report proper. For instance, he outlined the work of, and results obtained by, Dr. Drugman in connection with condensing gas-stoves. But the investigation is incomplete;

and it has been deemed advisable to defer publication until the matter can be put into more definite form.

There is much in the printed report connected with the description of the methods adopted in the experimental work that will not greatly appeal to the majority of gas engineers and managers, beyond giving them the assurance that some attempts (although all may not commend themselves) have already been made to ensure accuracy in the results. The introduction to the report, if somewhat elementary in certain of the initial explanations, is useful for giving to it completeness. One point is the criticism of the misuse of the word "radiator" applied to certain well-known types of gas-heaters. These appliances should, the Committee remark, be more correctly termed "convectors." It is really a small point on which to lay hold. The term "radiator," if a misnomer in its present application, is one that appeals to the general public; whereas the term "convector" would have no, or little, meaning to the public. In the application of the nominal term "radiator," it is more a descriptive trade expression than anything else. It is agreed with the Committee that there is a widespread and deeply-rooted belief that a gas-fire, even if satisfactory as a radiator, is necessarily attended by some hygienic disadvantage. "If the radiating efficiency of gas-stoves can be materially improved, and if it can be shown that a gas-stove, when properly constructed and used, has no more deleterious influence than a coal fire, a great advance will have been made towards the substitution of gaseous for solid fuel as a means of domestic heating." The report of Mr. Smith goes a good way towards showing these points; and he gives for the first time a tolerably correct absolute measurement of the radiating power of a gas-stove. The open gas-fire with which he experimented consisted of seven bunsen burners all connected with the same air and gas supplies, which were adjustable. The fire-clay front measured 9 in. by 9 in. The average consumption was 17 cubic feet of a gas of a net calorific value of about 142 calories (571.4 B.Th.U.). The details of the experiments may be bye-passed in this brief reference to the report. Suffice it to say that, under the conditions of the experiments, the amount of energy radiated from the stove lay between 30 and 33 per cent. of the total energy generated by the stove. Of this about 25 per cent. was radiated above the floor-level. In one experiment, a reflector was placed at the foot of the stove; and the amount of the energy radiated above the floor-level was increased to 28.6 per cent.

Among the indications of the experiments are that either the front of the fuel should be much thinner, in order that it might attain a higher temperature, and therefore emit more radiations, or that it should be made more open, and the back of the stove more compact, so that more direct radiations would be sent into the room. It is also interesting, as showing the value of the maintenance of the house-flue in connection with gas-fires, that the temperature of the products of combustion, on leaving the stove, varied with the volume of air passing through the stove-flue. Should the house-flue be closed except for the stove-pipe, the suction on the stove-flue will be very great, and the flue loss of heat correspondingly high. Should, however, the house-flue be open and the stove-flue about 4 feet long, with its entrance restricted, there will be a smaller volume of air passing through the stove-flue, but an increased ventilation up the house-flue. It was stated by Mr. Smith that the amount of air passing through a stove has no marked effect on the radiations into the room. With regard to the preheating of the gas, it is remarked that there is no reason why it should not enter the bunsens at the temperature of the escaping products of combustion (90° to 100° C.). Of course, some proportion of the heat will always be required for the purpose of carrying away the waste gases; but 3000 B.Th.U. per hour is looked upon as excessive. There is an account given as to the experiments regarding the vitiation of the atmosphere by carbon dioxide from gas-fires. But the general findings from the experiments will prove the most attractive of all points in the report: (1) The total radiation from an open gas-fire is about 32 per cent.; and this is unaffected by the amount of ventilation through the room. (2) No carbon monoxide escapes under ordinary conditions into the room; and very little is ever found in the flue. It is only when the flame is interfered with that there is any. (3) About 30 per cent. of the heat generated in the stove passes directly into the flue. This figure varies with the volume of air passing through the stove-flue. (4) There is no necessity for products of combustion to enter the room and cause discomfort. (5) Reflectors may

be usefully employed to produce a sensible increase of radiation into the region where it is most wanted. There is ground for satisfaction in these conclusions; but they show that there is a big margin from which to secure for the user of gas-fires a greater degree of heating efficiency.

The Report Criticized.

The report, as the President said in opening the discussion, gives a pretty good indication of what the Research Committee are doing; and he and many others hoped the Special Purposes Fund of the Institution would be maintained in a position to persevere with this and much other work. The speakers in the discussion were Mr. John Bond, Mr. H. James Yates, Mr. J. H. Brearley, Mr. James W. Wilson, Mr. H. Kendrick, Mr. Alex. Wilson, Dr. A. H. Elliott (New York), Mr. Walter Grafton, and Professor Smithells. It will be seen from these names that the excellent course has been continued by the Council of the Institution of inviting manufacturing representatives interested in particular subjects to take part in their discussion. Naturally, the debate ran over much ground; and there was a considerable amount of criticism, which to do it justice, as Professor Smithells remarked, required a studied reply. Several of the submissions by the reporter were challenged, and certain matters otherwise criticized. The room in which the tests are being made came in for a bad handling. It was described as box-like; and the point was made that it did not comply with the normal conditions under which gas-fires are used. As to the amount of air passing over the fire, the President holds that the pull on the chimney must seriously affect the radiating value of the fire. But Mr. Yates tells us that a fire can be constructed in which a large amount of air can be carried over the top of the refractory material without interfering with the heat, and without any possibility of carbon monoxide escaping. Curious is Dr. Elliott about (in the report) a missing one-third of the heat produced by the combustion of the gas in the fire. He finds from the report that one-third is radiated into the room, and one-third goes up the chimney; but he looks in vain in the report for the other one-third. There is disagreement regarding the point as to getting the radiation from the fire high up into the room; the most useful place for it, the practical gas man points out, is at the floor-level. Again, no products of combustion are wanted in a room; and if there are any, then the fire is not correctly constructed or used. Proper maintenance is insisted on before the winter season commences as the best means of preventing complaint.

Some interesting figures were imparted by Mr. Bond as to the cost of a given amount of radiation. Coal fires, he submits, cost less than gas-fires; while electric radiators come off a bad third. It would appear that gas has not much to fear from electricity as a heating agent. The figures (which will be found in the full report of the discussion) as between coal and gas fires were challenged in relation to useful heating effect. It was thought that comparative tests of coal and other fires which would appeal to the public would be of advantage. But Professor Smithells points out that the Committee want to elicit facts on scientific lines, and not merely to produce arguments for adoption by a reluctant public. It seems to him the time has come when, instead of relying upon the persuasive arguments of the makers of fires and the ill-considered statements of medical men, there should be scientific facts available to support the position of gas as a heating agent. The manufacturers assert that they are, and they offer evidence in support, engaged in doing their best by research and so forth in improving their fires apart from the work of the Committee. This is satisfactory; but the point is submitted that it is not right, in view of the great expense to which they are put in securing the development of a high state of efficiency, for gas suppliers to go too much for cheapness. Research, improvement, and cheapness will not run together. It is to the interest of both the gas suppliers and the fire makers to supply an efficient article. Mr. J. W. Wilson wants a place to which gas-fires can be sent for testing; and a certificate awarded if the fires succeed in reaching the standards laid down. It is suggested by Dr. Elliott that, if gas is used to heat water, and the water is employed for heating rooms, a great deal more useful heat can be got out of the gas than by using it for heating under present methods. It is possible to get no less than 80 per cent. of the heat units of the gas into the water. The heating apparatus, however, would

be very expensive. The question of humidity was also touched upon.

With the discussion on the Gas Heating Research report, a long sitting ended. It was much after two o'clock before the remnant of the members rose. The meeting had grown somewhat thin. Sheer weariness (not with the quality of the subject-matter before the meeting, but the length of the sitting) and inner cravings were the causes of departure.

Meeting on Wednesday morning, the first matters to be considered were the affairs of

The Benevolent Fund.

There is nothing much to say about this. The report has been published; but the President remarked upon the aid that is being rendered to the fund by the affiliated District Associations—an incentive to this having been the lead given by Mr. Charles Meiklejohn in connection with the Midland Association. Mr. Thomas Bower and Mr. Hubert Pooley were added to the Committee. The rules were also altered so as to give the District Associations a greater identity and interest in the working of the fund. In future, the Hon. Secretaries of the affiliated District Associations will take part as members in the work of the Committee. It is an excellent arrangement.

Apologies for Absence.

It was with regret and sympathy that the members heard that Mr. Corbet Woodall, through a slight accident, was unable to be present at the meeting; and that arrangements for a trip to Canada on professional duty prevented the attendance of Mr. Thomas Newbigging, the President of the Society of British Gas Industries. It was, however, with gratification the members heard that Mr. Newbigging was able to undertake the journey.

The remainder of the sitting was devoted entirely to the question of carbonization; and there is no doubt, from the large attendance throughout, that of all technical topics this is the one that has foremost thought in the minds of the profession at the present time. The whole of the matter presented, and the discussion, show that we are passing through a very live period of change in carbonizing practice, and also that opinion is about as unsettled as it can possibly be. In the first place, there was circulated a report by the Carbonization Committee; and the papers read in succession, before discussion, were by Dr. Rudolf Lessing, on "Carbonization in Chamber Settings," by Mr. J. Ferguson Bell, on "Carbonizing," and by Mr. Robert Watson, on "Some Advantages and Disadvantages of a Hot-Coke Conveyor."

Registering Carbonizing Progress.

The Institution are under much indebtedness to Dr. Rudolf Lessing this year. In addition to his paper treating of "Carbonization in Chamber Settings," he, at the request and under the direction of the Carbonization Committee, prepared an epitomized record of the new carbonizing work that has been done in this and other countries during the past twelve months. The members would have had a more comprehensive survey at the hands of the doctor had there been more time between the request made to him and the date by which the report had to be available for presentation. The record shows enormous development in the application of the Dessau intermittent system of carbonization in vertical retorts, and in the use of chamber settings in Germany and other countries abroad. So little do German gas-works think now of the ordinary horizontal and inclined systems, that the contractors for carbonizing plant will not say much about them; but they are all now putting their energies into either vertical retorts or chamber settings. The Dessau type of vertical setting, being the first in the field, has obtained a larger adoption than the competitors; but it has had the advantage of some active promoters, who enjoyed the technical and financial support of a powerful group of industrialists. It is, as Dr. Lessing points out, significant that of about 4022 retorts erected, or under construction, on the Dessau system, about 1000 have been to the order of a single company. A statement recently issued by Mr. Edward Körting, with reports by Messrs. Prenger and Weiss, indicates that the Dessau retort has a durability of 900 to 1000, and even more, days under fire, after which probably only the lower part of the retort requires renewal. Lightly touching upon the controversy as to the preferable practice of admitting steam into vertical retorts or water gas

made in separate plant, Dr. Lessing makes no statement as to his own views on the subject.

In this country, there has been slower progress in the application of vertical retorts, due to the ambition of British engineers to effect continuous charging and discharging, to which the vertical retort specially lends itself. "Considering all the factors involved, and in view of the wider experience gained, it must," says the report, "be admitted that this principle is not only a perfectly sound one, but it appears to be preferable to that of the intermittently charged and completely discharged retort, both from theoretical and economical considerations." The extent of adoption in this country of the vertical system so far is easily put on record: Ten beds of sixes on the Dessau system are now being erected at Sunderland. Of the Woodall-Duckham system, nine settings of four retorts are going in at Burnley, ten settings of four retorts at the Kensal Green Station of the Gaslight and Coke Company, four retorts are in use at Nine Elms, and there are the settings at Bournemouth. Oversea, an installation is being erected near Chicago to test local coals; and the system is also in operation at the Lyons Gas-Works. A setting (equal to 20 tons a day) on the Glover and West continuous system is in daily use at St. Helens. In other directions, Mr. W. R. Herring is at work on a setting at Edinburgh, to allow at will of continuous or intermittent operation; Mr. Alex. Wilson, at Glasgow, is also experimenting; and Messrs. Dempster and Sons are at work on a setting at Cleethorpes. The report includes a test at Nine Elms with the Woodall-Duckham setting on 61.39 tons of coal; the make being 12,839 cubic feet per ton of 15.2-candle power gas, and a net calorific power of 509.7 B.Th.U. The Glover and West system, using slacks of local coals, gives results of 11,500 to 11,800 cubic feet of 16-candle gas of a net calorific power of 530 to 540 B.Th.U., with a very low fuel account and a dry coke. "The good results," remarks Dr. Lessing, "seem to be largely due, quite apart from the continuous system involved, to the very excellent heating horizontal compartments, which permit of a convenient and independent adjustment of the temperature of the retorts at every height." The report touches upon the President's three-foot chambers, carrying (twelve-hour) charges of 21 cwt., yielding, with Yorkshire small coal, 12,300 cubic feet of 15-candle gas of 500 B.Th.U., and superior coke, with the other products up to satisfactory figures. Mr. Alex. A. Johnston is also conducting experiments at Brentford in inclined chambers, with charges of 15 to 25 cwt. Considerable interest attaches to these trials, as attempts are being made to guide the travel of the gas through the charge in a direction most conducive to obtaining a high quality by providing a vertical partition wall, which, by means of suitable recesses, collects the gas in the centre of the charge. Love's 45° inclined retorts are not forgotten; but Dr. Lessing does not supply any fresh results. Another distinctive feature of carbonizing practice in this country has been the charging of ordinary retorts fuller; and by this means some of the results of vertical working have been secured.

It is considered that the adoption of carbonizing chambers abroad is the most important event in the carbonizing branch of the gas industry during the year; and it is remarkable how they have taken possession of technical fancy in Germany and elsewhere. Most of the German carbonizing plant erectors now have designs of their own; and the results of the working of those so far in operation appears to be approximately of the same character—about 12,000 cubic feet of gas per ton of a net calorific value of 550 B.Th.U., but of poor illuminating power. The coke is not much inferior to the metallurgical variety; and a fair yield of ammonia is combined with the production of a light tar containing very little free carbon. The report briefly marks much progress. It also contains references to retort-house machinery, to low-temperature carbonization, and to the instructive researches by Mr. R. Forbes Carpenter into the latest carbonization systems.

Carbonization in Chamber Settings.

Hopes were not falsified in the paper on "Carbonization in Chamber Settings." The British gas profession has been placed in possession, through the "JOURNAL," of a considerable amount of information on the subject; but this is the first occasion on which it has been brought directly before the Institution or any other of our home societies. The author of the paper—Dr. Rudolf Lessing—although he cannot claim to be a designer of, or practical worker with, these settings, has made such an extensive study of

them at the scene of their birth, through the published information concerning them, and personal inquiry, that he is able to speak with some authority. He spoke well; and his reasoning is such that one inclines to a ready acceptance of, at any rate, the theoretical argument through its very lucidity and apparent soundness. The argument from the practical point of view is another matter. But before he finished his paper (which was illustrated by numerous lantern slides), Dr. Lessing made it abundantly clear that he is not an advocate for any precipitate adoption of this system of carbonizing; he rather appeared before the members as a chronicler of events, with the view of stimulating enterprise and progress. Nor did he advocate any particular system of chamber settings; he treated all of which he had knowledge with frank and absolute independence. In fact, so far from thinking the chamber system has attained to the title of perfection, he makes a suggestion which may prove an inspiration to those interested in continuous carbonization in vertical retorts, and result in a trial being made of continuous gravity or mechanical charging in conjunction with large-bulk chambers.

Before the author concluded, he produced sufficient evidence to indicate that chamber settings have already reached a degree of working adoption on the Continent that shows that many gas engineers have been attracted by them. But the peculiar thing is that, although they have done so, they cannot be in any better position than Dr. Lessing for forming judgment; and he candidly confesses, despite his study of the system, that he is not in a position to submit that sufficiency of material and working results, which he considers to be desirable, and indispensable evidence in forming a conclusive opinion for or against the change. A passing tribute to coke-oven workers, a reference to disadvantages and advantages of coke-ovens from the gas maker's standpoint, and an allusion to some casual remarks of Dr. Bunte as to the possibilities of carbonization in larger bulks for gas-making purposes (which remarks served as the inducement to the subsequent work by German *confrères*), led up to an account by the author of the development of what are nominally known as the Munich chambers, as designed and put into practical work by Mr. H. Ries, in collaboration with Dr. Edward Schilling. First 1 ton inclined chambers; and then 2·2 tons, with subsequently a bench on larger scale of fifteen chambers in five settings. These have been in continuous operation at Munich since Oct. 6, 1906. A diagram is given in the paper by Professor Bunte, which affords a good idea of the general course of carbonization in these chambers. The average illuminating power of the gas is low—only 10 to 12 candles; but the calorific power is about 560 B.Th.U. A remarkable feature is the high candle power at the commencement of carbonization and then its rapid fall, and continuance at a low level. The charges, of course, are comparatively few, with a consequent saving of labour, and smaller losses of gas upon charging and discharging, in comparison with small charge working as in ordinary practice. In plant with larger carbonizing capacity, the contrasts in these respects will be all the more striking. In the Hamburg settings, the charges average 17·5 tons per setting of three chambers; the yield of gas (English coal) being about 12,500 cubic feet per ton. An astonishing point, considering the construction of the settings, and the large masses of cold coal dumped into the chambers, is the lowness of the fuel consumption—12 to 15 per cent. of the coal carbonized. And this seems to be confirmed by varied experience. In new works that he has constructed, Mr. Ries has built a bench of six settings of three chambers, and increased the capacity per setting to 19·4 tons. A second bench of the same capacity is in course of erection. The increased carbonizing space is obtained by lengthening the chamber to 28·7 feet, corresponding to 23·4 feet on the horizontal. The charging and discharging arrangements are generally described by Dr. Lessing. On the Munich system settings are nearly completed or under contract with a total carbonizing capacity of upwards of 1500 tons per twenty-four hours at Leipsic, Paris, Rome, Berlin, Hanau, Ratisbon, and Munich.

Turning from the Munich construction, particulars are supplied of the Koppers settings at the Bochum gas-works; a notable point being that the output per man per shift is stated to be 100,000 cubic feet. A battery of fifteen chambers has been erected at Vienna, carbonizing about 120 tons per twenty-four hours. Occupying a total area of 7000 square feet, 200 cubic feet of gas are made per square foot covered. The yield of gas per man employed, per shift of

eight to ten hours, equals upwards of 175,000 cubic feet. Knoch's inclined chambers with vertical heating flues are alluded to; there being in this plan of construction absolute independence of each chamber. Klönne's inclined, horizontal, and vertical patterns are also noticed. At Königsberg, four of these inclined chambers have been erected; and the carbonizing wages are said to have dropped from 9d. with inclined retorts to about 3d. per 1000 cubic feet with the inclined chambers. The Klönne horizontal chambers at Rotterdam, described by the Engineer in our columns last December, are also referred to; as is a vertical setting of five chambers at Dortmund. A vertical chamber oven of Messrs. Horn's design has been started at Hecklingen. A complimentary allusion is made to the work of the President at Norwich and to that of Mr. A. O. Jones. When Dr. Lessing passed from purely descriptive work, and a statement of the advantages and disadvantages of the chamber system, to the theoretical aspects of carbonization in bulk and the course of the process of the carbonization as mentally pictured by him, he was at his best; and we will not attempt to put into few words that which contains so much interest as it stands in the form in which he presents it in the paper—largely assumptive though it be.

Carbonizing Experiments at Derby.

Succeeding the account of work on chamber settings, Mr. J. Ferguson Bell was called upon to read his paper on "Carbonizing." Mr. Bell has been reconstructing the carbonizing plant in one of the retort-houses at the Lit-church station of the Derby Gas Company; and it will be seen from the paper that in the new bench of eleven settings of eights, 22 in. by 16 in. by 18 ft. throughs, he has incorporated several of the latest approved practices for securing good returns, together with one or two ideas that are not perhaps so commonly approved. He has adopted 8-inch ascension pipes on one side of the retorts only. Each of the dips is fitted with Simmonds patent anti-dip valve. There are separate gas take-offs for each setting; the gas-valves are fitted with Drory indicators; and the tar is removed by the now well-known Dillamore tar columns. Carpenter's retort-house governors control the suction on the 18-inch foul main. The quantity of carbon formed on the inside of the retorts worked with anti-dip valves is less than half that formed on retorts worked with light seals; and up to the present time there has not been a single stopped pipe. A De Brouwer projector and a Jenkins De Brouwer pusher are used, with a De Brouwer hot-coke conveyor.

The costs of working quoted by the author are actual over six months' operation, including everything for eighty retorts, from coal unloading to coke store or hopper. Small coal and slack are generally used. When working six-hour shifts, 6 cwt. charges are put in; eight-hour, 8 cwt. charges; ten-hour, 10 cwt.; and twelve-hour, 12 cwt. With the projector no difficulty is found in putting in heavy charges of 12 cwt.; and these Mr. Bell finds will push out almost as easily as the lighter charges, provided the coal is properly carbonized. The cost for carbonizing (including all retort-house labour) is for six-hour charges 7½d. per ton, and for eight, ten, and twelve hour charges 6½d. Working the whole bench (eleven beds), the cost for six-hour work is under 7d., and for the longer and heavier charges 6d. per ton.

The paper is packed with details and figures, for which reference must be made to the original on other pages. But just a glance at the carbonizing results, as the author has made numerous experiments with both light and heavy coal charges to ascertain in which direction the maximum benefit in gas and residuals is to be obtained. In these trials he has only used seconds or ordinary Derbyshire coal, with good rough Derbyshire coking slack added; and the class of coal must be considered in making comparisons. With the heavier charges, a denser and improved quality of coke is obtained, that is particularly suited for trade purposes. The tabulated figures show that the quantity of large coke increases with the weight and duration of the charges, and that there is less breeze made; but these heavier charges of longer duration somewhat increase the fuel account. In regard to ammonia, the slower carbonization tends to augment the production; there being an increase of over 17 per cent. between charges of six and twelve hours' duration. With heavier charges of longer duration, too, the quantity of tar produced is greater, and found to be lighter and much thinner; and, in addition, the gas leaving the condensers carries a larger quantity of light tarry matters forward to be removed by the tar-extractor.

The figures as to gas made indicate that so far as total sperm value is concerned, it makes little difference whether the coal is carbonized during six, eight, ten, or twelve hour periods. With the lighter charges and shorter time of carbonization, the quantity of gas made is less, but the candle power is higher; and with the longer periods the make increases while the candle power decreases. With six-hour charges (average weight, 6 cwt. 20 lbs.), the gas made per ton corrected was 10,594 of 16·31-candle power, tested by the "Metropolitan" No. 2 burner; with eight-hour charges (average weight, 7 cwt. 3 qrs. 12 lbs.), the gas made per ton was 11,245 cubic feet of 15·59-candle power; with ten-hour charges (average weight, 9 cwt. 2 qrs. 17 lbs.), the make was 11,499 cubic feet of 14·53-candle power; and with twelve-hour charges (average weight, 11 cwt. 2 qrs. 4 lbs.), the make was 11,463 cubic feet of 14·77-candle power. The paper includes some tests with eight-hour charges of high-class Yorkshire silkstone coal. The experiments clearly indicate that heavy charges with longer periods of carbonization tend to give higher and better results from the coal, more especially in regard to the yield of bye-products. Mr. Bell's trials in this respect cover much ground, and exhibit the care and thoroughness invariably associated with the work he undertakes.

Hot-Coke Conveying, and Its Advantages.

The application of material handling machinery in gas-works has spread with considerable rapidity, not only through the larger works of the country, but down to works on a lower level in point of capacity. In the use of hot-coke conveyors, how low in works' productive capacity can we profitably go? This was the point brought up for consideration in the paper submitted by Mr. Robert Watson. From carbonizing to the transit of the spent charges from the retort-house is a gentle descent. The author's contention is that the line of profitable application of conveyors is lower than many are disposed to think. Discussing the economic possibilities of such plant, the indirect advantages, as well as the direct charges, have to be considered—the former including the quickening of retort-house operations, facile stacking, and applicability to screening methods. As a matter of fact, in small works, the full value of the conveying plant is more easily appraised from the point of view of the coke yard than from that of the retort-house. The preparation of coke for the various needs of home consumers is in these days essential to its disposal, and for the avoidance of cut-prices and the annual losses that cut-prices occasion. To stimulate local trade in broken coke, a coke-breaking plant, elevator, screen, and hoppers were required at Doncaster; and the question was whether the coke should be conveyed to the plant by barrow or conveyor. After duly weighing the *pros* and *cons*, a West combined coke conveyor and screening plant was adopted. Apart from the monetary point of view, the advantages, as seen by Mr. Watson, are humanitarian, the accelerating of charging operations by the rapid removal of the coke; the obviating of the tendency with the use of coke-barrowers to lessen the weight of the spent charges by placing less coal in the retorts, as well as the avoiding of light charges in the bottom retorts owing to the difficulty of filling the coke-barrowers without spilling, and the work of clearing up. The wear and tear of plant, breeze, and coke saturation by water, are the disadvantages; but Mr. Watson shows, by his own experience, that a limit can be placed on these. All were experienced by him at Doncaster at the outset; but they have been reduced, and the conveyors are now working under normal conditions and satisfactorily. For details of how this has been brought about, there must be reference to the text of the paper.

The question of breeze is an important one; and to this the author devoted some attention. He maintains, and rightly, that a properly constructed conveyor *per se* does not increase the breeze production to any serious degree. It is the treatment subsequent to the conveyor that is in fault; but this can be largely minimized by simple means. Taking barrowed coke thrown out in the usual way, and coke collected at the end of the inclined section of the conveyor, he found the breeze from the barrowed material equal to 4·6 per cent., and from the conveyor 6·5 per cent. Then subsequent to the head of the conveyor incline, the substitution of one steep shoot by three shoots arranged so as to allow the coke to slide, reduced the total percentage of breeze from 10·1 to 7. Therefore, between the two methods of transport, there does not appear to be a great deal of difference; and if coke-breaking is resorted to subsequent to either

method of conveying, the breeze produced must have approximate correspondence. Still, he admits that the excess is sufficient to cause trouble on some works. The percentage of breeze wheeled, broken, and screened is 7, as against 8 when mechanically conveyed and screened; and therefore, in the handling of 12,000 tons of coke based on 22,000 tons of coal carbonized per annum, the difference between the tonnage of breeze is as between 840 and 960. On a basis of 22,000 tons of coal carbonized per annum, Mr. Watson puts his costs, including loss due to excess breeze, at 7·64d. per ton of coal. Taking credit for the increased value of (say) 2000 tons of domestic and smithy coke at 1s. 3d., equalling 1·36d. per ton of coal, the total cost for conveying and screening is brought down to 6·28d., as against 6d. for conveying only. As the plant can deal with more coke, it is expected there will be a proportionate drop in the costs with the increasing output of the retort-house. The costs per ton of coal carbonized for wheeling, breaking, and screening, amount to 9·28d. Taking credit as before for the increased value of 2000 tons of domestic and smithy coke 1·36d., the total costs are reduced to 7·92d.; while for wheeling only the costs are 6·78d. Judged by these costs, the gain by conveyor removal is not great; but the small profit shown, added to the important advantages indirectly accruing to retort-house working and to the men, would, the author contends, justify the use of a conveyor in comparatively smaller works than those of Doncaster. The results, when the effect on the disposal and sale of coke is taken into consideration, are much more decided. The difference in favour of the full conveying and screening plant, as compared with barrow wheeling and separate breaking and grading appliances, is as much as 1·64d. per ton of coal carbonized. The withdrawal of surplus coke from the outside market to be sold, through proper preparation for use, at full prices in the home district is also a point to be taken into account.

The Discussion.

Many men, many views. But it cannot be said that some of the remarks in the discussion were altogether pertinent to the cardinal features of the papers. There was really too much matter over which the members could rove. An important question was asked by Mr. Charles Hunt. It was as to whether the report of the Carbonization Committee represented the whole of the work done by the Committee during the year. A reply was given in the negative by the President, who explained that the Committee had not been idle; and the report merely embodied their views. Supplementing this, Mr. Shoubridge mentioned that, in the present inconclusive state of experience with the newer systems of carbonization, the Committee had thought it advisable not to expend money in their direct investigation until matters were in a more settled condition. Those who took part in the discussion were Mr. Charles Hunt, Mr. Edward Allen, Dr. Harold Colman, Mr. J. P. Leather, Mr. A. T. Harris, Mr. A. F. P. Hayman, Mr. H. Townsend, Mr. T. Canning, Mr. H. W. Woodall, Mr. W. H. Y. Webber, Mr. E. A. Harman, Mr. J. H. Brown, Mr. H. E. Copp, Mr. J. G. Tooms, Mr. W. H. Morgan, Mr. S. Y. Shoubridge, Mr. T. S. Lacey, and Dr. Elliott.

It was soon seen that, with so many forms of carbonization for gas production in existence, there are no very settled views on the subject. Engineers are somewhat embarrassed and perplexed over the position with which they are confronted. Not many tackled the question of the carbonizing chambers. But it is clear that up to the present British gas engineering notions have not advanced far on the road of preference to large bulk carbonization. There is no question that Mr. Irving fairly reflects the views of many in saying that it cannot be the correct system of working to place a large bulk of coal in a chamber, and let it distil there for four-and-twenty hours; and he shows his preference for something of a more continuous nature. In this, Dr. Lessing is not at variance with him. Naturally the illuminating power curves of the gas from the chambers proved striking. Illuminating power must continue an important factor in this country, so long as it is the parliamentary standard. If we were under a calorific power test, the poor illuminating power of the gas from chamber settings would not weigh so heavily in the balance against them. Quite the most informative speech on the papers was that of Dr. Colman. It was, in fact, a miniature lecture. The manner in which the first volatile products travel, and how they are subjected to heat in their travel, through the coal and coke are points of great importance. In the newer developments of vertical retorts,

intermittent or continuous, and the larger bulk carbonization chambers, there are no doubt variations in the manner in which the volatile products course through the coal and the coke. The new systems do not yield the same amount of marsh gas as can be obtained in horizontal retorts; and this is accounted for by the fact that, in the former, the volatile products do not get heated to so great an extent in their passage, as they do in horizontals, in which, using the same coal, the percentage of marsh gas would be higher and the hydrogen lower. Attention was called in this connection to Dr. Bone's lecture of last year. In Dr. Colman's view, it may be regarded as reasonably probable that the cracking-up of the tars does considerably increase the percentage of marsh gas, and therefore this yields beneficial results. It seems to him that what we have to aim for is the cracking-up of the tars produced in vertical retorts and coke-ovens just to that extent where the tar gives off its maximum quantity of carbon to the gas, without, at the same time, increasing the amount of free carbon and naphthalene to an abnormal extent. That is the problem before us. It sounds very simple; but it will require a great deal of work ere it can be achieved. Some very practical points were made by Mr. Hayman, who has had an opportunity of studying large bulk carbonizing chambers at closer quarters than gas engineers in this country. The weight of the charges, and the amount of heated surface to which the gas is exposed, are not beautiful things in the eyes of most gas makers. The fuel account is high. The saving of labour too is annulled by the irregular quality of the gas, and the high capital charges. Mr. Canning also made the point that the use of such chambers is curtailed by the demand in a locality for metallurgical coke.

Turning to other salient points. The work that has been done at St. Helens with the Glover and West vertical retorts was sketched by Mr. John West; and Mr. Harold Woodall showed distinct gratification in having such an old carbonizer as Mr. West testifying to continuous carbonization being the proper thing. There is no doubt that the vertical retort has done much to increase our knowledge of what goes on in carbonization, and advantage has been taken of it in horizontal work. As Dr. Colman aptly says, the advent of a new system in any industry usually helps to make the working of the old system better. The use of heavier charges in horizontal working is one result of the coming of the vertical retort; and Mr. Bell was heartily congratulated on the results he has secured in this way, and which results Mr. Shoubridge was able to confirm. It shows there is something in the old horizontal retort yet.

On the question of coke transport, there was not much discussion. Mr. Watson's contribution suffered by being tied up with carbonization; but it was a sacrifice to time. There was confirmation as to the dropping of the coke after it leaves a conveyor, and not the conveyor itself, being the most guilty in the matter of breeze production. Two or three speakers testified well to the telpherage system of coke handling.

Thursday morning first thing the benches were sparsely occupied; but the President took this quite good-naturedly, in view of the excellence of the attendance the previous two days. A little later, however, the numbers were largely augmented; and there was again a good audience.

Calorific Value and Mantle Efficiency.

There was a large amount of interest attaching to the first paper by Mr. Arthur Forshaw, M.Sc.—interest which will be variously described as academic or practical according to the amount of personal attraction that the subject has for those who look into it. It is well that such research should be carried out as that in which Mr. Forshaw engaged, on his selection for the Institution Research Fellowship in the Department of Gas Engineering and Fuel at Leeds University. Wrong theories and notions may have long sway unless they are proved by someone competent to be erroneous, or at all events until some investigator of sufficient competence challenges their correctness. In the paper there is much that is of practical directive importance. The communication is entitled "A Comparison between the Illuminating Efficiencies of Carbon Monoxide and Hydrogen when Used in Conjunction with the Incandescent Mantle;" but in one respect it is, in effect, a challenge to the belief that has become somewhat prevalent that the illuminating efficiency of a combustible gas—be it coal gas, water gas, or natural gas—used in conjunction with an incandescent

mantle, is proportional to its net calorific value. The basis for this belief appears to be the investigations carried out by Messrs. White, Russell, and Traver in 1901-2; and more recently by M. Sainte-Claire Deville in 1907. The conclusions arrived at by these investigators were much on the same lines. Mr. Forshaw, however, found it difficult, on *à priori* reasoning, to attach any physical meaning to the supposed simple connection between the calorific value of a gas and its illuminating efficiency, whatever view is taken of the cause of luminosity of the mantle.

With few exceptions, the comparisons made between the illuminating values of various gases and their calorific powers have had reference to more or less complex mixtures of gases; and the results of such experiments as have been instituted with single gases, or with mixtures of two gases, are precisely those which do not conform to the conclusions drawn from the more complex gases. Thus the desirability of a careful series of comparative experiments being made with one or two gases in a state of purity appealed to Mr. Forshaw; and for this purpose hydrogen and carbon monoxide seemed to possess qualities which eminently fitted them for such a comparison. The two gases are similar in having nearly the same net calorific values, and also in requiring exactly the same proportion of oxygen (or air) for their complete combustion. Here, however, their similarity ends; and they differ in two important respects—in density and "combustion intensities." The density of carbon monoxide is fourteen times that of hydrogen; and not only is the rate of combustion of hydrogen known to be very much higher than that of carbon monoxide, but their rates are unequally accelerated by the influence of hot surfaces. This reminds of the lecture delivered recently by Professor W. A. Bone before the North of England Association of Gas Managers. However, under the circumstances, it was decided to make a systematic investigation of the mantle efficiencies of these two gases; and the conditions requisite for the attainment of the maximum illumination from each, with a view to determining whether, with two single gases having nearly like calorific values, but exhibiting considerable differences in the character of their flames and modes of combustion, the supposed dependence of illuminating effect upon the calorific values could be verified.

Then Mr. Forshaw placed before his audience the preparatory work associated with the experiments, following with the results that he obtained under different conditions, as well as the effect of using cones in the burner, after the manner suggested by Messrs. Cash and Eady ["JOURNAL," July 14, 1908]. In all the experiments in the paper in which hydrogen and carbon monoxide are compared under similar conditions of aëration, the advantage is overwhelmingly in favour of carbon monoxide. The maximum duty obtained for hydrogen at a consumption of 9.13 cubic feet per hour was 11.76 candles per cubic foot—a result which has to be compared with 17.33 candles per cubic foot obtained for carbon monoxide, at a consumption of 7.69 cubic feet an hour. These results show a 48 per cent. margin in favour of carbon monoxide; while a comparison of their calorific values, as used in the test, shows only a 13 per cent. advantage in favour of carbon monoxide. Among other conclusions, it is found that, when hydrogen is burned in an ordinary atmospheric burner, with the highest possible degree of aëration with such a burner, the duty afforded steadily decreases with a rising rate of gas consumption. It is also seen that the distribution of luminosity over the mantle with such a burner is vastly different with hydrogen than with carbon monoxide under similar conditions. It is found, too, that the use of cones inside the mantles causes a quickening of combustion and concentration of illumination. There was acknowledgment by Mr. Forshaw to Messrs. George Bray and Co. for the interest they had taken in constructing the burner used in the experiments, and to the Welsbach Company for their interest in making the mantles.

The Discussion.

Communications were read by the Hon. Secretary on the subject of the paper from M. Sainte-Claire Deville, Professor Bone, Mr. Vernon Harcourt, and Mr. J. W. Bray. Remarks were contributed by the President, Mr. Thos. Holgate, Mr. Leon Gaster, Mr. J. P. Leather, and Mr. James Paterson. M. Sainte-Claire Deville does not think the results obtained by Mr. Forshaw, when properly examined, disclose very much difference between them. Support was given to Mr. Forshaw's conclusions by Professor Bone. He contends that mantle efficiency results depend upon other factors besides

the mere calorific value of gas; but the precise definition of these other factors must be left for future inquiry. It was pointed out by Mr. Vernon Harcourt that a property other than calorific value in relation to mantle efficiency is the rate of combustion. The greater the rate of combustion, the higher the temperature of the flame. Mr. Bray remarked upon the construction of the burner being a highly important matter in dealing with two different gases. If Mr. Forshaw had changed his burner, he might have obtained a nearer approximation between the illuminating power of hydrogen and carbon monoxide. Among the speakers the same view was held. In using a gas like hydrogen, both a special burner and mantle should be constructed. However, with the complimentary remarks made both by correspondents and speakers Mr. Forshaw must have been highly gratified. Much importance is attached to the fact that a commencement has been made in this country in the scientific investigation of illumination with incandescent mantles. It is very acceptable to have fundamental data relating to distinct gases; and it is thought that such work will assist in assessing the value of different gases obtained by the new systems of carbonization. Certainly, the examination of simple gases in this manner will put us in a better position to know what to aim for in carbonization. The highest mantle efficiency corresponds with that gas which has the highest flame temperature, said one speaker; and another enlarged this by observing that it is important in incandescent lighting to pay attention to both the shape and intensity of the flame. It is considered by Mr. Leather that Mr. Forshaw has in his conclusions stated things which are not borne out by facts or experiments—particularly in regard to surface contact in quickening combustion. Mr. Paterson fails to see that putting a cone into a flame can increase combustion; but different results might have been obtained if the cones had been made hollow, and of thin substance, so as to have prevented the absorption of any heat. It is hoped that the investigations will be continued—especially in connection with the inverted burner, which has developed a higher efficiency than the upturned burner from the complex gas supplied by the town-gas maker.

Sympathy.

Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Works Regulation Act, is well known to many of the members of the Institution. He has within the past few days suffered great bereavement through the loss of his wife. The members know the Chief Inspector as their friend; and, on the proposition of Mr. Charles Carpenter, seconded by Mr. Samuel Glover, the members placed on record their deep sense of sorrow with Mr. Forbes Carpenter. Mention was also made of the serious illness—happily the worst has passed—of Mrs. James Whimster, of Armagh, which prevented Mr. Whimster's attendance at the meeting.

Statistical Studies.

Statistical exercises do not supply the most attractive or thrilling of material to put before a gathering of men at the last sitting of a three days' meeting; and subject and period in the proceedings therefore combined to lessen the attendance which Mr. Herbert Lees and Mr. Arthur Valon well deserved for their instructive compilations in the matter of statistics peculiar to the gas industry. Mr. Lees' paper was a "Study in Working Costs;" and it was thoroughly done, within limits. Those who desire to sell gas cheaply cannot neglect to study costs, item by item. Every item from coal to consumers' appliances for which money has to be spent by a gas undertaking, every piece of plant and every appliance, and every method involved in the manufacture and distribution of gas, all have their distinctive effects on working costs. The gas engineer requires the eyes of Argus. It is good, says Mr. Lees, for an engineer not only to make comparison of his own with another's work, but also to carefully note the progress of his own undertaking year in year out. Granted; but, in all such comparisons, geographical and local conditions have to be taken into account before complimenting oneself or becoming depressed over a condition of one's circumstances that, with all endeavour, will not attain a uniformity with the concern with which comparison is made. Mr. Lees makes his study over the area limited and defined by "Field's Analysis." The lessons to be extracted from the well-known "Analysis" are good; but it must always be borne in mind that dealing year by year with the same, and in number a moderate, set of undertakings, the "Analysis" has set upon it a limited

significance. There is danger in conclusions drawn from averages; but the object of the author's study is to see, within the confines of his survey, the trend of working costs in quinquennial periods over some five-and-twenty years, ending with 1907. These years have been very live ones in the gas industry; and they compass the period of (in large part) the introduction of gaseous firing, the coming of the incandescent mantle, cooking-stoves, the prepayment meter system, &c.

The fuel account claims first consideration. Mr. Lees at once finds himself faced with the difficulty of unreliable information. There is so much estimating about the quantity of coke and breeze used for fuel, and so little accurate measurement; and, in the estimates between works and works, there is in consequence considerable discrepancy. But assuming the method of calculation adopted throughout by the compilers of "Field's Analysis" has been consistent, evidence is found by the author of progress in fuel economy; and this progress is sure to become more general. Taking next the figures as to the make per ton for the four groups of concerns treated in the "Analysis"—Metropolitan Companies, Suburban Companies, Provincial Companies, and Provincial Corporations—between the years 1883 and 1907, they disclose "substantial progress." Not such progress, however, as published high makes have led one to fully expect. But we are dealing with averages. In the case of the Metropolitan Companies, the progress in average increased make, in the 25 years, with a make of 10,885 cubic feet per ton in 1907, is 610 cubic feet; the Suburban Companies, with 11,169 cubic feet per ton in 1907, 956 cubic feet; Provincial Companies, with 10,457 cubic feet per ton in 1907, 344 cubic feet; Provincial Corporations, with 10,827 cubic feet per ton in 1907, 1069 cubic feet. The last-named have made most progress, but only because their make in 1883 was as low as 9758 cubic feet. The Provincial Companies have effected the least progress in this regard; and their average make in 1907 is the lowest. New carbonizing principles and methods, in addition to higher temperatures, have come in of late years to improve working accounts in this respect. It should be noted, however, that high makes per ton are not everything; other considerations have to be taken into the calculation. It may be very economical to purchase a local low gas-yielding coal, with in the end a profit comparing with the best.

The author cannot say much about coal and residuals; these being dominated by market fluctuations and local influences. Coming to working expenses, the total per 1000 cubic feet of gas sold has increased in the case of the Metropolitan Companies between 1883 and 1907 by 1.45d.; and in the case of Provincial Corporations by 0.50d. The Suburban Companies exhibit a decline of 0.15d. and Provincial Companies of 1.13d. Wages have been an important factor in this increase, notwithstanding the introduction of machinery. If, however, manufacturing charges (apart from coal) be taken, it is seen these have been reduced in the case of the Metropolitan Companies by 2.35d. per 1000 cubic feet; in the Suburban Companies, by 3.11d.; in the Provincial Companies, by 1.76d.; and in the Provincial Corporations, by 0.72d. Though the Provinces show a smaller decrease in this respect during the period, it is because their figures were lower in 1883, and are still the lowest in 1907. One notable and gratifying point in the author's comments is that the introduction of additional machinery has not added to the cost of wear and tear; the item being less than formerly. It is not surprising to find that the economies gained in other directions are cancelled by increased expenditure in the distribution department. The item of rates and taxes shows an increase of nearly 50 per cent. in the case of the Metropolitan Companies; the Suburban and Provincial Companies have maintained a very regular figure throughout; and the Provincial Corporations have an increase of 40 per cent. The author makes a remark emphasizing what has before been pointed out, that this 40 per cent. does not indicate that, where sums are extracted from municipal trading undertakings in aid of the rates, the rates are lower than where there is no such source of income for the local exchequer.

The net cost of gas into the holder per 1000 cubic feet sold has decreased all along the line, excepting in the case of Provincial Corporations, who show an increase of 0.76d.; but they come out second lowest in the list of costs with 11.89d. per 1000 cubic feet—the premier position being occupied by Provincial Companies with 11.32d. Other charges, principally distribution, have nullified the advantage gained in the net cost in the holder. Between 1883

and 1907, the net cost and working expenses per 1000 cubic feet of gas sold has increased in the case of the Metropolitan Companies by 0·80d., Suburban Companies by 0·02d., and Provincial Corporations by 1·98d., while the Provincial Companies have decreased by 3·09d.—placing them in a superior position, with 17·15d. per 1000 cubic feet. Capital charges, however, is a field for exploitation; and in the 25 years, the Metropolitan Companies have reduced their capital charges per 1000 cubic feet of gas sold by 4·67d., the Suburban Companies by 6·18d., the Provincial Companies by 3d., and the Provincial Corporations by 3·87d.—the total of the capital charges in 1907 being respectively 10·40d., 9d., 7·79d., and 6·29d. Day gas consumption, and the lower rates at which capital can be obtained by gas companies, are largely responsible for this reduction. The average net gas-rental has in the period been reduced to in the case of the Metropolitan Companies (in 1907) 30·34d., Suburban Companies 31·83d., Provincial Companies 22·77d., Provincial Corporations 26·16d.—the reductions being respectively 6·43d., 9·83d., 7·62d., and 3·14d. It will be noted that the average net rental of the Provincial Corporations in 1907 was higher than the Provincial Companies by 3·39d.; it must not be overlooked that the Corporations occupied a better position in 1883 than any of the other groups of undertakings. In the raising of capital, too, they have occupied an advantageous position. But the difference is becoming less; and while the Provincial Companies show a steady reduction in capital charges, the Corporation charges appear to be on the increase. Averages are all very well from which to draw general deductions; but the ideals that are to be adopted are beyond the best individual records under an approximately like set of conditions. Mr. Lees does not desire his paper to be taken as anything more than an attempt to mark progress. The result of his study is encouraging; and prospects are shown to be distinctly hopeful.

The Capital Account.

Has not the time arrived when an effort should be made to enable gas companies to reduce their capital accounts? This question is the essential feature of the final paper presented by Mr. Arthur Valon, which, though short and last on the list, is in its matter of immense importance. He makes suggestions to the end in view; but he does not submit them as being the best, but merely propositions. In leading up to his point, he does not—and this was recognized by the meeting—take up any partizan or dogmatic attitude, or point the finger of scorn at one class of undertaking, because, under its conditions of working, the average capital per million cubic feet of output—regarded from the point of view of the average of the whole—is higher than in the case of the other class of undertaking, nor does he enter into the vast field of explanation that is necessary to show the wherefore of this.

Admittedly, it is, at the first blush, startling to find that the total capital raised, per million cubic feet of gas sold, by statutory companies is £822, while the total money borrowed by local authorities, after deducting sinking fund and loan repayments, amounts but to £457. Examination of details, however, shows that the figures are not strictly comparable owing to stock conversions in the case of companies, and the amount paid upon transfer by local authorities for goodwill. The total of the amounts paid for goodwill upon transfer cannot be obtained without a large amount of unprofitable research; but the average of sixteen of the largest undertakings amounts to £137 per million cubic feet of gas sold upon the existing consumption. Looking at the table accompanying the paper, it is remarked that the net capital outlay in the case of the companies has steadily fallen from £675 to £610 per million cubic feet of gas sold, while, in the case of the Corporations, the total amount of money borrowed per million cubic feet fell until 1897, when it stood at £616. It has since risen to £639; but if allowance be made for the increase at the time of transfer, the figure would be lower than the net capital outlay of the companies. Since 1891 the capital cost per million cubic feet of increase has been greater in the case of local authorities than in that of companies, due to the proportion of expenditure in slot installations that the latter wisely charge to revenue. But the ultimate point of consideration is that there is now a difference of £153 per million in the net capital of the local authorities and the companies to the advantage of the former; and a difference of £309 per million between the outstanding loans of the local authori-

ties and the capital of the companies upon which dividend or interest has to be paid.

This being the position, the direction in which an effort should be made by the companies to reduce their capital is, Mr. Valon submits, by redemption. That is the only way. There is precedent in the Gaslight and Coke Company; but this Company is in an altogether exceptional position in respect of its capital account, owing to amalgamations and the abandonment of intown stations. However, it was in 1903 that the Company were restricted from paying any increase of dividend above the standard until they first placed a definite sum to a fund for the redemption of capital—the fund being formed by money the Company might otherwise have divided as increased dividend. Such a process must, if generally applied, of course, be safeguarded by limitations. How the sums should be appropriated are discussed in the paper; and how the sums set apart for redemption should be applied is also considered. These are all details, however, merely supplementary to the main idea of redemption. It is not possible to settle any detailed scheme; and as to the objections of present shareholders and consumers, this is a point that should be considered in the light of the concluding words of the paper: "A low capital account is so obvious an advantage in the struggle with our competitors—a struggle which is likely to be even keener in the future than in the past—that some present sacrifice would surely be justified in order to obtain it."

Assent and Dissent.

In the discussion Mr. Lees' paper was, unfortunately, almost neglected; and on Mr. Valon's paper, there was, as might have been expected there would be, a division of opinion as to his central suggestion. The speakers were Mr. Edward Allen, Mr. D. Irving, Mr. D. Vass, Mr. John Carter, Mr. J. P. Leather, Mr. D. T. Livesey, Mr. A. Yuill, and Mr. J. H. Brearley. In a very few sentences, the trend of the discussion can be indicated. There was some talk of Mr. Valon's paper suggesting that the gas industry is a dying one. That Mr. Valon repudiated. All sorts of objection was raised to the suggestion of a regulated capital redemption fund for gas companies. It is thought that it would be against the interests of present consumers and shareholders. The price of gas would have to be raised; and this would be detrimental both to the present and future of the undertakings—particularly in the case of the smaller companies. In short, the cure would be worse than the disease, if so the capital position of companies can be called. The favourable position of gas stocks in the market is considered to be an argument against any such scheme being necessary. On the other hand, there were speakers who agree that a redemption fund would strengthen the position of gas companies. Middle courses were suggested—such as greater recourse to revenue for improvements, and so keeping down capital expenditure. It was also suggested that greater reserve fund powers are required. Needless to say Mr. Carter hardly thinks justice is done to municipalities in connection with their trading undertakings, and that they do not receive the impartial treatment they deserve. In his opinion, the suggestion is significant that such a drastic change as Mr. Valon recommends is necessary to put the affairs of gas companies in as sound a position at those of municipalities. Mr. Valon points out that if gas companies had a redemption fund, it would only be equivalent to the sinking fund of municipalities.

Pipe Thread Standardization.

Mr. James W. Helps, who attended the recent Paris conference on pipe screw-threads, handed in a report on the subject. This is reproduced in the general report of the proceedings. He acknowledged the indebtedness of the Institution to the British Engineering Standards Committee for the great assistance they rendered at the conference.

The New President.

Though a foregone conclusion, there was much enthusiasm on the announcement that, as a result of the ballot Mr. James Helps, the Senior Vice-President, was to pass to the highest seat of honour in the Institution. Mr. Alexander Wilson, of course, succeeds to the Senior Vice-Presidency; and Mr. Robert G. Shadbolt takes rank as the Junior Vice-President.

Next Year's Meeting.

There was some discussion as to the place of meeting next year. It is suggested that Leeds should be selected. There are reasons for. The Institution is to have a closer association with the Leeds University; and the endowment of the Professorship in Gas Engineering and Fuel is an event of the year. A small, but still a further consideration is that in the Leeds Gas-Works, the new President (Mr. Helps) spent the early years of his connection with the gas industry. Again, the University, through Professor Smithells, gives the Institution a cordial invitation to the city. There are reasons against. All going well, in the succeeding year, the Glasgow Corporation Gas Committee will, with Mr. Wilson, be issuing an invitation to the members to assemble in that city; and there is a large proportion of the members who find London so convenient, that they do not look with pleasurable anticipations to meeting away from the Metropolis two years in succession. The matter was left with the Council to settle; but the meeting gave them a clue to their preference for London.

New Honorary Members.

The President of the Société Technique and of the German Gas and Water Association were added to the long roll of honorary members.

Then we came to the final business. There was a perfect shower of votes recognizing services rendered to the Institution during the year and at the meeting. Many appreciative words were uttered regarding the President and others; and they were in their very fulness richly deserved. They formed an appropriate conclusion to an annual meeting highly favoured from many points of view, and one ranking with the foremost of its predecessors in point of success in work and result.

SOCIAL EVENTS OF THE WEEK.

After the cold and wet days that London had been experiencing immediately before the meeting of the Institution, there is ground for hearty congratulation that, with the opening of the sittings, the weather generally put on better behaviour, and there was improvement quite to the close of the week, by which time it may be said the weather was brilliant in comparison with what it had been. In consequence, the visit to the Metropolis was thoroughly enjoyed. It is one of the attractions of London to our provincial friends and their ladies that there is so much to do and so much to be seen there—no matter the prevailing climatic conditions. Yet we must give one and all their due. Providing the proceedings for the discussion of the prosaic matters of technical and commercial concern do not occupy the whole time, the members are, as a rule, punctilious in observing their duties in this respect, and we accept this as evidence that the ladies do not seek to entice them from the main object of the visit.

Masonic.

Maintaining custom when the Institution of Gas Engineers have their annual conference in London, the Evening Star Lodge (No. 1719) arranged on Monday last week to hold an emergency meeting, so as to offer a welcome to the members and their masonic friends. The gathering took place at the New Gaiety Restaurant, Strand, and was largely attended—there being some 142 present. The W.M. (Bro. Jacques Abady) was in the chair, and was supported by his Wardens, W. Bro. W. A. Surridge and Bro. Cyril Davis. In the course of the evening, Mr. John Terrace, Engineer and Manager of the Great Grimsby Gas-Works, was initiated; and at the close of the ceremony, W. Bro. A. E. Broadberry, P.M., of Tottenham, delivered the customary charge. The subsequent proceedings included a banquet, followed by a selection of vocal and instrumental music—arranged by a Committee consisting of the W.M., the Secretary (W. Bro. W. D. Child), W. Bro. Arthur Valon (Director of Ceremonies), and W. Bro. Walter T. Dunn.

Reception and Dance.

It is appropriate that the reception by the President and his wife should come early in the week's doings. There seems a little unfitness about an event of this kind occurring when the programme for the week has been half passed through. On this occasion, the President and Mrs. Glover departed from what has grown almost the custom of having

the reception on the Wednesday evening, and did quite the correct thing in receiving the members and their ladies on the evening of the opening day of the meeting. The splendid and convenient galleries of the Royal Institute of Painters in Water Colours were again chosen as the scene of an evening of social and merry event. When it is stated that the guests of the President and Mrs. Glover numbered no less than 330, it will be recognized that the latter had a busy time during the period of the reception from eight to nine. But the smiles and heartiness of the President, and the smiles and grace of Mrs. Glover, convinced their numerous guests and friends that they were deriving considerable happiness from the position in which they found themselves. Among the guests were Mr. and Mrs. Dugald Clerk and the Chairmen of the Sections and the Secretary of the Society of British Gas Industries. Mr. Dugald Clerk is the Vice-President of the Society. There was much regret that the President (Mr. Thomas Newbigging) could not be present. However, we are glad to see the interchange of courtesies between the Institution and the Society. May it long continue. That by the way, however. The guests quickly spread themselves about the rooms, and were soon engaged in admiring the pictures, in friendly discourse, in listening to the music, and those who delight in the whirl and pleasures of the dance were busily occupied in the pleasant task of securing their partners. The programme of music under the direction of Mr. Arthur Barlow was an excellent one; and as vocalists, in company with him, were Miss Florence Holderness, Miss Ethel Bevans, and Mr. Henry Plevy. Their songs and madrigals were much admired. After the reception, the guests were constantly on the move between the music, dance, and refreshment rooms. Not until about a quarter of an hour before midnight did the last of the guests depart, filled with most pleasant recollections of the evening.

At Norwich, and on the Bure and Wroxham Broad.

After work, play. Friday morning, there was great bustle around the entrance to No. 8 platform at the Liverpool Street Station of the Great Eastern Railway from just before 9.30 to 9.50. There was Mr. Dunn and his courteous and ever-willing assistant dispensing, next to the ticket examiners, place tickets for a luncheon and a booklet giving succinctly an account of the sights of Norwich—the "sights" including the gas-works—and simultaneously they were also kept busy answering the thousand-and-one inquiries, more or less necessary, of a number of inquisitive excursionists. We must, while we think of it, give Mr. Dunn his due. During an Institution meeting, there is not a single man who is harassed so much as he. Not only does all the detail of the meeting fall upon his shoulders, but he is supposed to know everything, and is plied with innumerable questions, many of them having very distant relation with the work and duties of his office. But he keeps a clear head all through; and when he has not a ready answer (which is seldom the case) the courteous word generally leaves the questioner under the impression that he has obtained all the information he requires. On this morning, the sight of the Secretary reminded one of all sorts of interrogations. But eventually the whole throng of 250 or so excursionists were aboard the special, and were soon on their way to the grand old city of Norwich. It was a great home-going for the President and Mrs. Glover, accompanied by such a number of friends, among whom they had been the central figures in London during the week. An excellent idea was the making of the excursion on this occasion to the scene of the President's daily work, and enjoying its hospitality and beauties. There were a few who shook their heads when they heard of the proposal to go such a distance for the excursion. But in the event it was found that the idea was very popular; and those who undertook the arrangements for the day soon discovered they had taken on their shoulders a bigger task than they had bargained for. For the President's sake, however (such is the reward of popularity) they counted the additional work but as an additional pleasure. The Board of the British Gaslight Company—the owners of the Norwich gas undertaking (over which the President presides as Engineer and Manager with such acknowledged ability)—took upon themselves the reception of the visitors and their entertaining at lunch; and in successfully carrying out their generous wishes, there must be special mention here of the work of the Secretary of the Company (Mr. A. W. Brookes) and the members of the President's own staff at Norwich, and particularly of



VIEW OF THE NORWICH (ST. MARTIN-AT-PALACE) GAS-WORKS.

his assistants, Mr. V. E. Harston, Mr. W. H. H. Wayte, Mr. C. G. Frost, Mr. W. H. Taylor, and Mr. F. H. Phillips. They marshalled the details of the work with such consummate skill, that there was nothing wanting; everything presented an air of completeness; and everything passed off during the day with something like mechanical precision. The same with the afternoon's arrangements for pleasure and sight-seeing which had been kindly provided by the Corporation and their officials.

Thorpe Station at Norwich was reached just before 12.30; and outside special trams were standing, by which the visitors variously reached Bishop Bridge Gas-Works or St. Martin-at-Palace works. Both works were fully described and illustrated in the "JOURNAL" for Sept. 19 and 26, 1905; and their interesting features were then given special prominence. But from the booklet placed in the hands of the visitors we may just refresh the memory of readers with the following outline sketch:

The gas first supplied to the city was made from oil, under a patent granted to Mr. John Taylor (a native of Norwich) in 1815. In association with a Mr. Martineau, Mr. Taylor constructed oil-gas works at Hull, Bristol, Leeds, Colchester, Leith, Bow, Whitby, and several other places.

The British Gaslight Company was established in 1824; and all the shares of the Norwich Gas Company were soon afterwards acquired. The progress of the Company's Norwich works in recent years can be judged by the following figures:

	Gas Sold. Cubic Feet.	Consumers.
1901	362,643,000	13,379
1906	468,522,000	23,132
1908	515,522,000	25,485

The works were remodelled in 1903-4. They occupy two distinct

sites, at St. Martin-at-Palace and at Bishop Bridge. In addition to these works, the Company have central offices and show-rooms in the Market Place, and residuals works for the manufacture of sulphate and distillation of tar, at Great Yarmouth.

On the St. Martin-at-Palace site are situated the retort-house, containing two benches of retorts, with a gas-making capacity of 2½ million cubic feet. The settings are of ten □ (with the exception of the three feet deep chambers), and are heated by Klönne regenerators; the stoking being done by West's compressed-air machinery recently supplemented by a combined De Brouwer machine. The latter machine is for charging and discharging the chambers, and for relieving the compressed-air machinery when the latter is under repair. The coal-stores have a capacity of about 7000 tons. The coal is received by water, and is discharged from lighters on the river by means of a powerful elevator, which delivers through an automatic weighing-machine on to band conveyors. The water-gas plant originally consisted of two of Messrs. Humphrey and Glasgow's sets of 500,000 cubic feet capacity each. No. 2 set was remodelled and enlarged to 800,000 cubic feet capacity in 1906; and No. 1 set is now being likewise remodelled. The blast is supplied from two Sturtevant fans and Marshall reciprocating engines; and these are being supplemented by a De Laval turbine blower.

The steam plant consists of three Lancashire boilers, two 26 ft. by 6 ft. 6 in., and one 30 ft. by 7 ft. 6 in.—the latter, being constructed with dished ends and corrugated flues, was installed in 1908. The coke plant consists of De Brouwer conveyors, and hopper stores. The surplus is delivered into a covered store. The power house contains one 75-horse power "National" and one 80-horse power Tangye gas-engines, air-compressor, and dynamo. The tar and liquor storage comprises two circular steel tanks above-ground, each of 100,000 gallons capacity. The workmen's rooms are provided with facilities for cooking, washing, bathing, and dressing. The gasholder on the site is used as a relief holder.

On the Bishop Bridge site are situated the exhauster, meter, and governor house, which contains a vertical exhauster set of 150,000 cubic feet capacity per hour, a horizontal set of twins of 60,000 cubic feet capacity per hour each, and a horizontal set of 40,000 cubic feet capacity per hour. The latter is used for carburetted water gas.

There are three station meters, two for coal gas, and one for carburetted water gas, two district governors, and a complete set of valves for controlling the flow of gas to and from the holders. The purifiers comprise four boxes 30 ft. by 30 ft. by 5 ft. 6 in. of Green's type, four 20 feet square water-lute boxes, four 36 ft. by 24 ft. by 5 ft. boxes, also with water-lutes, the first eight dealing with the coal gas, and the four latter with carburetted water gas. The purification is entirely by oxide. The holders have a total capacity of 1,384,000 cubic feet; and the maximum gas delivery in 24 hours is 2,253,000 cubic feet. An additional holder of a million feet capacity is about to be installed. The laboratory and photometer room are completely equipped with apparatus for testing the gas for illuminating and heating value, &c., and for the checking of all raw material and products. The district workshops and stores form the headquarters of a large staff of outdoor employees; the shops being provided with the necessary apparatus and tools for the cleaning and repairing of cookers, fittings, lamps, &c.

On arriving at St. Martin-at-Palace works, the visitors found Mr. R. S. Gardiner and Mr. Leonard R. Wilkinson waiting to receive them in their capacity of representatives of the Board of Directors. Unfortunately Mr. J. Horsley Palmer, the Chairman, could not be present; and Mr. Corbet Woodall was detained in consequence of the effects of a recent slight accident in which he was involved. The London staff was represented by the Secretary (Mr. Brookes); and members of the Norwich staff were, of course, all there, and unremitting in their attention to the visitors. A large marquee had been erected for the purpose of the lunch on the vacant part of the works' site; and it was decorated with a refined taste that was very generally commented upon. When the Chairman (Mr. Gardiner) had taken his seat, it was seen that places of honour were occupied by Mr. and Mrs. Glover, Mr. Wilkinson, Mr. James W. Helps (the incoming President), and the two Vice-Presidents,

Mr. Alex. Wilson and Mr. R. G. Shadbolt. Mr. Charles Carpenter and Mr. H. E. Jones were also near the Chairman. The City Authorities were represented by the Sheriff of Norwich (Mr. A. G. Howlett), the Deputy Mayor (Alderman W. H. Dakin), the Chairman of the Executive Committee (Mr. F. C. Havers), Aldermen and Councillors of the chief governing body of the city, the Very Rev. the Dean of Norwich (Dr. Lefroy), the City Engineer (Mr. A. E. Collins), the Electrical Engineer (Mr. F. Long), the Water Engineer (Mr. W. H. Parr), and others. Altogether there were about 45 local guests; so that the company who sat down numbered just about 300.

The luncheon was an excellent and generous one, and well served; and after the long railway journey, there was no question about the guests doing full justice to the good things set before them.

Thanks having been returned by the DEAN OF NORWICH, the loyal toast was proposed by the CHAIRMAN; and then

The CHAIRMAN submitted "The Institution of Gas Engineers." In doing so, he said those who knew what a deep interest the Chairman of the Company (Mr. J. Horsley Palmer) took in the concern over which he presided with such wisdom and success, would recognize that only an unpreventable cause could have deterred him from being present that day. They were also sorry at the absence of Mr. Corbet Woodall. His presence would have been so very acceptable on this occasion. They regretted the unfortunate wound which he sustained in Denmark a fortnight or so ago, and which had disabled him temporarily. The good wishes of those present would go out to Mr. Woodall, for his speedy recovery from the mishap. He (Mr. Gardiner) was pleased to be in the privileged position of offering the Institution a hearty welcome that day on behalf of the British Gaslight Company, and of proposing success and prosperity to the Institution. It was thirty years now since he first became associated with the gas industry, and with it he had in one way or another been continuously connected. When one looked back, and considered the means and methods by which gas was produced and distributed, and when one thought of the improvements that had been introduced (say) even in the last ten years, owing mainly to the creative genius, application, and resourcefulness of members of the Institution, and, perhaps in some minor degree, to the support that had been given to their efforts by the directors of gas companies and members of corporation gas committees, one felt indeed that it was almost superfluous to wish success and prosperity to the Institution, which through various stages had now reached the position to which it was entitled as the premier organization of the members of the gas profession in Europe. It was indeed a very proud privilege to address any body representing all that was best in every sense of the word in the gas industry of Great Britain and Ireland. The members had that day been good enough to come from London to see the Norwich works of the British Gaslight Company, and to see what their able President [cheers] had the last few years produced in the way of bringing up-to-date the gas plant in the city. This being so, might he (the Chairman) take the opportunity of sincerely saying one word to the younger members of the profession, whom chance had placed in works of less importance, and works on which large sums of money for experimental and improvement purposes could not wisely or properly be expended. He (the Chairman) had heard on occasions like the present one disappointment and sorrow from visitors because their own surroundings did not give them the advantage of producing the best that was in them. He felt very strongly that—apart from the supreme source of contentment which all must derive from the feeling which could alone be produced under the circumstances in which one was placed—in the gas industry, with every kind of works and with every kind of plant, the engineer or the assistant who was doing his best to get the highest results and to produce standard gas at the cheapest cost, and who was doing his best to get down the capital per million cubic feet of gas sold, was doing just as much to worthily represent the Institution, and to further the interests of the gas industry, as he who had the good fortune to be in a modern works, or to build new works, and to work plant of the most modern description. There was only one more point to which he had time to refer, and that was the pleasure the Directors of the Company experienced in knowing that the members and officials of the Corporation of the City of Norwich were extending to the visitors generous, kind, and gracious hospitality. They were taking the visitors to view some of the beautiful and picturesque surroundings of the ancient city; and he should not be worthily representing the views of his colleagues on the Board of the Company, if he were not to say on this occasion that they lost no opportunity of impressing on their managers, and requested them, to carry out the feelings which they themselves entertained, that it was only by harmonious and friendly co-operation between those responsible for the health and comfort of the city and those who were responsible for the supply of such a necessary everyday commodity as gas—that, he repeated, it was only by sympathetic co-operation between the representatives of these two bodies—the comfort, the convenience, and the well-being of the community could be furthered. He coupled the name of the President with the toast.

Mr. GLOVER, in reply, said he felt very much the hearty manner in which the toast had been proposed and accepted. He hoped those present would forgive him for not making a speech on this occasion, as he had been doing so much speaking the last few days, and had had to undertake somewhat arduous duties on behalf of the Institution. But he could not allow the opportunity to pass without saying how much honoured the Institution were by having this invitation to visit Norwich, by the generous hospitality his Board had extended to the members and their lady friends, and by the presence there of the Sheriff of Norwich, the Deputy-Mayor, the Dean, Aldermen, and Councillors, together with the City Engineer who had very kindly taken the chief responsibility of the afternoon's programme. There were also present the Engineer of the successful electricity undertaking of the Corporation, the Medical Officer of Health, and other officials. There were usually profuse

smiles when one mentioned electricity. In that city the officials of the electricity and the gas undertakings worked together most harmoniously. They recognized—he (the President) recognized—that there was a place for both. They were—both Electrical and Gas Engineers—putting the best possible into their several departments for the good of their respective concerns; and he was glad to say they were both successful. The electricity works of the city had been well-managed from the first—formerly as a company, and since as a municipal undertaking. And he was not surprised the people of Norwich were proud of the concern. But the diagrams and figures he had shown during the week in London proved that in respect of gas the present function was not a funeral service; they were there only because of the successful carrying on of the ancient Company in the ancient city.

Mr. LEONARD R. WILKINSON next proposed "The Visitors." He remarked that this was a red-letter day in the annals of the Company. That their guests had come so far in such great numbers was a great compliment to the Company; and it was one the Directors would not readily forget. It was of the utmost importance, and would be even more so in the future, that such companies as theirs and such corporations as that of the city should be friends. In the city, they had been friends in the past, were friends in the present, and would still be in the future. On behalf of his colleagues and himself, he might say they would leave no stone unturned to secure the continuance of these cordial relations for all purposes.

The SHERIFF (Mr. A. G. Howlett), in responding, said he was very proud that one of their citizens should be the President of such an important body as the Institution of Gas Engineers. Mr. Glover had been in Norwich for some years now; and, by his geniality and ability, he had won the appreciation and esteem of his fellow citizens. Although the Corporation and the Company were running rival enterprises, he was glad to think and believe that the relations of the two bodies were most cordial and friendly. Their President had said there was room for both gas and electricity. He did not think they were competitors in any sense of the word. The success of the Corporation electricity works had been due to the rivalry of the Gas Company; and he had no doubt the rivalry of electricity had spurred on the Gas Company.

Mr. F. C. HAVERS also made reply, and congratulated the members of the Institution upon having a President so able as Mr. Glover. He hoped the day would be far distant when Mr. Glover severed his connection with the city.

Mr. J. W. HELPS submitted the toast of "The Chairman and Directors of the British Gaslight Company." In the course of his remarks, he spoke of the enjoyment those present had already derived from their visit, and of that which he was sure they had still to derive. Speaking of their hosts, he said he numbered among his friends several of the Directors of the Company. Their Chairman that day (Mr. Gardiner) he honoured as a man who had done much for their industry in knitting together the ties of friendship between the gas men of this and other countries. Their friend, Mr. Corbet Woodall, was one of themselves; and Mr. Horsley Palmer, Mr. Wilkinson, and other members of the Board were known for their business qualifications. They owed their gratitude to these gentlemen; for they had not only given them an excellent President, but they had allowed the President to do his work in that capacity, throughout the year, in such a way as to redound to the credit not only of himself, but of the Company. When they found the Directors allowing their engineers a free hand to enter upon research work to further not only their own interests but those of the whole industry, they knew they had men who were solicitous for the highest welfare of the industry. One and all thanked the Directors of the Company for affording Mr. Glover the opportunity for carrying on the great work upon which he had embarked. Those present would wish him to thank the Chairman and the Directors not only for this, but for the most generous manner in which they had received their visitors that day. (Cheers.)

The CHAIRMAN acknowledged the toast and the kind expressions and hearty endorsement that had accompanied it. It had, indeed, given the Directors great pleasure to see the members there that day; and he hoped the day's proceedings would tend to do something to foster that cordial co-operation between the directors of gas companies, members of corporation committees, and gas engineers which was so necessary to the welfare of the industry as a whole.

There were a few minutes to spare for the professional men of the party to visit the retort-house to see two of the chamber-retorts discharged about which information had been given in the President's address and elsewhere in the proceedings during the meeting. They found everything precisely as described and illustrated in Mr. Glover's address. The chamber-retorts each carry a 21 cwt. charge; and the two charges seen were exceedingly well burnt off. The chambers, however, were somewhat hotter than usual, owing to the charges having been kept in (in order to allow those present to see the retorts discharged) some $\frac{3}{4}$ hour beyond the ordinary span of twelve hours. The charges, though the retorts were full—almost close to the top—came away clean. The great mass of coke was played upon by a water-hose; but, of course, the De Brouwer conveyor, not having been constructed for such bulks of coal, did not catch it all without a little shovel work. The coke was of large size, and fully complied with the description applied to it during the week. It was an exceedingly interesting demonstration. An opportunity was given of examining the construction of one of the settings, now being built; and of witnessing the working of the De Brouwer projector, with the charging-plate specially fitted for these chamber-retorts.

There was not much spare time to linger over the interesting and instructive demonstration. The programme had been arranged with very small loose ends of time between the

items; and the party were soon making their way to the station to reach Wroxham for the river trip. A few volunteered to remain behind as the launch accommodation available was only equal to 250; and those who deprived themselves of the treat had the satisfaction of being escorted by Miss Edith Collins, daughter of the City Engineer, round the City to see the sights. At the cathedral the Dean interested the party considerably by pointing out the historical features of the ancient edifice.

But our own interests were with the large river party. Several launches had to be requisitioned to provide accommodation for all. Those living at Norwich have been vastly favoured by Nature; and as the panorama of beauty passed before the eyes of the visitors a little feeling arose in one's mind that it would have been more charitable on the part of Nature if she had scattered her charms about the country rather more freely, and had not exercised so much power of concentration. Well, the River Bure was passed along; the launches all did Wroxham Broad; and we were getting to know something more than we knew before as to how many of the people of Norfolk, and those who visit the county, enjoy the hours of real leisure and recreation that come as the reward of industry, when the launches stopped at the landing-stage opposite the "White Swan" Hotel, Horning, and there tea was provided. Only forty minutes were allowed here; and it was not long before the big party were again seated in the launches, and on their way back to Wroxham, where the special train for London was timed to leave at 6.45. At the station, we bid—or as many as time would allow did so—the President "Good-bye." But he joined the train; and it was as he stood on the platform at the next station, and the train was passing out, that three rousing cheers were given him. So was brought to an end a presidential year that is fraught with much for the future of the industry, and with the end of the one a new presidential year commenced, in which the central figure will be Mr. James W. Helps, of Croydon. We wish him during that year the health that will be necessary for the duties before him; and in those duties and the work over which he will preside, all the success and pleasure that he himself could possibly desire.

On Thursday night Mr. W. J. Liberty, the Lighting Inspector of the City of London, met many of the members of the Institution by the Law Courts to inspect the new Graetzin high-power inverted lamp which had been temporarily put in position for examination by the Lighting Committee of the Corporation (see *ante*, p. 695).

GENERAL REPORT.

The Annual General Meeting of the Institution opened last Tuesday morning, at the Institution of Mechanical Engineers, Storey's Gate, S.W.—Mr. THOMAS GLOVER, of Norwich, the President, in the chair. There was a very full attendance of members, at which the President expressed his great satisfaction.

Confirmation of Minutes.

The minutes of the last annual meeting were taken as read, and confirmed.

Appointment of Scrutineers.

On the motion of Mr. ALEX. WILSON (Glasgow), Messrs. Thomas Berridge (Leamington) and Mr. W. S. Morland (Gloucester) were unanimously appointed Scrutineers.

The Annual Report.

[See "JOURNAL" for June 1, p. 574.]

The PRESIDENT said the annual report of the Council had been circulated; and he hoped it had been read by all the members, for it was becoming a more important document every year, as the work of the Institution increased. If any one had not yet read it, he hoped they would do so, as it contained the record of much work done during the past year—some of it very important. If it were agreeable to the meeting to take the report as read, he would move its adoption.

Mr. J. W. HELPS (Croydon) seconded the motion.

Mr. ISAAC CARR (Widnes) said he should like to ask a question before the report was confirmed, with reference to the paragraph relating to standard burners. It stated that the Council proposed, in conjunction with the Gas Companies' Protection Association, to promote a Bill in Parlia-

ment for the purpose of making the No. 2 "Metropolitan" burner the universal test-burner; and he wished to ask if the Council had considered what the ultimate result of the promotion of such a Bill would be to the Institution from a financial point of view. It was obvious that if such a Bill were promoted, it would be strenuously opposed by the authorities upon whom it was likely to inflict injury; and it would therefore involve a very large outlay. He should like to know what proportion (if any) of the expenses of such a Bill would come upon the Institution, because their funds (which were sufficient for their own ordinary requirements) would be very inadequate if they had to bear any considerable proportion of the expenditure on such a Bill. While he congratulated the Council on the report as a whole, he took very strong exception to this particular portion, and thought the Council would have been much better advised if they had adopted a policy of non-intervention, and let this matter take its own course. He had no particular objection to the No. 2 "Metropolitan" burner as a burner, or to any other standard burner; but he did object to its being made the means of throwing dust in the eyes of consumers and of gas authorities generally. ("No, no.") It reduced the standard sperm candle to a farthing dip, and a very poor one at that. They had it on the authority of the people who were promoting this Bill that the 14-candle standard was necessary for the industry; and now these persons told them that they were unable to make gas of so low a quality. It was a very great mistake on the part of the Council to interfere. He desired to express his disagreement with this part of the report. He should not, however, propose an amendment because he did not think he should carry it; but he would content himself with this protest.

The PRESIDENT did not think that Mr. Carr would have any considerable following in the meeting. He had raised this objection to the action of the Council in helping to promote the unification of the test-burner in this country. At present the methods of testing were various; and there was no real comparison of the quality of the gas as supplied in various towns. This was an attempt to unify the standards used—to get the Board of Trade sympathetic, and if possible to induce them to promote a General Bill, which would get the standard burner unified, and so prevent the confusion at present existing. He felt sure the Council had the sympathy of the meeting in thus attempting to straighten things out; and there could be no doubt it would be a great benefit to the industry if they could induce the Board of Trade to promote such a Bill. The Institution did not propose to incur any considerable expense in promoting such a measure, either by themselves or in conjunction with the Gas Companies' Protection Association. Unfortunately, they had not the funds for such work; but he could not see the slightest objection to their co-operating in this useful object to the full extent of their power.

Mr. W. GRAFTON (Glasgow) took exception to Mr. Carr's reference to the farthing-dip, and thought that everyone must object to being tied to a burner which did not give the true result.

The resolution for the adoption of the report and accounts was then put and carried unanimously.

Presentation of Awards.

The PRESIDENT said he had much pleasure in asking Mr. Harold Woodall to come forward and receive the "London" Gold Medal for the best paper of last year, entitled "Continuous Carbonization in Vertical Retorts."

Mr. HAROLD W. WOODALL (Bournemouth), in thanking the President and the Institution, said the paper was the record of the work in which he had the pleasure and honour of being associated with Mr. Duckham for five years; and he could not accept this medal without mentioning that gentleman, to whom any credit which might attach to the paper was equally due. Looking back over the work, there were a few "ups," and a good many "downs;" but they had always felt that they had the sympathy and encouragement of the Institution, and he thanked the members for this culminating proof of their sympathy.

The PRESIDENT next presented the Silver Medal to Mr. Bywater, for his paper on "Refractory Materials," which, he said, was having important results. The after-effects of the paper would last a long time. A Committee had been formed to work in conjunction with a larger Committee, to endeavour to standardize refractory material. They had all had experience—unfortunate experience sometimes—of the need for such a Committee.

Mr. F. J. BYWATER (Birmingham), in returning thanks, said he had endeavoured to call the attention of the industry, and of engineers generally, to what he had always considered a most important matter; and he trusted the result would tend to bring about the straightening out which was essential to success. In so doing, they would obtain the co-operation of many other industries who were keenly interested, and also of manufacturers, who had received the idea of conferences with engineers very candidly, and had expressed themselves as most anxious to meet them in every possible way.

The PRESIDENT then presented the third prize to Mr. Hayman, for his paper on "Continued Experience with the Dessau Vertical Retorts"—perhaps, he said, the most important development in carbonization. The paper might have been somewhat overshadowed by the previous one on the same subject; but it was very important, and gave the subsequent experience at Dessau.

Mr. A. F. P. HAYMAN (Berlin) said he thoroughly appreciated the great honour conferred upon him, which was far beyond the merits of the paper; but he valued it as a mark of appreciation of the work which was being done in Germany in connection with vertical retorts. Last year they had the pleasure of welcoming in Berlin a great many of the members, who were able to inspect what was being done there, and to see the various developments of the gas industry in that country. He hoped the impression they received was that in Germany they were well to the fore in everything appertaining to the manufacture and use of gas. A further reason why he particularly appreciated this honour, was that it had given him an opportunity of attending another of their annual meetings, and of renewing his acquaintance with so many members of the profession.

The President's Address.

The PRESIDENT then delivered his Inaugural Address, which was given in the "JOURNAL" last week (p. 698). At its close,

Mr. WILLIAM KING said he had been asked to propose a resolution, somewhat to his surprise, as he would have expected that it would be entrusted to someone more actively engaged in the industry; but he was quite sure it would meet with hearty acceptance. His only right even to be present was as an old member of the Institution or as a Director of one of the largest London Suburban Companies; but between directors, committee-men, and officers there should be the closest bond of union and sympathy, and possibly those who occupied the post of directors might be in a better position than others to sympathize with the anxieties of engineers if they had gone through the mill themselves. He had listened to many, if not all, previous presidential addresses; and he thought the older members would agree with him that they had never heard a more excellent one. When, in addition to the daily round of anxieties, which the President so cheerfully faced, but which they all knew were by no means trivial, he had been willing to undertake the anxiety and investigation necessary for the preparation of a presidential address, a very large debt of gratitude was due to him; and he (Mr. King) therefore proposed that the best thanks of the Institution be presented to the President for his excellent address.

Mr. J. HORSLEY PALMER said that he had been asked to second this motion, though he was not a member, and it was only by the kind courtesy of the Council that he was so frequently invited to attend the meetings. It was, however, a special pleasure to second the resolution on account of the intimate connection between the President and himself, as Chairman of the British Gaslight Company, of which the President was the most able officer. In listening to the address, there recurred to his memory many recollections of work abroad, because one engineer on his staff had just received a bronze medal. He much regretted that he would be unable to be present at Norwich on Friday to welcome the members; but he hoped they would have a hearty welcome by three Directors and the Chief Engineer; and he hoped they would have a happy day.

Mr. H. E. JONES desired to add the testimony, not of a director, but of a really hard-working engineer, to this vote of thanks. He was delighted to see in the chair a thoroughly practical engineer. He considered that in Mr. Glover they had a typical President, who had the whole of his work at his fingers' ends; and he therefore, as a fellow-worker, desired to support the resolution.

The resolution having been carried by acclamation,

The PRESIDENT, in responding, expressed his gratification that the resolution had been moved by his old friend and fellow Lancashire man, Mr. King, and seconded by the Chairman of his own Company.

The Livesey Memorial Fund.

Mr. S. Y. SHOUBRIDGE (Sydenham) announced that the subscriptions to this fund now amounted to £9970 16s. 7d.; and he hoped the small balance required would be made up before the close of the meeting.

Professor SMITHELLS expressed his pleasure at having the opportunity of saying, on behalf of the University with which he was connected, how much honoured they felt by being selected as the place in which the memorial to the great leader they had recently lost was to be set up. This was the first opportunity he had had of speaking at any of their meetings since the profession had determined how to carry out this memorial; and he did not like it to pass without assuring them how much the University appreciated the compliment paid to them, and how determined they were to do all they could to make it worthy of the great man whose memory it was to perpetuate. The words contained in the President's Address on the whole subject of the relation of scientific teaching at the University to the profession of gas engineering, left nothing to be said by him; for anything more discriminating or more just it would be impossible to put together. He only hoped the views he had expressed might be seconded in the minds of all belonging to the profession. If they were, he had no fear at all for the future. That they had great difficulties to face, he did not attempt to deny. They had a new enterprise to conduct; but if they had the co-operation of the profession from the first, as he hoped they would have, there was no doubt of their obtaining complete success in the end. He knew from intercourse with members in the gas industry, that there existed a certain amount of scepticism as to the advantage to be given to the profession by the University; and no doubt there were grounds for this belief. But he would remind them that the University with which the memorial was to be connected was a new one, situated in a great centre of industry, and in an environment which would be sure to bring it into close practical touch with the industries of its neighbourhood and of the country. The only other word he wished to say was that they had found, in connection with all enterprises of this kind in the University, that it was indispensable to have the scientific department advised and controlled by a Committee on which representatives of the separate industries were placed. And he took it—though, of course, all the details of the future scheme were not as yet fixed upon—that the Livesey Professorship would be under the constant supervision of a Joint Committee representing members of the Institution and other branches of the gas profession and also the University academic body. In this way they would have a guarantee that there would be contact between the practical mind and the scientific mind, and that they would have that action and re-action between the intellectual and practical side which was so indispensable for the proper progress of both. Though the vote of thanks had already been passed, he should like to add his tribute to the praise already given to the President for his address, which was full of suggestiveness that would lead to many developments of thought and action which would be of great advantage to the community.

Mr. H. E. JONES said he had just heard that they had raised the £10,000 required, with the exception of about £30. He had been making in a certain quarter an appeal which he hoped would turn out successfully; but, whether it did or not, he would make himself personally responsible for providing the £30.

The PRESIDENT said the members must all feel grateful to Mr. Jones for undertaking this responsibility.

[It may be convenient to record here that, just before the mid-day adjournment, Mr. C. F. Ruggles (Leighton Buzzard) expressed his pleasure in stating that, since the announcement made earlier in the morning with regard to the Livesey Memorial, he had been authorized by the members of the Eastern Counties Association (of which he is the retiring President) to say that they would be very pleased to further augment the fund by twenty guineas.]

On Wednesday morning, after the meeting of the Benevolent Fund,

The PRESIDENT read two letters he had received from Mr. Corbet Woodall and Mr. Thos. Newbigging regretting

their inability to be present at the meeting—the former in consequence of a slight accident, and the latter as he was fulfilling a professional engagement in Toronto. They would, he said, all rejoice to hear that Mr. Newbigging was still energetic enough to cross the Atlantic, and would sympathize with Mr. Woodall, to whom he suggested a message to this effect should be sent.

This was at once agreed to.

Reading of Papers.

The reading of papers was then proceeded with. They were taken in the following order:—

Tuesday.—Report of the Gas Heating Research Committee.

Wednesday.—"Carbonization in Chamber Settings," by Dr. LESSING. "Carbonizing," by Mr. J. FERGUSON BELL. "The Advantages and Disadvantages of a Hot-Coke Conveyor," by Mr. R. WATSON.

Thursday.—"A Comparison between the Illuminating Efficiencies of Carbon Monoxide and Hydrogen when Used in Conjunction with the Incandescent Mantle," by Mr. ARTHUR FORSHAW. "A Study in Working Costs," by Mr. HERBERT LEES. "The Relative Capital Accounts of Gas Undertakings Owned by Companies and Local Authorities," by Mr. ARTHUR VALON.

The papers, with reports of the discussions thereon, will be found in another part of the "JOURNAL."

The Benevolent Fund.

On Wednesday, the annual meeting of the donors and subscribers to this fund was held. A report of the proceedings will be found on p. 885.

The Report of the Carbonization Committee.

The PRESIDENT, after Dr. Lessing's paper had been read, said it was a most important contribution; but before discussing it, he proposed that Mr. J. Ferguson Bell should read his paper on "Carbonization." The report of the Carbonization Committee had also been printed and distributed. This Committee found some difficulty in making a satisfactory report, owing to the pace at which developments were proceeding; but they had been fortunate in securing the services of Dr. Lessing, and his report, which had been prepared under the direction of the Committee, would be found both interesting and instructive. He hoped that, taken in connection with the paper just read, it would be of use to those members who had to plead for the Investigation Fund, and who had perhaps found some difficulty in asking for subscriptions.

Mr. CHARLES HUNT (London) asked if this report represented the whole work carried out by the Committee during the past year.

The PRESIDENT said it could hardly be said to represent the whole of the work, because there was a good deal of work which it was very difficult to put in a report. The Committee had had several meetings to discuss the position and consider how far it was possible to visit various works where new carbonizing plant was erected; and though they decided that they could not visit these new installations on the Continent, they had by no means been idle. On the whole, he thought that the report fairly embodied the views of the Committee.

Condolence with Mr. Forbes Carpenter.

After the discussion of Mr. Forshaw's paper on Thursday morning,

The PRESIDENT said that there were two matters he had to mention. It was within the knowledge of many of them that Mr. Forbes Carpenter, the Chief Inspector under the Alkali Act, had intended to be present and take part in the discussion on the papers on carbonization. In his last report, Mr. Carpenter gave almost a treatise on carbonization developments, which was a most important contribution to their knowledge, and was read with great interest all over the country. Unfortunately, Mr. Carpenter had had a very severe bereavement in the death of his wife, and it was suggested that they should send him a vote of condolence, which perhaps some member would move.

Mr. CHARLES CARPENTER (London) said though his knowledge of Mr. Forbes Carpenter did not extend over so many years as that of many other gentlemen, his acquaintance with him had been one of the most delightful he had ever

experienced. In every way Mr. Forbes Carpenter had endeavoured to help the gas man in performing his duties. It was easy to understand that a man of another disposition might make the lot of gas men more difficult than it already was; but Mr. Forbes Carpenter had in every way facilitated their work, and had been helpful to them in every respect. There were some among them who owed Mr. Carpenter a more than ordinary debt of obligation. He proposed that a vote from the meeting should be sent to Mr. Carpenter, expressing deep sympathy with him in the bereavement he had sustained.

Mr. SAMUEL GLOVER (St. Helens) said that, knowing Mr. Carpenter personally and having the greatest respect for him, he concurred most heartily in what Mr. Carpenter had said as to the way in which Mr. Forbes Carpenter assisted with all his weight in his most influential office to the better performance of their duties as chemical manufacturers in relationship to the public. He had the utmost respect for him, and the greatest sympathy for him in his bereavement.

The motion was carried by the members rising silently.

Mr. James Whimster's Absence.

The PRESIDENT said he had just received a letter from Mr. James Whimster, of Armagh, regretting his inability to be present at the meeting through the illness of his wife. They all missed Mr. Whimster's familiar face, especially as he came from Ireland, where they had comparatively few members; and he should take upon himself to write expressing the regret of the members at his unavoidable absence.

The Livesey Memorial Fund.

At the conclusion of the reading and discussion of papers on Thursday,

The PRESIDENT said he was sure they would all be glad to hear that the Livesey Memorial Fund had now reached the grand total of £10,154 7s. 10d. The further list contained contributions of £52 10s. from Mr. Charles Hawksley, £25 from the Lambton Collieries, £21 from the Eastern Counties Gas Managers' Association, £52 10s. from Sir John Aird, £5 5s. from his Manager, Mr. Nisbet, and a number of others from members of the Institution.

Mr. SAMUEL GLOVER remarked that it ought to be thoroughly understood that good use could be made of any sum above £10,000 which might be subscribed.

The PRESIDENT said this was quite true. The sum of £10,000 was named as the minimum; but there was nothing to stand in the way of a further flow of generosity.

The Standardization of Pipe Threads.

The PRESIDENT said Mr. Helps and himself were deputed to attend a conference in Paris last year initiated by the Société Technique du Gaz; and as Mr. Helps had recently been attending a further meeting on the same subject, he would ask him to report what had been done.

Mr. J. W. HELPS said he had prepared a report for insertion in the "Transactions," but did not propose to read it.* He would simply acknowledge the kindness and courtesy shown by the President and Council of the Société Technique, and add that the Institution were greatly indebted to the British Engineering Standards Committee for allowing their representatives to attend the conference, and to Mr. Leslie Robertson and Mr. Krause for the great assistance they rendered thereat.

The New Officers.

The PRESIDENT announced the result of the election of office-bearers for the current year, as follows:—

President.—Mr. J. W. Helps, of Croydon.

Vice-President (in association with Mr. Alexander Wilson, of Glasgow, elected last year).—Mr. R. G. Shadbolt, of Grantham.

New Members of Council.—Mr. J. Ferguson Bell, Mr. John Bond, Mr. Charles Meiklejohn, and Mr. J. W. Morrison.

Auditors.—Mr. James L. Chapman, and Mr. Samuel Wood, F.C.A. (Messrs. Wood, Drew, and Co.).

Hon. Secretary.—Mr. S. Y. Shoubridge.

The PRESIDENT also announced that all the candidates

* The report appears on p. 885 of to-day's issue.

for membership of the Institution had been duly elected. The following is the list :—

MEMBERS.

Angus, J. C., Lighting Engineer, North-Eastern Railway Company, York.
 Cleasby, P. C., Engineer and Manager, Guildford Gas-Works.
 Cowie, R. W., Engineer and Manager to the Gas Commissioners, Lockerbie.
 Davies, D. H., Engineer and Manager, Gas Department, Nantwich Urban District Council.
 Frizelle, T., Engineer and Manager, Holyrood (Co. Down) Gas-Works.
 Hoggard, A. W., Superintendent, Effingham Street Gas-Works of the Sheffield Gas Company.
 Langford, L. J., Engineer and Manager, Abertillery Gas-Works.
 Lennan, G., Manager, Dungarvan (Co. Waterford) Gas-Works.
 Ramsden, R. S., Assistant-Manager, Burton-on-Trent Gas-Works.
 Talbot, H., Engineer and Manager, Todmorden Gas-Works.
 Westlake, W. N., Manager and Secretary, Exeter Gas Company.

ASSOCIATE MEMBERS.

Blackman, J. W., Engineer and Manager, Masterton (N.Z.) Gas-Works.
 Carpenter, G. W., Engineer's Assistant, South Metropolitan Gas-Works, Rotherhithe.
 Clark, H. N., Assistant-Engineer, West Ham Gas Company.
 Keable, E. F., Assistant Engineer and Manager, Gorleston and Southtown Gas Company.
 King, A. G., Assistant to Mr. W. H. Pearson, jun., Engineer, Consumers' Gas Company, Toronto.
 Vince, E. P., Assistant-Manager, Merthyr Tydfil Gas-Works.
 Warrilow, J., Assistant-Engineer and Manager, British Gas-light Company, Etruria, Stoke-on-Trent.
 Wootten, E. D., Assistant-Manager, Burslem Gas-Works.

ASSOCIATE.

Lessing, Rudolf, Ph.D., F.C.S., Consulting and Analytical Chemist, Southampton House, 317, High Holborn, W.C.

Mr. HELPS, in thanking the members for the honour conferred upon him, assured them that he would do his utmost to see that the prestige of the Institution did not suffer in his hands. Mr. Glover had set him a very difficult task; but he would do his best to follow him, and to secure if possible as successful a year, and an equally successful meeting, as they had just concluded.

Mr. SHADBOLT also thanked the members for his election, and assured them of his desire to worthily fill the post to which he had been elected.

Next Place of Meeting.

Mr. HELPS said he was one of those who felt that the best chance of having a successful meeting was to hold it in London; but there were one or two little points in favour of an alternative. They had been drawn into very close connection with Leeds by the establishment of the Livesey Professorship; and it was the town in which he entered on his own career as a gas engineer, longer ago than he liked to think of. Naturally, therefore, he felt somewhat in favour of the meeting being held there; but he did not wish to press the point, and placed himself entirely in their hands. Whichever was decided upon, either now or later, he should be equally pleased. He might say that he had received a letter from Professor Smithells, saying that the University Council had passed a resolution cordially approving the suggestion that the Institution should be invited to hold their next annual meeting at Leeds; and he expected that a formal invitation would follow, in which the Gas Committee of the Corporation would concur.

Mr. H. KENDRICK (Stretford) moved that the question should be left to the decision of the Council.

Mr. D. H. HELPS seconded the motion, which was at once agreed to unanimously.

Mr. EDWARD ALLEN (Liverpool) thought the members should have an opportunity of expressing their wishes, which no doubt would have great weight with the Council. He believed there was an almost unanimous desire that the next meeting should be held in London.

Mr. SAMUEL GLOVER thought what should weigh with them was the meeting-place the following year. It was generally considered that every alternate meeting at any rate should be in London; and it would be well to bear in mind that, in due course, they might be invited in 1911 to meet in Glasgow. It might be very desirable on some

future occasion to go to Leeds; but, on the whole, he thought next year they should meet in London.

Mr. A. WILSON (Glasgow) having stated that he looked forward to the Institution meeting in Glasgow the following year,

Alderman MILES (Bolton) said if it was in order to pass a resolution for the guidance of the Council, he would move that the next meeting be held in London.

Mr. ALLEN said his proposal was intended to be that in the opinion of the meeting the gathering next year should be in London.

Alderman MILES said he would second this; and it was agreed to.

The PRESIDENT said he thought the Council would understand what was the general feeling on the matter.

Votes of Thanks.

Mr. HELPS proposed a hearty vote of thanks to the President, not only for the way in which he had conducted the meetings, but also for his services to the Institution during the past year. Mr. Glover had always been at his post, and had extended the greatest courtesy and kindness to everyone with whom he was brought in contact. They owed to him a great debt of gratitude, and also to Mrs. Glover for the interest she had taken in the proceedings. They all enjoyed themselves at the reception; and he hoped the President would convey their thanks to Mrs. Glover.

The motion being carried by acclamation,

The PRESIDENT said he had done what he could, and only wished he could have done more. The success which had attended his efforts was largely due to the loyal support he had received from the Vice-Presidents, the Hon. Secretary, and every member of the Council, who had all been anxious to forward the interests of the Institution.

Mr. J. P. LEATHER (Burnley) proposed a vote of thanks to the Directors of the British Gaslight Company and the Norwich Corporation for their kind invitation to Norwich.

This also was carried unanimously.

Mr. THOMAS BERRIDGE (Leamington) moved that the best thanks of the Institution be tendered to the Council of the Institution of Mechanical Engineers for their kindness in granting the use of their rooms for the meeting. Had it not been for their kindness, they would perhaps have had to look about for rooms of their own—probably in memory of Sir George Livesey; but as they had the privilege of using these excellent rooms, they were able to spend the money to better advantage.

The motion was carried unanimously.

Mr. A. F. BROWNE (Vauxhall) moved a vote of thanks to the Scrutineers and to the readers of papers. He said that the President and Council might be heartily congratulated on the excellence of the fare they had had placed before them, which they had greedily consumed; but it would take enormous powers to digest it. The papers had dealt with matters of exceptional interest, and had been of great individual merit, as was shown by the large attendances.

The motion was carried unanimously.

Mr. J. T. JOLLIFFE (Ipswich) moved a vote of thanks to the Hon. Secretary, Mr. Shoubridge.

This was seconded by Alderman MILES, who expressed the hope that Mr. Shoubridge would try to expedite the preparation and distribution of the "Transactions."

The motion having been carried,

Mr. SHOUBRIDGE said his thanks were rather due to the members for placing him in such enviable position. He would see if anything could be done to meet the point mentioned by Alderman Miles. He then proposed a vote of thanks to their indefatigable and hard-working Secretary, Mr. W. T. Dunn. No public institution, he said, could have a better Secretary.

The vote having been carried unanimously,

Mr. DUNN said it was always a pleasure to him to work for the Institution, and all the more so that his efforts were so kindly appreciated.

Honorary Members.

The PRESIDENT said he had now to do what he ought to have done before—viz., nominate as honorary members of the Institution for the coming year the President of the Société Technique de l'Industrie du Gaz en France, and the President of the German Association of Gas and Water Engineers.

Mr. WILSON seconded the nomination, which was carried unanimously.

This concluded the business.

GAS HEATING RESEARCH.

REPORT OF "GAS HEATING RESEARCH" COMMITTEE

Appointed by the Institution of Gas Engineers in
Conjunction with the University of Leeds,

And consisting of Messrs. JOHN BOND, J. H. BREARLEY, and CHARLES WOOD, in co-operation with Professors ARTHUR SMITHELLS (Chairman), WILLIAM A. BONE, and JULIUS B. COHEN, of the University of Leeds, and Mr. E. W. SMITH (Research Chemist).

PREFATORY NOTE.

The object which the Committee have had before them has been to make a scientific investigation of the efficiency of the gas-stove as a heating appliance, and to ascertain the facts in regard to certain hygienic questions that arise in connection with heating by gas. Similar inquiries have frequently been made in the past—some of them of considerable value; but it was hoped that, under the joint auspices of representatives of the coal-gas industry and of the scientific staff of a University, with special resources at their disposal, a more complete investigation might be made, which would carry weight as a statement of facts, and serve as a secure basis for work directed to further improvements upon existing appliances.

The successful prosecution of such an inquiry as the Committee have contemplated, demands a large amount of preliminary work which cannot immediately bear fruit. But the Committee are glad to state that this stage has been passed, and that for some months past they have been able to make steady progress with the actual inquiry. The work was commenced by Dr. Drugman in November, 1907. Under his direction, the experimental room was constructed and was completed in December. The following six months were spent in testing the meters and other apparatus used, and in standardizing materials and methods of analysis and measurement. Thereupon a series of preliminary tests was carried out on "condensing" stoves, chiefly with a view to determining their efficiency in preventing the escape of sulphur products.

At the end of October, 1908, Dr. Drugman resigned his position as chemist in charge, and was succeeded by Mr. E. W. Smith, M.Sc. The Committee desire to acknowledge the valuable work done by Dr. Drugman, who applied himself with unremitting industry and scrupulous care to the somewhat tedious labour of the preparatory work. Since Dr. Drugman's departure, Mr. Smith has carried on the experiments to the great satisfaction of the Committee, and has proved himself to be highly qualified for the work. The results obtained by Mr. Smith, which are recorded in the present report, were obtained between the middle of November, 1908, and the end of March, 1909.

The Committee hope that these results may be considered as sufficiently important to warrant a continuation of the inquiry, so that it may embrace many other questions that demand accurate investigation—such, for example, as the efficiency of different kinds and arrangements of radiating material and burners, and methods for securing ventilation.

(Signed) ARTHUR SMITHELLS, *Chairman*.
WILLIAM A. BONE.
JULIUS B. COHEN.
JOHN BOND.
J. H. BREARLEY.
CHARLES WOOD.

INTRODUCTION.

When coal gas is burned in an enclosed space, the amount of heat* communicated to that space depends only on the chemical composition of the gas and the amount of it that is burned, provided that in the end it is burned completely to carbon dioxide and water. No mechanical contrivance can increase the total output of heat.

If we suppose the gas to be burned in a naked flame, the heat is delivered to the surrounding space in three ways. In the first place, the hot products of combustion stream

upwards, intermingling with the air, warming it and any surfaces with which they come in contact. In the second place, a certain amount of air is warmed by contact with the flame; and this also carries away heat. Heat distributed by hot currents of gases is said to be convected. In the third place, the flame parts with some of its heat by emitting rays through the air in every direction on to the objects in the room. Heat distributed in this way is said to be radiated.

If the utility of an appliance for heating by gas depended solely on the amount of heat that was given out, a simple burner giving a naked flame, whether luminous or atmospheric, would be as effective as any other appliance. But the utility of a gas-heating appliance such as a gas-stove must be considered in regard to a number of practical questions:

1.—If, for example, we desire not to introduce the products of combustion into the space we are heating, we must provide the stove with a flue sufficiently large to carry off these products. The flue may be so arranged, as to its length and the conductivity of its material, that it will drain off most of the heat of the gases passing through; so that if the flue, before opening into the outside air, is wound about inside the space that is being heated, the products of combustion may be got rid of without taking much heat with them.

2.—Again, we may desire to avoid very hot currents of air, which rise at once to the ceiling. And in that case, instead of using a naked flame, we should cause it and its products to heat up metallic surfaces of some considerable extent. These heated surfaces would then cause much cooler and broader and more slowly moving upward currents of air, which would set up a more general circulation in the room.

3.—We might desire to obtain as much heat as possible in the form of radiant energy sensible as heat. In that case we should cause the flame and its products to heat up some material of such a kind and in such a way that it drained a very large quantity of heat from the flame and emitted it again in the form of radiation.

4.—Lastly, it may be supposed that a gas stove is desired not only to heat, but to ventilate, a room. In that case it will have to be so used as to eject air in addition to its own products of combustion.

Other considerations might be named; but these are sufficient to emphasize the chief points that have to be considered in regard to the heating efficiency of gas-stoves. And gas-stoves might be relegated to one or other of three categories according as they heated a room mainly: (1) By direct diffusion of hot products of combustion; (2) by heating surfaces which caused convection currents of warm air; (3) by radiation. Stoves of the first type are to be found in the "reflecting stoves," which are not infrequently used to take the chill off the air of shops. Stoves of the second type include "radiators," "steam radiators," and "condensing" stoves. [The use, or rather the misuse, of the word "radiator" in this connection is based on a similar misuse which has become common in connection with steam or hot-water heating coils. These appliances would be more correctly called "convectors," as their heat is almost entirely delivered by warming the surrounding air, and so causing convection currents.] Stoves of the third type include the normal gas-stove, where atmospheric flames are caused to heat up a refractory fuel to the highest possible temperature. Of course, there are stoves of intermediate type, in which more than one of these methods plays an important part.

There can be no doubt that the form of heating most acceptable to the Englishman in a living room is radiation from a bright fire; and it is in the comparison of the brightness and radiant warmth of coal-fires and gas-fires that gas-fires (apart from questions of cost) are commonly disparaged. There is also a very widespread and deeply-rooted belief that a gas-fire, even if satisfactory as a radiator, is necessarily attended by some hygienic disadvantage.

In taking up the study of gas-heating appliances and endeavouring to gain an accurate estimate of their efficiency, the Committee felt that they might best begin with a study of the radiating efficiency of gas-stoves—including, incidentally, a study of the hygienic conditions. If the radiating efficiency of gas-stoves can be materially improved, and if it can be shown that a gas-stove, when properly constructed and used, has no more deleterious influence than a coal-fire, a great advance will have been made towards the substitu-

* To ensure clearness the word "heat" is used here, although it would be more scientifically accurate to substitute "energy."

tion of gaseous for solid fuel as a means of domestic heating. In the following report will be found details of the measurements of radiation from one of the prevailing types of gas-stove with fire-clay fuel. These measurements, it is believed, have been made with as much accuracy as is at present possible, and give for the first time a tolerably correct absolute measurement of the radiating power of a gas-stove.

OPEN GAS-FIRES.

By E. W. SMITH.

This included the determination of :

- The total energy radiated as heat from the stove.
- The effect on the radiation of changes in the volume of air passing through the room and up the flue.
- The extent of the so-called "drying" of the room air where open gas-fires are used.
- The extent of the vitiation of the room air caused by open gas-fires.
- The amount of heat passing directly up the flue and not available for heating the room.
- The amount of carbon dioxide found (1) in the room and (2) in the flue.
- The amount of heat used in heating the air of the room.
- The volume of air that might be raised from 45° to 60° Fahr. by the heat available in the stove.
- The effect of using a reflector.
- The effect on the heat lost to the room, of changes in the volume of air passing up the flue.

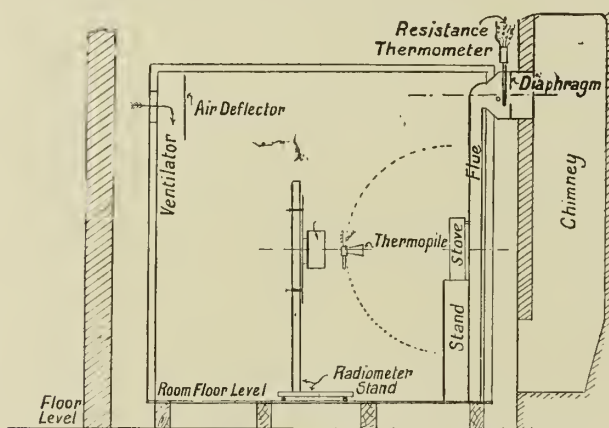


Fig. 1.—Section on Line A B (Fig. 2) of Experimenting Room.

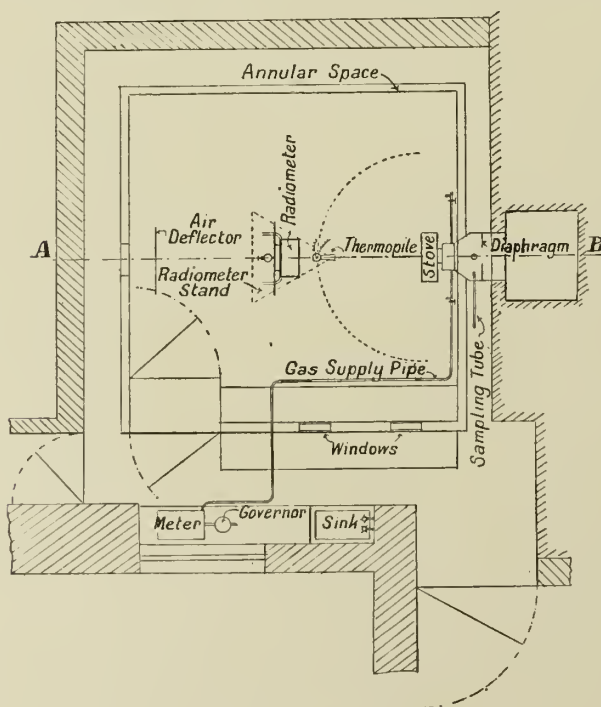


Fig. 2.—Plan of Experimenting Room.

Description of the Experimenting Room.—It was very necessary in connection with this work that the varying conditions to be coped with should be completely under control. For

this purpose, a special chamber was built (see figs. 1 and 2) in one of the rooms of Woodhouse Lodge—a building which is adjacent to the Fuel Department of the University of Leeds. It consisted of a double-walled room built of tongued and grooved boards, the inner and outer walls being about $2\frac{1}{2}$ inches apart. These were made as nearly as possible air-tight by lining the inside walls with calico, coated with asbestos paint, and the outside walls with a thin coating of pitch. The floor, which had to bear the weight of the stoves, &c., consisted of a layer of tongued and grooved boards made air-tight with painted calico. Over these asbestos board was laid, and on the top of this a sheet of asbestos-magnesia cement.

The room was as large as the available space allowed—viz., 9 ft. by 9 ft. by 9 ft., with an internal capacity, after allowing for the various articles in the room, of 710 cubic feet. Only one side was easily accessible, and in this side double doors, connected with an air-tight passage, gave access to the interior without danger of cold air suddenly entering. The rest of this side was fitted with shelves, both inside and outside, on which apparatus could be placed. There were two windows ($14\frac{1}{2}$ inches by 10 inches) immediately above the shelves, so that the apparatus could be watched from outside.

Air was admitted through movable panels, 10 inches square, at the top and back of the room; and the products of combustion were carried away through a square flue placed at the opposite side of the room, near the ceiling. This flue was connected with the chimney of the outer room—an ordinary kitchen chimney. As it was important that this flue should be quite air-tight, the inner lining was made of galvanized sheet iron. So that the combustion products might be drawn away if required, at a uniform rate, a small electric fan was used, and fitted exactly into the outer end of the flue. This could be run at either a high or low speed. This, as well as the electric lights within the room, was controlled by switches from outside.

The gas-supply pipe passed into the room through a panel, and was directly connected to the test-meter, standing on a shelf outside the room. This, in its turn, was connected through a Stott's governor with the house supply meter. The general plan and section of the room can be seen from figs. 1 and 2.

The flue inside the room was made of sheet copper, wrapped with asbestos board in order that there should be as little loss of heat as possible from the flue gases before they passed into the kitchen flue, outside the experimenting room. The flue left the room by means of a hole $8\frac{1}{2}$ inches square, 8 ft. 4 in. from the ground. Its cross section dimensions were 6 inches by 4 inches; and at the point where it left the room its cross-sectional area might be reduced either to 4 inches by 4 inches or to 3 inches by 3 inches. At this point, too, an electrical resistance thermometer was brought into use—this being connected with a Callendar recorder, erected in the main buildings. Arrangements were made that samples of gases might be drawn from the room from immediately above the stove, and from the flue near to the thermometer. This was done by means of aspirators, in which the volume of gas abstracted could be measured.

Method of Estimating the Rate of Air Change in the Room.—The chemical method was adopted for the estimation of the rate of air change in the room as being likely to prove the most accurate for the work in hand. The mode of procedure was as follows:—

1.—A determination was made of the carbon dioxide contents of the outside air in parts per 10,000 (Pettenkofer method, modified).

2.—A sample was taken, extending over the whole time occupied in doing the ventilation experiments (15 to 20 hours), of the gases passing up the flue, and the carbon dioxide contents determined in parts per 10,000.

3.—The gas-rate, in cubic feet per hour, was accurately determined and reduced to 0° C. and 760 m.m. pressure, dry.

4.—A sample of the gas burnt was abstracted from the main before entering the test meter, during the whole experiment. This was exploded with oxygen in a "Bone and Wheeler" gas analysis apparatus, and the amount of carbon dioxide formed from the combustion of a cubic foot of the consumed coal gas estimated.

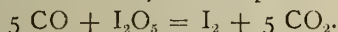
From (4) and (3) was estimated the volume of carbon dioxide (at 0° C. and 760 m.m. dry) passing into the flue per hour. Then if (1) = x ; (2) = y ; (4) = z ; and if the

volume of air passing up the flue per hour equals " v ," then

$$v = \frac{z}{y - x} \times 10,000.$$

Carbon Dioxide Determinations.—Pettenkofer's method was employed with the modifications proposed by Letts and Blake.* These consisted (1) in coating the inside of the sampling vessels with paraffin wax, to prevent the glass being attacked by baryta solution; and (2) carrying out the titration in a vacuum. A further modification consisted in having a soda-lime tube fitted to one of the holes in the corks of the sampling bottles, and also a three-way glass tap. The same was done with the titration flask. By this means, atmospheric carbon dioxide was prevented from entering these vessels should the gases contained contract owing to a fall of temperature in taking them into the laboratory, which remained fairly constant between 56° and 60° Fahr. The results obtained by this method were checked by a gravimetric determination, by drawing a sample over calcium chloride, sulphuric acid, caustic potash, and soda lime. They were not found to differ seriously. The samples of flue gases were always analyzed gravimetrically.

Carbon Monoxide Determination.—The flue gases were also analyzed for carbon monoxide in most experiments, as were also the gases abstracted from immediately over the stove. The method depending on the liberation of iodine from iodine pentoxide by means of carbon monoxide, and the formation of carbon dioxide, was adopted.



The amount of change was estimated colorimetrically by absorbing the iodine in chloroform and comparing the solution with equal volumes of standard solution. This method was open to slight error, as the iodine pentoxide was liable to be reduced by other constituents in the sample than carbon monoxide—as, for example, by formaldehyde, the presence of which in the products of combustion was most probable. The quantities of carbon monoxide found in all cases were so small that, assuming the whole of the change was caused by this gas, the figures are sufficiently convincing to show that during the course of these experiments only negligible quantities were formed, if any at all.

Hygrometric Measurements.—Wet and dry bulb thermometers, previously tested, were placed inside and outside the room, so that the percentage saturation of the inner and outer air might be determined. Glaisher's tables were used. Both hygrometers could be read from outside the room.

Sulphur Determinations.—The Gas Referees apparatus was open to two likely sources of error—firstly, in the incomplete oxidation of the sulphur, and, secondly, by contact of the hot parts with rubber containing sulphur. An apparatus was designed in which all the connections were ground glass joints, and in which the combustion products were led over hydrogen peroxide solution, and cooled by passing through a water-cooled condenser tube. The results were higher than those got by the Gas Referees apparatus.

Temperature Measurements.—All thermometers were on the Centigrade scale, and were constantly checked for accuracy. The flue temperatures were taken continuously by means of an electrical resistance thermometer, and registered on a Callendar recorder placed on the wall in the main building. With proper attention, it worked satisfactorily. The temperatures of the air in the experimenting room were determined by placing thermometers on all the walls in different positions, and hanging from the ceiling in the middle of the room—the bulbs of all being protected from direct radiation from the stove by placing each in the shadow of a piece of asbestos. The temperature of all gases passing through the various meters was taken by fixing thermometers into the meters above their water-levels.

Calorific Values.—These were determined by means of a Boys' calorimeter, the water being weighed instead of measured, and the net values determined by weighing the water condensed over half-an-hour, and checking this by calculating the amount of water produced during combustion from an analysis of the gas. The latter figure was always a little higher than the former; the escaping products of combustion having a slightly higher percentage saturation than the atmosphere.

Coal-Gas Analyses.—These were all done on the "Bone and Wheeler" apparatus, in which all measurements were made at constant volume. Complete analyses for CO_2 , O_2 , unsaturated hydrocarbons, CO , CH_4 , H_2 , and N_2 were accu-

rately made in about eighty minutes. Nitrogen was taken by difference. A typical analysis is as follows:—

CO_2	14 per cent.
O_2	41 "
Unsaturated hydrocarbons	3' 9 "
CO	6' 3 "
H_2	39' 04 "
CH_4	33' 9 "
N_2	16' 27 "

Gas-Rates.—These were estimated by noting the time taken by a cubic foot of gas to pass through the meter; correction being made by reducing the volume to 0° C. and 760 m.m. pressure, dry. The pressure of the gas at the meter was allowed for.

The Meteorological Conditions.—These were obtained from the "Cecil Duncombe" observatory, close to the laboratory. The barometric pressures which were required for each volumetric calculation were got from a barometer in the analytical laboratory.

EXPERIMENTS WITH THE OPEN GAS-FIRE.

The stove used in the tests was of the simplest type and of normal size (see fig. 3).

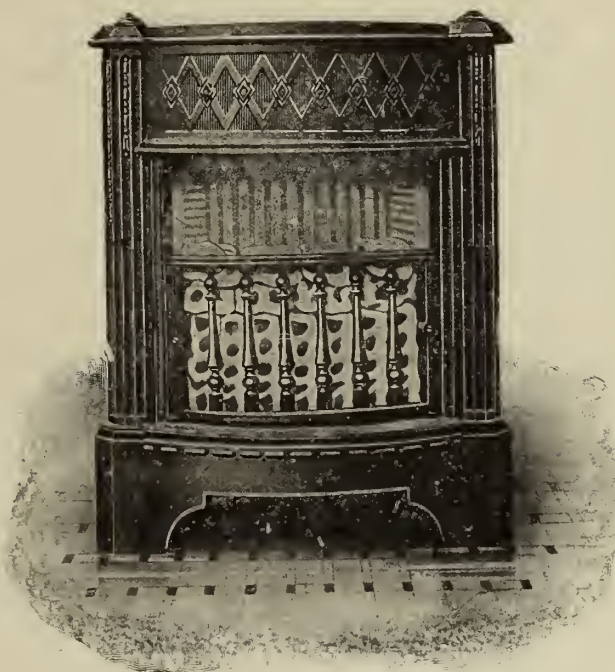


Fig. 3.

It consisted of seven bunsen burners all connected with the same air and gas supplies, which were adjustable (see fig. 4, A and B). Combustion took place within seven pieces of open fire-clay fuel; and the tips of the flames and hot products passed through similar material arranged across the top of the tube-like fuel. The stove had a thick fire-brick back; and the gaseous products passed out by means of a hole ($4\frac{1}{4}$ in. by $1\frac{1}{8}$ in.) into the copper flue already described.

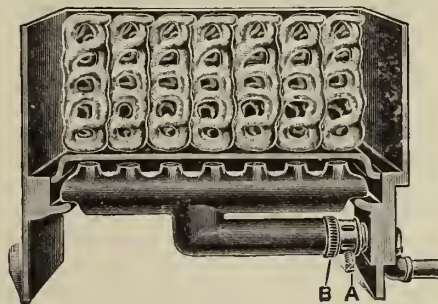


Fig. 4.

The whole was surrounded by a cast-iron frame-work. The fire-clay front measured 9 inches by 9 inches.

The air supply to the burners was so arranged that, after getting a distinct inner cone, it was adjusted until a slightly hazy inner cone was obtained. The flame was of such a size and shape that the outer cone, where combustion was being completed, very slightly impinged on the fire-clay fuel. The space beneath the fuel and round the burners was filled in so that the heat of the fire caused as little

* "Proceedings of the Royal Society, Dublin, 1900," p. 107.

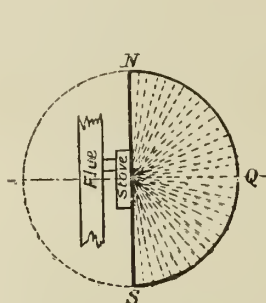


Fig. 5.—Side Elevation of Radiating Stove.

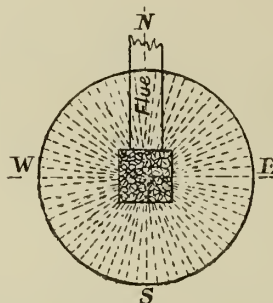


Fig. 6.—Front Elevation of Radiating Stove.

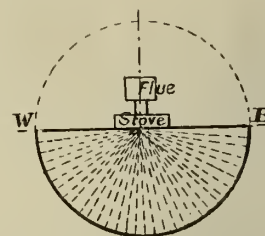


Fig. 7.—Sectional Plan of Radiating Stove.

draught as possible through the fire, with consequent loss of heat. The average gas consumption was 17 cubic feet per hour, and the net calorific value was about 142 calories (571.4 B.Th.U's.).

Estimation of Radiant Energy Sensible as Heat.

The chief work done since November has been the devising a method of estimating quantitatively the percentage of energy radiated as heat from the usual type of open gas-fire (fig. 3). The two main points that presented themselves were: First, to decide on the most suitable, and at the same time a sufficiently accurate means of estimating the rate of reception of radiant energy at any given point; and, second, to so apply this means as to be able to determine quantitatively the total energy radiated from the whole area of the heated surface. Sir John Leslie, a pioneer in research on radiation, used a differential thermometer, consisting of a U tube with a bulb at either end; one bulb only being exposed to radiation. This instrument is not sensitive enough, and, owing to the conditions of the work, would not be at all suitable.

Langley used an instrument which he called the bolometer.* This is very sensitive, portable, and receives radiation in every direction. Its principle is that of an electrical resistance thermometer, and is extremely simple to use. The radio-micrometer invented by D'Arsonval, and subsequently improved by Boys,† is also extremely sensitive, but not so handy as the bolometer. Its principle is that of the single thermo-junction and mirror galvanometer in one instrument.

The thermopile was the instrument eventually adopted, and, with proper precautions, has proved eminently reliable. It was of the Rubens type, and consisted of twenty junctions of iron and constantan wires in series, every alternate junction being shaded, and at the room temperature, and the remaining junctions exposed to the radiation. An electric current is set up flowing from one to the other, proportional to the difference in temperature of the hot and cold junctions. This current was shown on a Paul single-pivot galvanometer in milli-volts. There was also a temperature scale on the galvanometer, which could be brought into use by putting 10 ohms into the circuit by means of a convenient switch. The temperature scale having a much smaller range of deflection, the milli-volt scale was always used. As the temperature of the room affected all the thermo-junctions to the same extent, no increased difference in deflection of the galvanometer was shown by variations in the room temperature. Nevertheless, the galvanometer was always brought to zero after each reading, and any slight differences in its internal resistance allowed for.

When a satisfactory method for registering the comparative radiation intensities at various points was found, additional means had to be adopted for estimating the total radiated energy emitted from the heated surface. It would have been possible to absorb all or most of the radiations; but the method would have been so long and tedious that at the end of the experiment there was every likelihood that most of the conditions of the experiment would have changed. The method adopted was as follows: It was known that energy would be radiated to every point from which the fire was visible. This distribution is shown diagrammatically in figs. 5, 6, and 7, where the radiation is represented as falling on the inner surface of the hemisphere N.Q.S. (fig. 5). If, then, the radiated energy falling on the surface of the hemisphere could be estimated, the problem was solved. A promising instrument for

making this measurement was found in a so-called radiometer designed by Professor R. H. Smith; and with this the experiments were made (fig. 8). This instrument consisted of a surface 12-inches square, composed of flattened copper tubes, connected in series, through which a current of water was caused to flow.

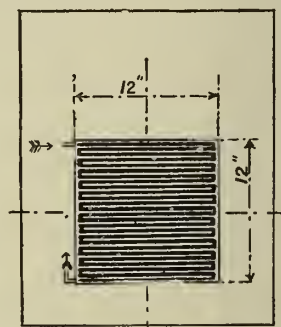


Fig. 8.—Front View of the Radiator.

The tubes were close together, and lampblacked, besides being protected by a lampblacked sheet-iron hood to protect the surface of the tubes from warm convection currents. Water was run through the tubes from a constant level and left the apparatus at a constant level, thus ensuring an even flow. Thermometers were so placed that the temperature of the water could be taken on entering and leaving the tubes. In using the instrument, it was placed facing the source of radiation, so that the radiant energy falling on the 12-inch square surface of tubes might be absorbed, and the water passed through the instrument would be raised in temperature.

By taking the temperature of the water as it entered and left the radiometer, the average rise in temperature was obtained. From the average rise in temperature and the weight of water flowing through in a given time, the heat equivalent in calories of the radiations falling on the radiometer surface per hour was calculated. The size of the hemisphere upon which the radiations fell had to be determined. It depended on the size of the radiometer. This was 12 inches square. The circumference of the hemisphere should be exactly divisible by 12; and the radiometer in one position should be directly opposite the stove. It was decided that the semicircle forming the circumference of the hemisphere should be 108 inches in length, this being

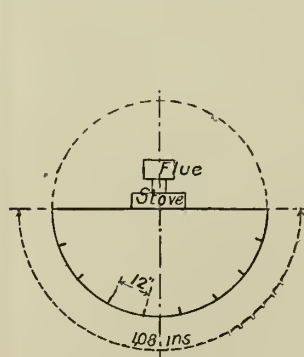


Fig. 9.—The Divided "Equator."

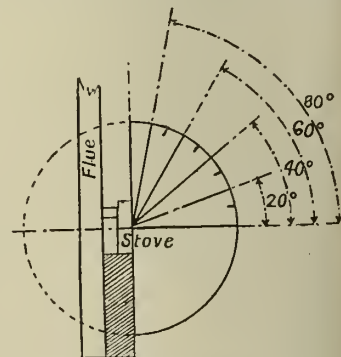


Fig. 10.—Diagram of the Cosine Correction.

divisible by the width of the radiometer, 12 inches. There would then be four divisions on the equatorial rod on either side of the centre division, or nine in all (see fig. 9). If the half circle measured 108 inches, then, by calculation, the radius or distance from the centre of the stove to the radiometer surface, or to the equator, would be 34.4 inches.

* "Nature," Vol. XXV., 1881, p. 14.

† "Philosophical Transactions" 1889 A., p. 158.

TABLE I.

Experiment.	Remarks.	Fan Rate and Size of Stop in Flue.	Gas Rate, Cubic Feet at °C., and 760 m.m. dry.	Calorific Value Net in Calories.	Total Calories per Hour.	Per-centage Lost to the Room, and Passing up the Flue.	Per-centage of Energy Radiated Above the Floor Level.	Per-centage of Energy Radiated.	Per-centage Used in Heating the Air of the Room.	Volume of Air that Might be Heated from 45° F. to 60° F. per Hour at 760 m.m.	Cubic Feet of Air Passing Up the Flue per Hour at 760 m.m.	Temperature Outside the Room, °C.	Temperature Inside the Room, °C.	Tempe- rature of the Flue Gases, °C.	Rise in Temperature in the Room, °C.	Rise in Temperature in the Flue, °C.	Carbon Dioxide, Parts per 10,000.	Carbon Monoxide, Parts per Million.	Baro- meter in m.m. of Mercury.	Percentage Humidity.	Water Vapour Present per Cubic Feet of Air.	Gas Pressure in Inches of Water.				
1	Preliminary experiment.	Fan half on.	17.08	164.9	2816	31.18	24.73	—	8.5	3332	1718	12.1	28.2	87.0	16.1	58.8	5.4	6.2	—	—	—	69	3	5	—	
2	Stove on the floor.	Stop 9 sq. ins.	17.73	132.6	2352	29.47	25.5	—	8.02	2615	1308	8.4	25.0	86.0	16.6	61.0	4.0	4.4	—	—	768	73	2.7	4.5	—	
3	Stove on the floor.	"	17.28	143.9	2486	30.33	27.7	—	7.46	2570	1404	8.0	23.2	85.0	15.2	61.8	4.33	4.20	—	—	765	72	2.5	4.5	—	
4	Stove raised 40 inches from the floor.	"	17.11	150.0	2566	—	—	—	—	—	1318	9.2	25.2	87.0	15.8	60.0	3.3	3.9	—	—	751	86	3.3	4.6	—	
5	Stove raised 40 inches from the floor.	"	16.87	144.6	2440	31.54	—	—	8.62	2915	1432	8.3	25.2	87.0	16.9	61.8	3.28	3.3	—	—	729	73	2.7	4.3	—	
6	Stove raised 40 inches from the floor.	"	17.56	150.3	2638	29.66	—	29.8	8.15	2982	1500	9.5	26.0	86.0	16.5	60.0	6.65	6.85	—	—	747.8	83	3.3	4.8	—	
7	The centre of the foot of the stove was horizon- tally opposite the centre of the radiometer and the equator.	"	17.95	148.8	2672	31.84	20.94	29.27	—	2896	1483	10.6	26.8	87.0	16.2	60.2	4.0	4.9	—	—	763.5	86	3.6	5.2	—	
8	The centre of the foot of the stove was horizon- tally opposite the centre of the radiometer and the equator.	"	16.92	146.6	2482	29.52	24.53	35.24	7.32	2519	1349	8.0	23.5	86.0	15.5	62.5	3.6	3.5	—	—	738.2	81	2.6	4.2	—	
9	The centre of the foot of the stove was horizon- tally opposite the centre of the radiometer and the equator.	"	17.74	148.9	2642	—	21.14	29.66	—	—	—	—	—	—	—	—	—	—	—	—	751.6	79	3.1	4.4	—	
10	The centre of the foot of the stove was horizon- tally opposite the centre of the radiometer and the equator.	"	17.12	142.9	2446	—	22.87	33.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
11	The centre of the foot of the stove was horizon- tally opposite the centre of the radiometer and the equator.	"	17.60	143.16	2527	—	25.3	31.1	—	—	—	—	—	—	—	—	—	—	—	—	754.6	79	48	—	—	
12	Stove 40 ins. from the floor.	"	17.60	143.16	2527	—	13.5	29.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
13	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	Fan full on. Stop 9 sq. ins.	17.62	137.7	2432	45.13	28.4	35.3	11.48	3871	2100	9.7	25.0	85.0	15.3	60.0	3.55	3.62	—	—	754.5	82	47	3.4	4.3	—
14	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	"	17.90	147.5	2640	37.8	25.4	31.0	9.16	3351	1760	7.9	23.7	89.0	15.8	65.3	3.54	3.70	—	—	743	78	2.7	4.1	—	
15	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	Fan off. Stop 9 sq. ins.	17.25	153.7	2701	15.52	—	—	3.07	1152	483	10.3	30.1	130.0	19.8	99.9	4.4	6.2	—	—	762.8	70	2.7	4.8	—	
16	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	"	18.10	142.47	2578	21.42	21.96	27.37	3.55	1268	494	8.5	29.8	132.0	21.3	102.2	3.2	6.0	—	—	769	69	2.6	5.1	—	
17	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	Fan off. Stop 16 sq. ins.	17.34	141.7	2457	18.77	24.87	30.6	4.08	1389	538.6	8.1	29.5	128.0	21.4	98.5	3.3	5.7	—	—	769	67	2.5	4.7	—	
18	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	"	17.48	146.24	2557	20.05	—	—	4.03	1430	593.6	5.6	25.6	125.0	20.0	99.4	3.74	6.0	—	—	745.8	75	2.3	4.5	—	
19	The centre of the stove is horizontally opposite the centre of the radiometer and the equator.	"	17.23	140.1	2444	—	27.6	34.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
20	Without reflector	"	17.69	141.86	2509	—	25.4	31.38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
21	With reflector	"	17.69	141.86	2509	—	28.6	31.38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
22	Large condensing stove . .	"	13.05	142.9	1865	—	20.07	25.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
23	Small condensing stove . .	—	11.19	141.1	1579	—	17.84	22.37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

When the points immediately above and below the stove (which to carry the analogy with the earth a little further, may be considered as the North and South poles) were joined by ten meridians passing through each of the points marked off on the iron rod or equator, it was found that these lines converged at the North and South poles at an angle of 20° to one another. Parallels of latitude were then drawn 12 inches apart, starting from the poles. The surface of the hemisphere was then divided somewhat as follows, with each parallel 20° above or below its neighbour (see fig. 11): In the centre there is a 12-inch square, and there are both to the right and left of this square four equal squares in the same plane, making nine in all. Now the division N, A, C, S, D, B is exactly the same shape and area as each of the divisions to its right and left, and the parts of these divisions between the same parallels are equal; so that, for example, E, F, G, H, K, L, M, N, P, are equal to one another. But the areas between the same adjoining meridians decrease as they leave the equator. It is found that these areas decrease

the further they are from the equator in proportion to the cosine of the angle that the line joining the centre of the area to the centre of the stove makes with the line joining the centre of the stove and the equator (see fig. 10).
So that the areas between 10° S and 10° N of the equator will be to the areas between 10° S and 30° S or 10° N and 30° N as 1 is to cosine of 20° = 0.94.
Also the areas between 10° S and 10° N will be to those between 30° S and 50° S or 30° N and 50° N as 1 is to cosine 40° = 0.766.
Also the areas between 10° S and 10° N will be to those between 50° S and 70° S or 50° N and 70° N as 1 is to cosine 60° = 0.5.
Also areas between 10° S and 10° N will be to those between 70° S and 90° S or 70° N and 90° N as 1 is to cosine 80° = 0.174.
There are now 81 areas, each nine of which bears a relation to the remaining areas as 1 : 0.94 : 0.766 : 0.5 : 0.174

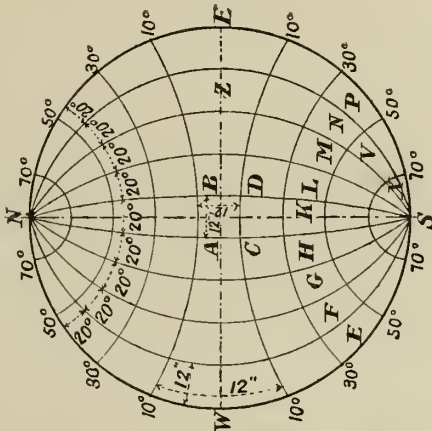


Fig. 11.—The Hemisphere Surface, in Front of the Stove, Divided into 81 Areas.

TABLE II.

Number of Experiment.	Conditions Under Which the Experiment was Run.	Meteorological Conditions.	Barometer in Millimetres of Mercury.	Hygrometer Inside Room.		Hygrometer Outside Room.		Dewpoint.		Percentage Saturation or Degrees of Humidity		Vapour in a Cubic Foot of Air in Grains.	
				Wet °F.	Dry °F.	Wet °F.	Dry °F.	°F.	°F.	In.	Out.	In.	Out.
1	Stove on floor, A 9	S.W. $\frac{1}{10}$; blue, Cirrus, squally, rain	..	67·64	82·7	47·9	52·2	57·6	41·9	43	69	5	3
2	" " " " " " " " " " " "	W. Dead calm, very wet fog . . .	768	63·0	76·1	43·4	47·6	53·7	38·7	46	73	4·5	2·7
3	" " " " " " " " " " " "	N.W. Dead calm, very foggy . . .	765	63·1	76·8	42·5	45·9	53·5	36·5	46	72	4·5	2·5
4	" " " " " " " " " " " "	S.W. $\frac{1}{10}$; blue, variable sky . . .	751	64·0	77·0	46·0	48·6	54·9	43·3	47	86	4·6	3·3
5	" " " " " " " " " " " "	W.N.W. $\frac{1}{10}$; blue, Cirrus, bright	729	63·9	77·3	43·2	47·0	53·1	38·9	44	73	4·3	2·7
6	Stove, ft. ins. from floor, A 9 . .	S.E. Very foggy	747·8	64·0	76·8	46·4	49·1	55·6	43·5	49	83	4·8	3·3
7	" " " " " " " " " " " "	N.E. Foggy, dull	763·5	67·0	80·3	49·5	51·8	57·9	46·3	47	86	5·2	3·6
8	" " " " " " " " " " " "	W.S.W. 10-30 miles per hour. $\frac{1}{10}$; blue, snow	738·2	61·2	73·4	40·5	43·2	52·3	37·3	48	81	4·2	2·6
10	" " " " " " " " " " " "	W. 0-37. $\frac{1}{10}$; overcast, Nimbus, variable, squalls	754·6	62·0	74·1	46·2	49·6	53·2	42·7	48	79	4·4	3·1
13	" " " " " " " " " " " "	W. Calm. $\frac{1}{10}$; overcast, rain, sleet	743	60·5	73·4	42·6	45·9	51·0	38·9	47	78	4·1	2·7
14	" " " " " " " " " " " "	E. Calm. $\frac{1}{10}$; fog, hoar frost, bright later	762·8	68·7	89·0	43·4	48·02	56·1	38·3	33	70	4·8	2·7
15	" " " " " " " " " " " "	E. Calm. $\frac{1}{10}$; overcast, bright later	769	68·9	85·8	42·8	48·0	57·8	37·1	39	67	5·1	2·6
16	" " " " " " " " " " " "	N.N.W. 2-19. $\frac{1}{10}$; overcast, snow	769	67·7	86·36	41·9	47·0	55·6	36·2	35	67	4·7	2·5
17	" " " " " " " " " " " "	W.N.W. Calm. $\frac{1}{10}$; bright . . .	745·8	63·5	77·4	38·3	41·9	53·8	34	46	75	4·5	2·3

corresponding to the cosine of the angles of 0°: 20°: 40°: 60°: 80°.

If this be set out in the form of a table, it is as follows:—

TABLE III.

West.					☉	East.				Relation of Areas.	— ↑ ° North. ← Equator. ° South. ↓
80°	60°	40°	20°	20°		40°	60°	80°	E.		
80									0° 174		
60									0° 5		
40									0° 766		
20									0° 94		
0									1° 00		
20									0° 94		
40									0° 766		
60									0° 5		
80									0° 174		

Thermopile readings were taken at the centre of each of the areas. Then the amount of radiant energy falling on the areas was proportional to the thermopile readings, whether in milli-volts or degrees Centigrade, and to the size of the areas. The thermopile readings having been taken, all that was necessary was to multiply each reading by its proportionate factor, as in column E (Table III.), and the correct relative values of the radiant energy falling on all the areas constituting the hemisphere were determined. Now, by means of Smith's radiometer, the real calorific values of the radiant energy falling on the centre area on the equator were determined, and knowing this, the remaining values were calculated and totalled, giving the total radiated energy received on the surface of the hemisphere.

The device used for moving the thermopile accurately to the centre of each division consists of two semicircular iron rods. One, the equator, is fixed; the other is fastened at each end by hinges to the north and south poles, and its centre point describes a semicircle about the other—being able to move east and west of the "Greenwich" meridian. The thermopile is fixed on this vertical rod at various points, 20°, 40°, 60°, and 80° above and below the horizontal rod, readings being taken to the right and to the left of the centre readings.

Table IV. is a typical example of a radiation experiment in which the whole of the thermopile readings have been filled in. The figures in column "A" show the height in degrees above and below the equator of the readings in the same horizontal lines. The figures in the same horizontal line with "A" are the thermopile readings east and west and north and south of the centre meridian and the equator respectively. Column K contains the totals of the thermopile readings lying between the same parallels. Column L contains the corrections for decrease in area of the divisions, and column M contains the corrected totals. If these totals are added together and the sum divided by the centre reading, at which point a radiometer determination had been made in calories, then a figure is obtained which shows the number of times that the calorific value of the (12-inch)² centre reading is found over the whole hemisphere.

The energy radiated on to the centre square, as determined by the radiometer = 27·35 calories.

Then the total energy radiated as heat = 27·35 × 25·8 = 705·7 calories.

TABLE IV.—Thermopile Readings.

A	To Left.				0°	To Right.				Total of Un-corrected Readings. K.	Cosine Correction. L.	Corrected Totals. M.
	80°	60°	40°	20°		20°	40°	60°	80°			
80°	0·4	0·5	0·6	0·8	1·0	0·9	0·8	0·6	0·5	6·1	0·174	1·06
60°	0·6	1·5	2·6	3·2	3·4	3·3	2·8	1·7	0·7	19·8	0·5	9·9
40°	0·8	2·4	4·6	5·4	5·7	5·6	4·8	2·6	0·9	32·8	0·766	25·12
20°	1·3	3·6	5·8	6·9	7·2	6·9	5·8	3·6	1·3	42·4	0·94	39·85
0°	1·3	1·2	6·6	7·2	8·0	7·2	6·6	4·2	1·3	46·6	1·0	46·6
20°	1·3	3·9	6·6	7·3	7·6	7·3	6·6	3·9	1·3	45·8	0·94	43·05
40°	1·2	3·1	5·0	6·0	6·2	6·0	5·0	3·1	1·2	36·8	0·766	28·18
60°	0·8	1·9	3·0	3·5	3·6	3·5	3·0	1·9	0·8	22·0	0·5	11·0
80°	0·6	0·8	1·2	1·6	1·6	1·6	1·2	0·8	0·6	10·0	0·174	1·74
Total readings = 206·5											Total . 206·5	

Centre reading = 8·0

Factor for radiometer value = $\frac{206·5}{8·0} = 25·8$

If the gas-rate is known, and also the net calorific value of the gas, the percentage energy radiated as heat of the total heat of the fire may be determined.

Gas-rate = 18·1 cubic feet per hour.

Net calorific value of the gas = 142·47 calories.

∴ The total calories produced per hour

= 18·1 × 142·47 = 2578.

∴ Percentage of energy radiated as heat

= $\frac{705·7}{2578} = 27·37$ per cent.

Radiation Determinations.

The first few experiments were preliminary, and were done for the purpose of finding the best conditions under which the determinations should be made, and the precautions that must be taken that reliable results may be obtained. Considerable difficulty was caused by the fact that the coal gas from the town's supply would vary in its calorific value by 3 per cent. during the course of an experiment. Should a change take place during a radiometer determination, this might cause a serious error. If the calorific value rose, then the figures for the percentage energy radiated would be high. This is the probable explanation that is offered for the slight discrepancies that occur between figures obtained from experiments performed under other-wise similar conditions.

The first three experiments had for their object the determination of the percentage energy radiated above the floor level, no account being taken of that radiated to the floor. These had an average of 26 per cent. (Column G, Table I.). Subsequently, it was thought that greater accuracy would be obtained if the stove were raised some distance from the floor, in order that the heated floor should not affect the radiometer. This, and another change which will be indicated later, made a difference in the energy radiated of about 4 per cent., which would bring the above figure (26) down to about 22. This agrees with the mean of later determinations (Experiments 6 to 11). The fan in the flue, used in the earlier experiments (Nos. 1 to 14) for the purpose of maintaining a constant draught, was at half speed. The exit from the flue was 9 square inches, and the volume of air passing up the flue averaged 1500 cubic feet per hour.

After the stove had been raised (40 inches from the floor), the total energy radiated from the stove was determined, and the mean of Experiments Nos. 6 to 11 was found to be 31 per cent. of the total heat generated in the stove.

From general observations of the thermopile readings obtained to the end of Experiment 11, it appeared as if more energy were radiated above the stove than below it. It was thought that this must be wrong, as by inspection the under-surface of the fuel appeared hotter than the top. For this reason there was every justification for raising the equatorial line and the radiometer so that their centres were in a horizontal line with the centre of the stove. Although this, obviously, would make very little difference to the total energy found as radiated, it would considerably alter that found as being radiated above the floor-level. This can be seen to be the case by comparing the figures obtained in experiments Nos. 11 and 12. In all probability the discrepancy of 1.8 per cent. in Column G is due to changes in calorific value of the gas during the experiments, as they were done under the same conditions in all other respects, taking place concurrently. In Experiments Nos. 13 and 14, the effect on the radiation of increased ventilation up the flue caused by putting the fan at full speed, was tried. About 1900 cubic feet of air passed through the top of the stove per hour; but no appreciable difference in the amount of energy radiated occurred. The calorific value in Experiment No. 13 is abnormally low, and could only be temporary. This will account for the slightly higher figure in Columns G and H.

In Experiments Nos. 15 to 20, the fan was turned off completely, and the size of the stop slightly varied. Ventilation was reduced to about 500 cubic feet per hour, but no difference of note in radiation was brought about by decreasing the draught up the flue. From this it is concluded that radiation is not influenced by changes of draught up the flue. This is because the volume of air pressing up the flue did not come into contact with the radiating surface, but passed in at the top of the stove. It is reasonable to conclude then that, under the conditions of these experiments, the amount of energy radiated from the stove lay between 30 and 33 per cent. of the total energy generated by the stove. Of this, about 25 per cent. was radiated above the floor level. In Experiment No. 21, a reflector was placed at the foot of the stove, and, as will be seen by reference to Column G, the amount of energy radiated above the floor-level was increased to 28.6 per cent.

It is interesting and extremely suggestive to note what happened during the process of combustion. The gas mixed with air left the bunsens, and was lighted. At first the flame was comparatively short, and heated the inner surface of the fuel. As this became hotter, the flame lengthened until it reached the top of the fuel, the edge of the outer cone of the flame playing on the inner surface of the fuel. The fire-clay began to radiate in all directions. The radiations from the back of the fuel were sent out into the room, except those that were intercepted by the front of the fuel. These were not altogether lost to the room, but were re-radiated to the back surface of the stove, raising its temperature and consequently its radiating power. The bulkier parts of the front of the fuel did, however, affect the radiations sent into the room, as shown by thermopile readings taken over the whole surface of the stove.

These parts are generally found on the left-hand side of each piece of fuel (fig. 4); and it is worthy of note that in all experiments the readings at 20° and 40° to the left of the stove were a little lower than those 20° and 40° to the right (see Table IV.). This would seem to indicate that either the front of the fuel should be much thinner, in order that it might attain a higher temperature and therefore emit more radiations, or that it should be made more open and the back of the fuel more compact, so that more direct radiations would be sent into the room. The temperature of the products of combustion, on leaving the stove, varied with the volume of air passing through the stove-flue. Should the house-flue be closed except for the stove-pipe, the suction on the stove-flue will be very great, and the flue loss of heat correspondingly high. Should, however, the house-flue be open and the stove-flue about 4 feet in length, with its entrance restricted, there will be a smaller volume of air passing through the stove-flue, but an increased ventilation up the house-flue.

Experimenters have often tried the effect of preheating the air that is used in the combustion of the gas; but so far as is known, no one has seriously tried the effect of also pre-heating the gas before mixing with the air. There is no

reason why it should not enter the bunsens at the temperature of the escaping products of combustion (90° to 100° C.). A certain proportion of the heat will always be required for the purpose of carrying away the waste gases; but 3000 B.Th.U. per hour is excessive. There is ample scope here for further experimental work.

Determinations were made of the amount of heat passing directly up the flue and lost to the room. It will be seen by referring to Columns B, F, and K that this was proportional to the volume of air passing up the flue.

B.	F.	K.
Fan off	19 per cent.	500 cubic feet of air
" half on.	30 " "	1500 " " " "
" full on.	42 " "	1900 " " " "

About 40 per cent. of the heat generated by this type of stove was heat of convection and conduction—viz., that neither radiated nor passing up the flue. This, as well as the radiated energy, was available for heating the room. The energy radiated into the room struck the walls and furniture in the room, and was converted into molecular energy. The air was warmed by contact with the warm walls, &c., and by passing over the stove. The air of the room was heated very little by the radiations passing through it, but very much by its passing over the objects in the room which had been heated by radiated energy. In this way, radiant energy became convected heat. This quantity increased with the volume of air passing through the room. It can be seen from Table I., Column I, that the percentage of heat used in warming the air of the room increased with the volume of air passing through the room.

B.	K.	I.
Fan full on	2100 cubic feet.	11.48 per cent.
" " " " " " " " " "	1760 " "	9.16 " "
" half " " " " " " " "	1500 " "	8.15 " "
" off	538.6 " "	4.08 " "

The temperature of the air passing through the room rose as the volume of air decreased (Columns K and O). The volume and temperature being known (Columns K and O), a simple calculation gives the volume of air that might be heated from 45° to 60° Fahr. (Column J.)

Vitiation of the Atmosphere by Means of Carbon Dioxide from the Stove.—Whenever the volume of air passing up the flue fell below about 1000 cubic feet per hour, the amount of carbon dioxide escaping into the room increased considerably, whereas above 1300 cubic feet the escape was only very slight indeed (Experiments Nos. 1 to 14, Columns Q and R). In no case, even in the small room used, and with the abnormally low ventilation as existed in Experiments Nos. 15 to 18, was the amount of carbon dioxide greater than 6.2 parts per 10,000. Carbon monoxide was very carefully looked for. Blank tests were made with the outer air, and slight discolorations of the chloroform occurred. In no case did the room air show a deeper colour than the blank, and only when ventilation up the flue had been very much restricted, as in Experiments Nos. 15 to 18, was any found in the flue gases (see Columns S and T).

As the ventilation experiments were always run over night, and lasted from 15 to 20 hours, it was ensured that conditions had become constant. During the whole time samples of (1) the room gases, (2) the flue gases, and (3) the coal gas burnt, were being collected for analysis. The room was never entered during the experiment; and all temperature and hygrometer readings were taken from outside. At the end of the experiments the manipulator entered the room by means of the double door, letting in as little cold air as possible. In this way the "smell test" could be determined. Only in Experiments Nos. 15 to 18 was the smell and heaviness of the room air unpleasant. This might be due to (1) the percentage humidity being so low (Column W), (2) to the high temperature, (3) to the presence of carbon dioxide.

On referring to Columns V to Y in Table I., it will be seen the percentage humidity of the room decreased with the rise in temperature (Experiments Nos. 15 to 17), though the percentage increase in the weight of water vapour present per cubic foot of air was higher. This was to be expected. It was stated in the report of the Smoke Abatement Society's research (1906) that a humidity of 58 to 72 per cent. at 15° C. is agreeable. It will be seen that the average room temperature in all these experiments was

abnormally high, being 25° C. At 15° C., the percentage humidity would increase to within this agreeable limit. If the radiating efficiency of the stove were increased, the amount of convected and conducted heat would be less, and although less heat would go to raising the temperature of the air of the room, more would go directly to warming the walls and objects about the room. This would mean that the "drying" effect would not be so great.

The radiating efficiency of the so-called gas radiators, with open fires, was determined (see Experiments Nos. 22 and 23). In the case of the large type of condensing stove (22), it will be seen that they radiate about 25 per cent. of their heat, and with the smaller type 22 per cent. This could be increased by doing away with the ironwork in front of the radiating surface.

Summarizing, it has been found that :—

- 1.—The total radiation from an open gas-fire is about 32 per cent. ; and this is unaffected by the amount of ventilation through the room.
- 2.—No carbon monoxide escapes under ordinary conditions into the room, and very little is ever found in the flue.
- 3.—About 30 per cent. of the heat generated in the stove passes directly into the flue. This figure varies with the volume of air passing through the stove flue.
- 4.—There is no necessity for products of combustion to enter the room and cause discomfort.
- 5.—Reflectors may be usefully employed to produce a sensible increase of radiation into the region where it is most wanted.

Discussion.

The PRESIDENT said the report had been very well summarized by Mr. Smith ; and they now had a grip of what the trade were doing. It was most important that this work should be standardized, so that makers should know what to aim at in devising a gas-stove. One thing he might take exception to was in respect to the effect of ventilation on the radiating power of the fuel. It seemed to him that if one had an excessive pull on the chimney, had the fire closed in, and the flue provided was too large for the opening, the amount of air drawn in through the fire would seriously affect the radiating power of the fuel. The heat would go up the chimney instead of being converted into radiant heat. The conditions constantly differed ; they might be quite different in two houses. The amount of pull on the chimney to which the fire was attached considerably affected its efficiency ; so that makers had to pay attention to the size of the flue-opening they provided. It was very important that 52 per cent. of radiation should be attained, and the loss of heat going up the chimney from such an expensive fuel as gas should be reduced as much as possible. But, at the same time, they did not want the products of combustion in the room. Mr. Smith admitted that in introducing this fire under nearly perfect conditions there was emitted a small quantity of carbon dioxide. This ought not to be there. If the fire were provided with sufficient canopy, and the flue opening was sufficient, the products of combustion ought to be entirely removed. If they had carbon dioxide, the combustion was not going on under proper conditions, and they were almost certain to get carbon monoxide also ; whereas they ought to be able to assure consumers that such things would not happen. There was no doubt that stove-makers

had all their work to do to meet the requirements of the public ; but the Research Committee were doing much to help them.

Mr. JOHN BOND (Southport) said they were much indebted to Professor Smithells, the Chairman of the Research Committee, Mr. Smith, the Research Chemist, and the other members of the University of Leeds staff for the great amount of valuable information which had been compiled in so short a period. The preliminary work, which naturally took up a lot of time, had been got over, and a good foundation laid for future research. The gas-fire of the ordinary radiating type used for domestic purposes had a keen competitor in coal, although, as the President had pointed out in his address, there were grave disadvantages attaching to the use of bituminous coal as a fuel for heating purposes. He (the speaker) had made a large number of tests, and had shown in the results the cost of radiant energy from different radiating sources. These tests were made by means of the Rubens thermopile and an ordinary delicate galvanometer having a suspended coil and mirror ; and the records were photographed during the tests. From these photographs, he was able to produce a number of slides, which he would be pleased to have thrown on the screen. [These will be found reproduced on p. 829.] No. 1 diagram showed the radiating curve and the average radiation of a coal-fire, where the coal was placed in the grate at the rate of 10 to 12 lbs. every three hours. No. 2 gave the radiation of a coal-fire, when the coal was placed in the grate at the rate of 4 lbs. each hour ; and also the average radiation. It would be noticed that this diagram illustrated how the radiation died down after no further addition of coal at the eighth hour. In No. 3, the total quantity of coke used amounted to 32 lbs. ; and this was placed on the fire at the different rates shown at the top of the diagram. The average radiation of the anthracite fire, as shown on diagram No. 4, was very low. This was due chiefly to the fire having a closed mica front ; but, of course, the principal heating source of an anthracite fire was due to convected heat. On diagram No. 5, the curve BB showed how evenly the radiant energy was given from a gas-fire ; and, had the pressure not varied after 5½ hours, the curve would have been still more regular. Curve CC gave the pressure ; and curve AA showed the calorific value of the gas, which was taken from a photographic record given by a Boys calorimeter fitted with thermocouples. The radiation from the electric radiator was shown on diagram No. 1, line BB. The amount of radiation, as would be seen, was low ; and taking the cost of electricity at the rate of 2d. per unit, or lower, the gas industry had not much to fear from this competitor. It must be distinctly understood that heat of convection had not been considered ; and figures regarding cost could not be taken as referring to the total efficiency in comparing the gas-fire with other means of heating. It would be noticed in a table which he would hand in later [and which we reproduce below] that, for a twelve-hours run, whereas the radiant energy from coal (at, say, 21s. per ton) cost 3·46d. to 3·49d., the radiant energy from a gas-fire, taking gas at 2s. 6d. per 1000 cubic feet, cost 15·34d. No labour had been considered in the taking out of these costs for a twelve-hours run ; but it was evident that the labour could make material difference in comparisons for short periods, as it would be necessary in the case of a coal, coke, or anthracite fire to add all the

TABLE Showing the Radiant Energy from Various Radiating Sources.

Radiating Source.	Calo:ific Value.	Ash in Material.	Moisture in Material.	Total Quantity Used.	Average Radiation at a Distance of 8 Feet from the Source. Millivolts.	Quantity to Produce 0·5 Millivolt Radiation at 8 Feet from the Source during Twelve Hours.	Rate.	Cost for Twelve Hours to Obtain an Average Radiation of 0·5 Millivolt at 8 Feet from the Source.
1.—Coal (consumed in ordinary fire)	14,200 B.Th.U. per lb.	2·13	1·88	44 lbs. in 12 hrs.	0·714	30·80 lbs.	21s. per ton	3·46d. (a)
2.—Coal (consumed in ordinary fire)	14,200 B.Th.U. per lb.	2·13	1·88	32 lbs. in 8 hrs.	0·773	31·05 lbs.	21s. „	3·49d. (b)
3.—Coke (consumed in ordinary fire)	13,200 B.Th.U. per lb.	6·15	5·43	32 lbs. in 12 hrs.	0·555	28·80 lbs.	12s. 8d. „	1·95d. (c)
4.—Anthracite (consumed in anthracite fire)	13,800 B.Th.U. per lb.	3 12	2·16	20 lbs. in 10 hrs.	0·154	77·90 lbs.	40s. „	16·69d. (d)
5.—Gas (consumed in "Canopy" gas-fire)	578 B.Th.U. gross	..	..	243 cub. ft. in 10 hrs.	0·285	511·50 cub. ft.	{ 2s. 6d. per 1000 c. ft.	15·34d. (e)
6.—Electricity (used in electric radiator) . . . . .	..	..	..	8·13 units in 12 hrs.	0·067	60·70 units	2d. per unit.	121·4d.

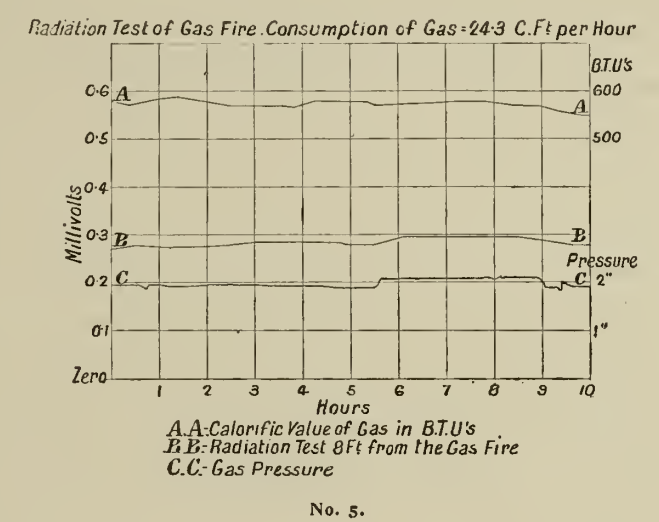
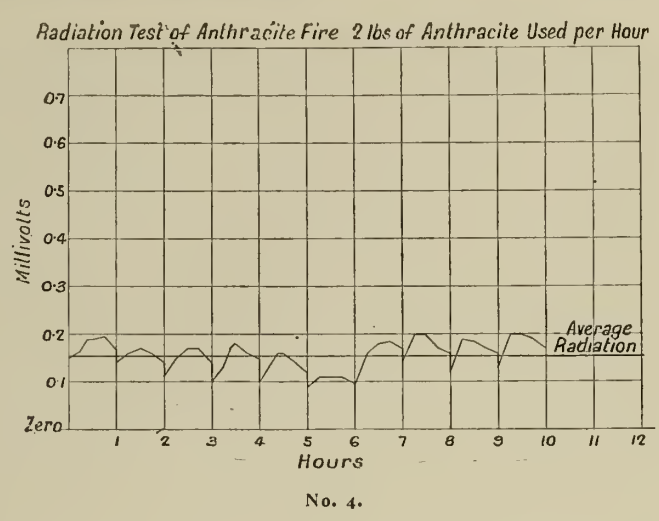
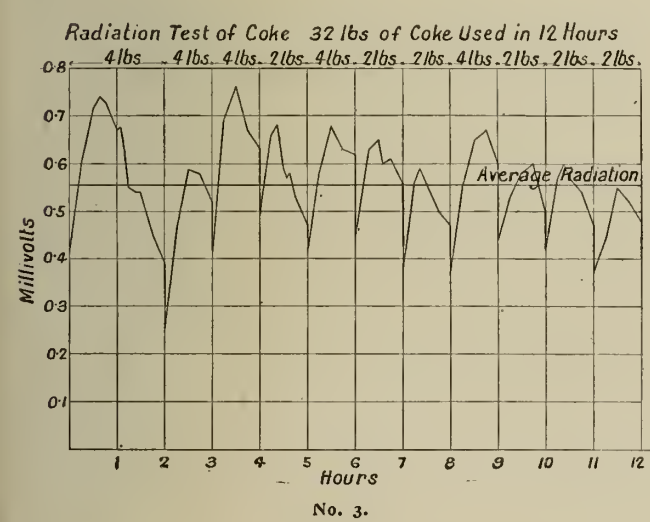
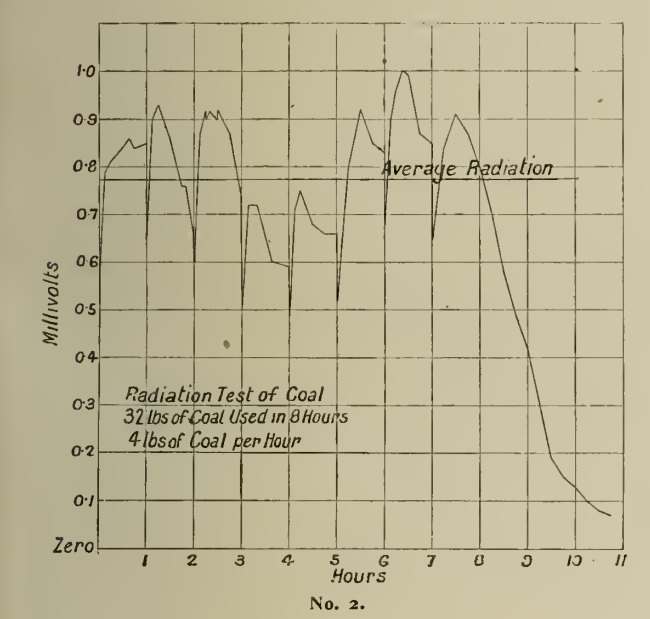
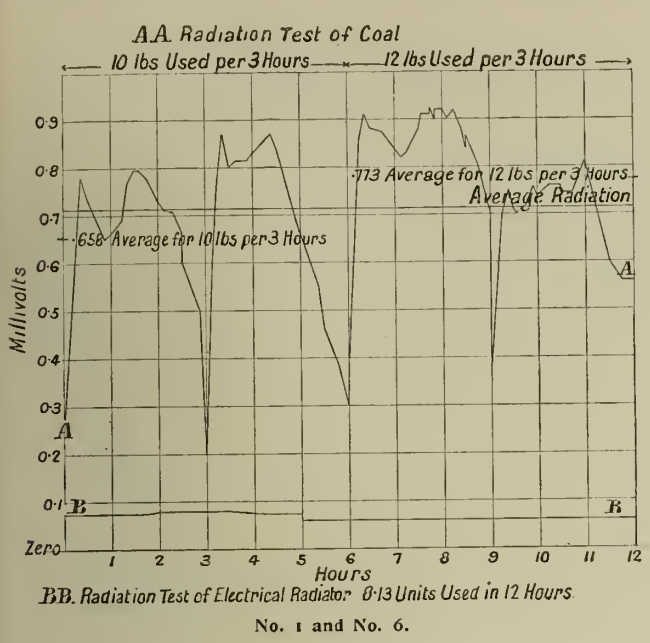
Remarks.—(a) 10 and 12 lbs. charged every three hours,

(b) 4 lbs. charged every hour.

(c) 2 to 4 lbs. charged every hour.

(d) 2 lbs. charged every hour.

(e) Gas corrected to 60° F. + 30·0" pressure.



inconveniences of building-up and lighting and removal of the ashes and dust. In conclusion, he wished to emphasize the necessity of carrying on the gas-heating research so that all points in connection with gas heating could be worked out on sound scientific lines.

The PRESIDENT said they were much obliged to Mr. Bond for his addition to the paper. He thought they might now hear something from a manufacturer.

Mr. H. J. YATES (of John Wright and Eagle Range Company, Limited) said he greatly appreciated the opportunity afforded him of taking part in the discussion. It seemed to him that if the experiment-room had been somewhat larger, it might have helped the tests very much. He felt great difficulty, as a manufacturer, in speaking on a subject like

this, because one was compelled to keep to himself a great deal of what he did. However well disposed he might be to his competitors, he had to make his living, and he could not give away all his information. Engineers were differently placed. If one discovered anything, he could give it away without fear of doing damage to his company. Radiation was undoubtedly the right form of heating for a living-room; and this opinion had been confirmed by Mr. Smith's paper. With convection, they had a drying atmosphere, but with radiation a fairly humid one. While on this subject, he should like to ask Mr. Smith, with regard to Table I., showing the difference between the outside and the inside percentages of humidity, if he was right in assuming that the difference was largely due to the difference of pressure. Taking the weight of water vapour present per cubic foot of air, the apparent difference in the percentage inside and outside led to the supposition that water had been introduced inside.

Mr. SMITH said that was so. The radiator necessitated having water in the room; and the higher the temperature of the air in the room, the greater was the amount of water vapour added to the atmosphere.

Mr. YATES said he thought the tests carried out by Mr. Smith taught a great deal; but he did not agree with him that it was advisable to get the radiation high up. They wanted to get the heat on the floor, because heat would naturally rise. Dealing with the question of the flue and the waste heat, if they increased the radiation, as they could do considerably with a flue when properly constructed, there would be no need to restrict it at all. They could send a large volume of air over the fire without interfering with the radiation. This was a matter which was not generally appreciated by stove-makers, who had an idea that if they carried a large amount of air up the flue they were cooling down the fire. In many cases this was so; but if the stove-makers constructed their stoves properly, they might carry a large volume of air over the fire without interfering with the heating capacity, and thus have a pure atmosphere in the room with no possibility of carbon monoxide escaping. In this way, the fire-place could always be entirely covered up; and they could get their ventilation right over the top of the refractory fuel. If they had a bad chimney, they

could not make a good one of it. Whether it was a gas or a coal fire, they would have trouble. It was not a remedy for a smoky chimney, as builders sometimes said, to put in a gas-fire. In the course of the paper, the author said that, from general observations of the thermopile readings, it appeared as if more energy was radiated above the stove than below it; and Table IV. was quoted as typical. This showed that the thermopile readings were all higher above the grate than below it. Mr. Smith spoke of there being no escape of carbonic oxide as long as things were perfect. This brought them back to the question of maintenance. There were fires made at the present day from which, if kept in order, no carbonic oxide was given off when they were lighted; but if they were left for the whole of the summer, and damp and dust were allowed to collect, and some of the fuel was fractured when lighted in the winter, they would give it off and cause dissatisfaction. If a periodical examination were made before they were brought into use again, there would be far less complaint. Then came the important question of the composition of the fuel. He had experimented for a good many years with refractory materials; but, unfortunately, all his theories had not been borne out by practice. He had tried various chemical compounds, and also endeavoured to increase the radiation by mechanical means. Mr. Smith had made several suggestions with regard to shapes; and he (Mr. Yates) had been trying to find some of his old experiments, and the iron models which he made of the various types of fuel he had used. But that now made, after the application of all the tests he had been able to apply, was, he believed, the most effective, from the radiation point of view. The fuel-guard was undoubtedly an obstruction to radiation, and therefore he omitted it altogether. But he had obtained a patent for it. The President was the first engineer he was acquainted with who really appreciated and knew what was wanted in shallow fires; and he had the pleasure, many years ago, of making some of the first shallow fires, long before they were known or offered to the public. Somehow they did not seem to "take on;" but what Mr. Glover thought then had been well borne out, and was now the order of the day. A great mistake was made with regard to fixing gas-fires in a room. They often replaced a 16-inch or 18-inch coal-grate with a 10-inch gas-fire; and then people said it did not heat the room. They should first ascertain the number of heat units it was possible to get out of a given fire; and then find the contents of the room, and the number of units required to heat it to a given temperature. This was the only satisfactory way of fixing any apparatus; and if they went to a heating contractor with hot-water pipes or a circulating radiator, this was his practice. It was not, however, followed with regard to gas-stoves. Another question was the cost of improvements. There was too much striving after cheapness. If they wanted a good apparatus, and the manufacturer had spent some time in improving and developing things, they must expect to pay for it; but some people were inclined to "go for" another stove which was 6d. cheaper from the first maker who came along. He hoped these things would be borne in mind. But there was a great deal yet to be done in the development of gas heating; and it could only be accomplished with the aid of the profession.

Mr. J. H. BREARLEY (Longwood) said he would rather listen to any suggestions from members of the Institution with respect to the work the Committee should undertake than speak himself. But, as he had done something in the direction alluded to in the paper, they might like to know what he thought about the work accomplished to the present time. Personally, he had been immensely fascinated by the scientific and the careful manner in which Mr. Smith had carried out his investigations into the estimation of radiant energy sensible as heat. One suggestion he would make was that makers should all set up in their laboratories similar apparatus to that described, and experiment on their own gas-fires; for one investigation of this kind was not really sufficient. The progress was necessarily slow; and if there were any members who had not conducted researches of this kind, they should remember that, though the work done by the Committee was very small, if they could manage to increase the radiant duty of the fuel even 1 per cent., the whole cost of the research would be amply repaid. The effect of such research as this could not be very easily seen. The makers had been somewhat stirred up during the last three years; and the report before the meeting would stir them up still further. He was quite sure that in Mr. Smith they had an admirable investigator; and it would be a great

pity if the work was not continued till they had something better in the shape of gaseous heat.

Mr. J. W. WILSON (Leeds) said gas-stove manufacturers could only view this investigation with great satisfaction, for it was very much needed. They made gas-fires, and took them round and showed them to the managers of gas undertakings. But there was no standard of utility; and in this respect they were at a great disadvantage compared with their friends dealing with lighting apparatus. The lighting man had no difficulty in showing the capabilities of his light, but the gas-fire man had to a great extent to rely on his imagination; and there was much difficulty in comparing results. The consequence very often was that the firm with the best imagination was the most successful. This investigation was certainly in the right direction. It was something for stove-makers to know that they would be brought to book if they said they could do more than gas was capable of doing. They would be compelled to keep within the bounds of truth; and the public would not be disappointed when they got the stoves. He did not suggest that they wilfully misstated any of the results; but there was a certain latitude allowed to the imagination which did not conduce to success. There was no reason why the Research Committee could not be used as a medium for making tests for stoves; so that a maker could send his stove to them, get a testimonial, and then be allowed to advertise that his fire had been tested by the Committee with certain results. With reference to the loss of heat, why should not a standard loss be adopted? Instead of losing 30 per cent., the average loss should not exceed 15 or 10 per cent.; and no stove should be sold by the gas undertaking unless it came within this limit. He did not think 30 per cent. was very serious when one considered that the stove tested was the cheapest of its kind made. There were other stoves—take the condensing stove as an ideal—in which there was less loss; and others where the waste products were allowed to pass immediately away from the chimney. These, of course, were in a different class, which would give better results with regard to the total amount of heat obtained. Taking the full products of the gas-stove, they could reduce the flue temperature from 500° to 300° Fahr., and then the actual loss need not exceed 15 per cent. at the outside. There was some difficulty in criticizing the figures, as they had not appliances for doing so; but the result of about 30 per cent. lost heat was higher than in the test Mr. Brearley made last year. Referring to the question of lighting, he doubted whether there was as much light got out of gas for illuminating purposes as there was heat. When they came to the incandescent burner, the amount of heat that escaped was, roughly speaking, about half, without producing any light; so he did not think 30 per cent. was a serious loss.

Mr. H. KENDRICK (Stretford) desired to add a word of thanks to the Committee and to Mr. Smith for the very useful work they had carried out; but there were one or two little points which he thought required clearing up. In the paper there was a typical analysis of the gas used in the experiment, which gave as the percentage of nitrogen the enormous figure of 16.27. Then a little farther on it was stated that "the net calorific value of the gas used in the experiment was about 1.42 calories." He emphasized the word "net," because he was very doubtful if, with a gas containing 16 per cent. of nitrogen, and with an illuminating power (obtained by a No. 2 "Metropolitan" burner) of 17.4 candles, they could get anything like this very high heat value. Taking some of the old figures, which were an average over the last three months, he found that 17-candle coal gas gave 1.45 calories gross and 1.28 calories net; but on mixing this gas with 20 per cent. of carburetted water gas, it was 1.44 gross and 1.31.5 net. His gas was half-a-calorie better than Leeds gas; so that he found it difficult to understand how the latter gas could be 11 calories higher than that at Stretford. Looking at Table I. in the appendix to the paper, and roughly going over some of the figures in columns F, G, H, and I, he could not make any of them total up to anything like 100; and he did not know where the balance had gone—whether any loss went up the flue, or on to the floor or anywhere else. Some of the figures totalled up to about 70; others to 130. He noticed, too, that the calorimetric value was still given as "net"—averaging 1.43 or 1.44 calories. It was evident that the mantle of the late Mr. Fletcher had fallen on Mr. Wilson's shoulders, and that they had a man who, though a manufacturer, was prepared to work in a scientific manner. He did not know before that they had an alarmist in their

camp; and he was surprised that Mr. Bond should tell them that heating by coal cost 3½d. per day, and by gas 16d., which was rather an astonishing statement. It might be for the same amount of radiation from the fire itself; but what occurred to him was whether the radiation was doing useful work—whether it was heating the air of the apartment. He thought he was correct in insisting that the amount of ventilation in coal-heated rooms was several times as much as in gas-heated rooms; and consequently a very great proportion of the heated air would be passing up the chimney instead of doing useful work in warming the room. On this account, a considerable correction should be made to the figures given by Mr. Bond. It was the same with regard to the humidity in the room. The apparent moist feeling in the air in a coal-heated apartment was not due to the large amount of moisture in the atmosphere, but to the very considerable quantity of cold air entering the room by every cranny of the doors and windows, reducing the temperature, and causing a feeling of moisture. Whereas with a gas-fire the air which passed up the flue was about one-fourth of that which went up the chimney with a coal-fire, and they had an apparent decrease in the moisture, this was simply due to the rising temperature increasing the capacity of the air for moisture, and a corresponding increase in the evaporation of the moisture from the skin causing a feeling of dryness. One other statement in the paper he did not understand. Mr. Smith said the result of imperfect combustion was a smell of carbon monoxide in the room. It was a long time since he had his lessons in chemistry, but he had a distinct recollection of being told that carbon monoxide had no smell at all. Probably Mr. Smith meant the smell of acetylene. He (Mr. Kendrick) had made some experiments with gas-fires, not with the view of testing the radiation in the manner now put before the members, but of trying to find which was the most efficient under actual working conditions, which could hardly be said of those obtaining in the tests described. He used his own office at the works, the door of which was open pretty frequently; and there he kept thermometers and also a thermopile with a galvanometer. He found that by using various types of fires he obtained a very different result for the same consumption of gas; and by using various types of fuel there was a very distinct difference. Taking the type of fire shown on the screen, he took the galvanometer readings with series up to 8 feet, and with the same fire each time; but with different fuels and different conditions the readings were 24°, 28°, 25°, 22°, 23°, 27°, 24°, 26°, and 28°. Then he had a conversation with Mr. Wilson as to the manner in which a gas-fire should be worked; and he insisted that it should be so regulated as to give a roaring flame. He (Mr. Kendrick) tried the effect of this, with the result that he had an increase of radiation (though another maker to whom he put the same question absolutely denied the necessity) to the extent of about 15 per cent. They had often heard certain statements about reflectors, and one table in the paper showed that the amount of radiation from the under-surface had been very much higher than that from the top, and that thus, in the ordinary course of events, the heat dropped into the fender or inside the guard, and its heating effect in the room was lost. If a reflector were used, it would take up this heat, which would be otherwise lost, and throw it farther out. He had a distinct increase in radiational readings in the galvanometer up to 10 feet away from the fire; and at the same time the temperature readings with the thermometers increased at a considerable distance—showing that the reflectors had a distinct effect. He should like to suggest that one of the matters that might be looked into, in addition to the particular points which had been examined, would be the effect of heating at different rates of consumption. It seemed to him that the shape of the flame issuing from the burner had a considerable effect on the amount of radiation. If the gas were turned low at any time, the amount of radiation did not correspond with the consumption. There was also a difference between the present pattern of the single-row fuel fires and the old two-row fuel fires; and there was also the question of the advantage or disadvantage of the duplex burner. If every fire were fitted with a duplex burner, they would get the flexibility now lacking, and which the coal-fire could be always made to give if properly looked after.

Mr. A. WILSON (Glasgow) suggested that the Committee should combine some utility with their science, so as to make the testing of some use to the public as well as to gas engineers. Scientific figures were all very well to those

who understood them; but unless they had comparative figures the public would not make much use of them. He suggested that they should also show comparisons with coal-fires. A little of this work had been done in Glasgow, and he thought it would bear good fruit. With regard to humidity and the drying of the atmosphere in the room, this did not convey anything to an outsider; but if they could tell him that they had exactly the same result from the heat of a coal-fire, and that a gas-fire caused no more drying than a coal-fire, he would understand it. This was what they had found—that there was some drying of the atmosphere both from the coal-fire and the gas-fire.

Dr. ARTHUR H. ELLIOTT (Consolidated Gas Company, New York) said he had listened with a great deal of interest to the paper, as during past years he had done a lot of work on the subject himself; but he was still very much "mixed up" in his mind as to what he had arrived at. A great deal depended on how the subject was really looked at. He had made a great many calculations and experiments in houses which he had himself built, heating them by hot air, by steam, and by hot water; and they could have just as much divergence of opinion as to these methods as they could with regard to heating by gas. The thing that struck him about the report was the extreme care with which the work had been done. It was unique; and he wished to thank the Committee heartily for having put him into some kind of shape as to how to go at it on the other side of the water. The impression he obtained from the report was that about one-third of the heat was radiated out, and about one-third was lost up the chimney. But where the other third went he could not find out; and this was what had puzzled him. The Committee would probably be able to explain it; but, if not, he might suggest that they had better hunt for this other third. With regard to heating houses or rooms, it largely depended on what was wanted. If they wanted an open fire, which was the English method, they must make some provision for flickering flames, and so on. In America, they heated principally by steam and hot water; they did not care particularly about the flame. They had plenty of anthracite coal, and were using it up very rapidly—more rapidly than England was using up her bituminous coal. But the heating with anthracite coal was very wasteful of the heat units in the fuel. One could take the same stove and heat it with coke or anthracite; and the amount of fuel used, if it were anthracite, was very much more than if coke were used. The reason was obvious. The flue temperature in anthracite stoves would be about 500° or 600° Fahr.; but with a properly regulated coke-stove of the same type it would only be about 300° or perhaps 250° Fahr. There was a great saving at once. They had to get sufficient draught in the anthracite stove to blow it up, while they did not have to do so with coke. This was where many failed in getting coke used. They were trying to introduce coke-stoves just now into New York, with a view to competing with anthracite; and they were doing this because they had fixed a coke-stove which, as they called it, was "fool-proof"—in other words, they had restricted the amount of air which could possibly get through it. It gave sufficient heat to produce a good fire; but one could not open the "draught" any more—in fact, they tried to fix it so as to make it troublesome to open. They obtained this idea from M. Boscheron, Engineer at the Liège (France) Gas-Works. He noticed that he had a plate working on a thread in front of the stove, which was the only place where the air could get in. He (Dr. Elliott) remarked to him that this was rather troublesome; and he replied that this was just what they wanted. They did not want it easy to open the stoves, because people could change the draught too rapidly. Two stoves ran together in this way, and the results compared, per pound of fuel used, were 17:21—the anthracite being 21. With regard to the application of fires for heating, if they heated hot water with gas they got more out of it than if they heated up the simple stove. It had been perfectly possible, with a commercial apparatus in New York, to get into water 80 per cent. of the heat units in the gas. If they heated a current of water that heated the room or house, they utilized 80 per cent. of the entire heat units. In his judgment, this was the way out of the difficulty. Of course, the apparatus was more expensive than the common type, which even now would give 50 per cent.; while a gas-heater (not a geyser) would give 50 per cent. of the total heat units in the gas. If they used better apparatus, restricting the amount of air given to the flame, but always giving it enough—and this could be calculated

with gas better than with any other fuel—the flue temperature would be low and constant, and the water would take up the heat.

Mr. WALTER GRAFTON (Glasgow) said, with regard to the table, when the full draught was put on he found that the greatest amount of it gave the greatest amount of efficiency, and that of the total heat recovered 80 per cent. was accounted for and 19·16 per cent. unaccounted for. As to the standard of comparison, it was obvious, if they wanted to convert consumers to the use of gas-fires, they must try to bring them as near as possible to the conditions of coal firing. From comparisons made in his own house, the room shown on the screen was a box closed up in every sense, and did not represent the normal conditions of living-rooms; and in this way it fell short of what they should put before a consumer as likely to be obtained with a gas-fire. Taking a coal-fire, he found the humidity was generally 15 per cent. less; but the grains of moisture per cubic foot were 0·4 greater than with a gas-fire. Again, he found the temperature of a room with a coal-fire was 12° to 15° higher than the outside temperature while maintaining the same conditions; but what were these conditions? From the results he had been able to draw up, he found, at least in a room with approximately 66° to 72° of humidity, that there was a comfortable temperature. They did not want the heat all taken away from the floor; they wanted the bottom of the room warmed as well as the top.

Professor SMITHELLS said, as Chairman of the Research Committee, he must say how gratified he and all the members of the Committee were by the manner in which the report had been received. They welcomed both the sympathetic observations which had been made and the criticisms which had been passed in the kindest possible way. There was a good deal to answer, and it was important that it should be answered; and probably the best plan would be to embody in a short memorandum, to be appended to the paper, a reply to the various questions raised. There was one general point, however, on which he should like to make an observation. Their object had been not to produce, at any rate at that meeting, a complete statement of the subject of heating by gas, but first of all to elicit the facts, and to show how they did so, and present them as a dry statement of scientific facts, not as arguments to be used in persuasion of a reluctant public to adopt heating by gas rather than by other methods. They knew the world was full of prejudice about all sorts of things and about gas heating in particular. There was a large section of the medical profession constantly making statements on the subject of heating by gas which would not bear examination. They had, he was afraid, womankind—not only the “new” women, but the “old” women as well—against them in the use of gas for heating. This was a serious thing; and it seemed to him that the time had come when, instead of relying on the persuasive statements of gas-stove makers on the one hand, or the obstructive or ill-considered statements of medical men on the other, they ought to have some authentic setting forth of the facts. This was the mission on which they had entered. To-day they had given only the first of their results in the form of what they believed was the first exact measurement of the radiation of heat given off by a gas-stove. He had used his influence to keep the report within the small compass in which it was submitted, and not at present to enter into the larger and more interesting question of heating by gas as a whole. If the Committee had justified their existence so far, they would go forward and discuss the question in all its aspects, and give the members material which they might present to the public in any way they pleased. But, at any rate, it would be an authentic statement of the merits and demerits of heating by gas.

Mr. SMITH has since submitted (in writing) the following remarks regarding the discussion on his paper: The measurements recorded in the report refer only to direct radiation and to the heat passing into the flue. The remaining portion of the heat, distributed by convection currents of air passing over the stove into the room, was not estimated. It can, in fact, only be ascertained by subtracting the sum of the radiated heat and that passing up the flue from the total thermal value of the gas burned. In considering the radiation from the stove, it must be remembered that the radiations do not appreciably warm the air through which they pass; but when they fall upon the walls, floor, and objects in the room, they are absorbed. The warmed surfaces thus produced partly re-radiate their heat; and part goes to heating

the air which is in contact with them—thus giving rise to convection currents. A current of air passing in front of a radiating surface does not appreciably absorb radiations; but if it cools the radiating surface by conducting away heat, there will, of course, be less radiation. In all the experiments recorded, the air in excess of that required for combustion passed through the top of the stove and not over the radiating surface at all. Although the percentage of nitrogen was as stated in the report, the remaining components of the gas brought the calorific value undoubtedly up to the figures given. By the “carbon monoxide smell” is meant the smell of the products of incomplete combustion, which were invariably accompanied by carbon monoxide. Of course, the smell was due to other constituents than carbon monoxide.

PAPERS READ.

CARBONIZATION IN CHAMBER SETTINGS.

By R. LESSING, Ph.D., F.C.S.

It may fairly be assumed that the most difficult problem which beset the originator of the gas industry was the selection of a proper shape and size of the coal containing distillation vessel. Murdoch himself, after experimenting with crucibles, pots, and tubes set at various angles, finally adopted the form of horizontal retort, which to this day dominates the majority of the world's retort-houses. It was not until the latter part of the last century that successful steps were taken to depart from what had become a standard pattern; and the trend of invention led in various directions to modifications, alterations, and improvements. The regenerative furnace was introduced into the retort-house, and thereby more rational methods of heating were developed, which permitted great improvements in material, design, and working of the retorts. The labour-saving principle underlying Coze's inclined retorts challenged the inventive genius of advocates of horizontal retorts, thereby producing a number of mechanical devices for the charging and drawing of the latter, which are being constantly improved and added to by more efficient machines.

The most revolutionary movement, however, by which the industry was stirred in recent years was the coming of the vertical retort of various systems. Originally and mainly intended to introduce the principle of gravitation into the manipulation of gas-retorts, it soon became evident that the method comprised so marked advantages in many respects over the older systems, that it not only became firmly established within a very short period of time in a great number of works—most notably on the Continent of Europe—but at the same time advanced our ideas on the theory of carbonization to a considerable degree. Hardly had we realized that the vertical retort had successfully emerged from the experimental stage, and taken the field in the competitive struggle with the well-tried systems of longer standing, when news reached us of the laying down and working on the largest scale of plant on a principle until then unknown in the practice of gas-works. I refer to carbonization in large-space chambers.

If I attempt in the following lines to bring a few data on this subject before the members of the Institution of Gas Engineers, I trust I shall be forgiven for doing so without being in a position to submit that sufficiency of material and working results which I should consider desirable and indispensable evidence in forming a conclusive opinion for or against the system. This is due partly to a justifiable reticence on the part of some of the firms in possession of this material, but more so to the very limited period of time over which results are, as yet, available. My apology for bringing this subject before you at this comparatively premature stage lies in my belief that the extraordinary rapidity with which this system has found a footing, and spread over quite a large number of gas-works, is in itself a justification for a discussion of its merits.

The introduction of recovery plant into the coke-oven industry has made enormous strides during the last twenty years. The development of this industry has shown that coal can be carbonized in bulk, and the means of coking in a single receptacle a quantity of fifteen to twenty times the weight of coal charged into an ordinary gas-retort have been worked out to great perfection. The gas being the by-product in coking practice, it is employed for the heating of the ovens; while with the gas-retort, the solid product serves

as fuel. There is no theoretical reason why, under equal conditions and with the same coal, there should not be made a gas of essentially the same character in both plants; the difference lying rather in the use of the products than in the making of them.

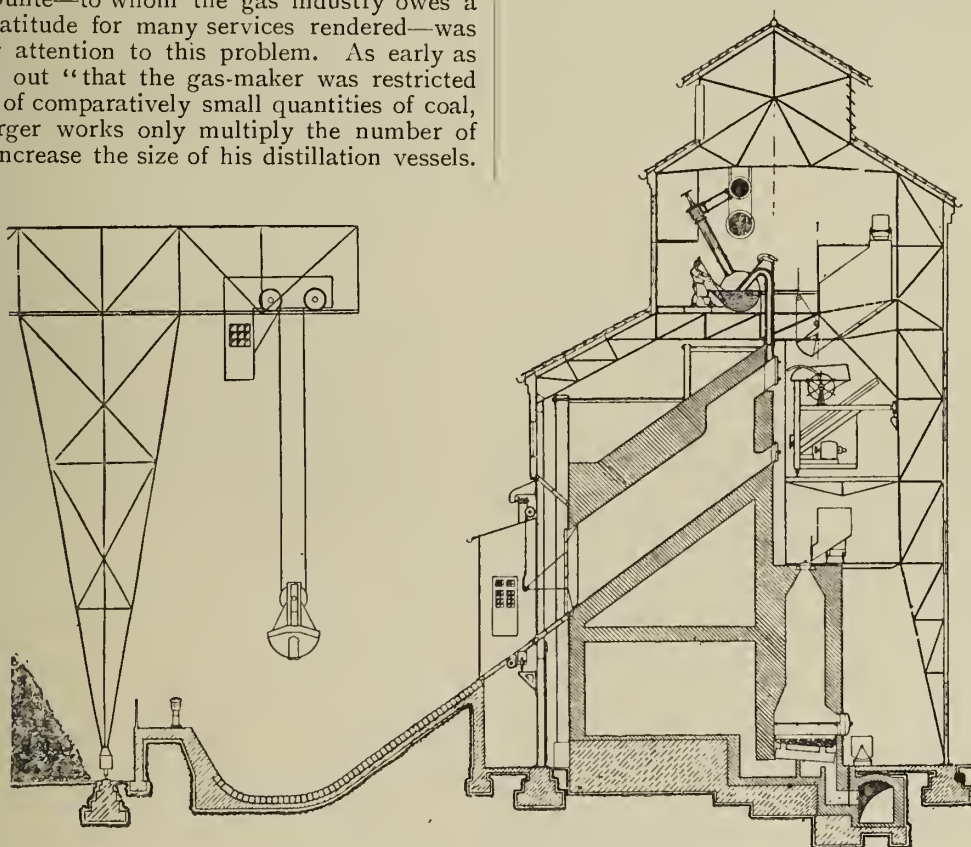
Of course, the practical differences are of very much greater importance. Surface action of the larger bulk of coal or coke, and the difficulty of keeping the brick-built chambers gastight, give a different aspect to the problem. The latter difficulty is, however, to a large extent due to the indifference of the coke-maker as to the quality of his gas—his mind being bent primarily on the quality of the coke. The fact, however, that coke-oven gas, either enriched with benzol, or else a richer fraction separated during the first period of coking, has been used in place of town gas in various places in this country and abroad (notably in the United States of America), showed that carbonization in bulk for the production of illuminating gas was a problem within the reach of possible execution.

Perhaps Dr. Bunte—to whom the gas industry owes a heavy debt of gratitude for many services rendered—was the first to draw attention to this problem. As early as 1894, he pointed out "that the gas-maker was restricted to the distillation of comparatively small quantities of coal, and could for larger works only multiply the number of retorts, but not increase the size of his distillation vessels.

exhaustive tests by Professor Bunte and his staff. Since the results of this examination, as well as those of a test by Professor Drehschmidt, comparing the chambers with Dessau vertical retorts have been fully published in the *Technical Press*, I need hardly enlarge on them. I should only like to draw your attention to one of Professor Bunte's diagrams, which gives a good idea of the general course of carbonization. In this case the charging of the chambers was effected within a few minutes, in order to obtain results representative of every stage of carbonization during the 24 hours.

On the whole, the results were regarded as satisfactory—the more so as an average illuminating power of from 10 to 12 candles is now-a-days considered sufficient by German experts as long as the calorific value lies somewhere above 5000 calories per cubic metre—equivalent to 560 B.Th.U. per cubic foot.

As to the common advantages of the system, Dr. Bunte calculates that for a make of $3\frac{1}{2}$ millions per 24 hours (the



Cross Section of the Munich Carbonizing Chamber.

If, however, enrichment of a crude gas with benzol would be resorted to, they were in a position to employ large distillation chambers, similar to recovery coke-ovens, which could be handled much simpler and cheaper than ordinary gas-retorts."

These casual remarks fell on fertile soil. Mr. H. Ries, the Engineer and Manager of the Munich Gas-Works, evolved during the following years (in collaboration with Dr. E. Schilling) a scheme for the working out of the problem; and to him is due the credit for having designed and put up the first large-space chambers for gas production. Towards the end of 1901—after a delay of several years caused by the transference of the works to the Municipality—he adapted an ordinary setting for inclined retorts in the old (now disused) Munich Gas-Works, to a setting of three chambers. They had a capacity of 1 ton each, and were set at an angle of 35° to the horizontal. Although the quality of the gas produced was not all that could be desired, the results were sufficiently encouraging to continue the experiments. The chamber space was increased to a capacity of 2.2 tons; and although this setting was also an adaptation only of an ordinary retort-furnace, the results were so satisfactory as to justify the laying down of large plant.

A bench of fifteen chambers, in five settings, was accordingly erected at the Kirchstein works of the Munich Corporation, and has been in almost continuous operation since Oct. 6, 1906.* This plant has been subjected to very

maximum demands of the Munich works), the old Munich horizontal retorts would require 2376 charges, as against 123 charges of the chambers, with a consequent saving of labour, and smaller losses of gas upon charging and discharging. In the new plant, with twice the capacity per chamber, the contrast must be all the more striking.

The results of the working of this first large installation were sufficiently convincing for the authorities of the Hamburg Gas-Works to decide on the putting down of a battery of ten settings with nearly twice the capacity of the Munich Kirchstein chambers per setting. I have had an opportunity of giving a short description of the plant in the *"JOURNAL OF GAS LIGHTING"* for July 14, 1908; and therefore I need here not go into the constructional details of the system. The plant has been in operation for the last eight months, and has, as I understand, given entire satisfaction; but there is to hand so far no independent test of its efficiency. The heating economy of the system may be gathered from its fuel consumption, of 12 to 15 per cent. of the coal carbonized, with a yield of about 12,500 cubic feet of gas per ton—only English coal being employed.

With a capacity of 17.5 tons per setting of three chambers, as adopted in the Hamburg works, the maximum size of the unit was not reached. It is satisfactory to note that it was left to the first designer and initiator of the system, Mr. Ries, to proceed one step further, and still increase the capacity of the setting to 19.4 tons, as against 9.7 tons in the previous installation. In his able hands, the chamber setting was thus developed from the first experimental plant to a unit of from six to seven times its carbonizing space.

* An illustrated description of these carbonizing chambers appeared in the *"JOURNAL"* for Aug. 13, 1906.

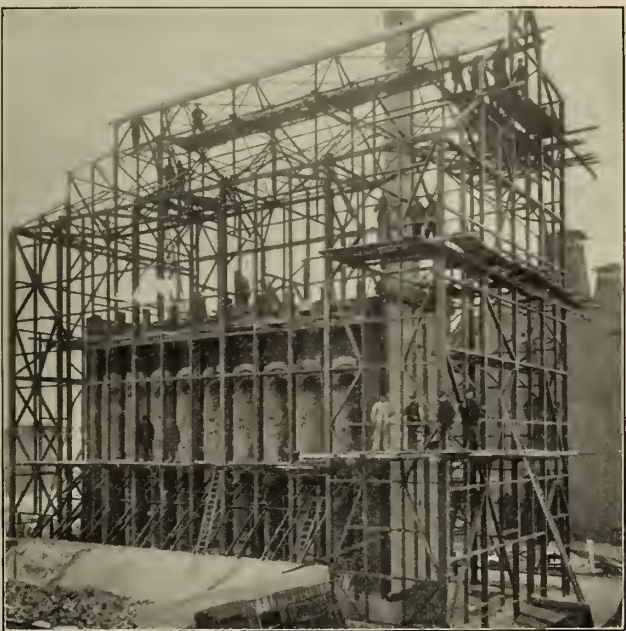


Battery of Koppers' Chamber-Ovens at the Bochum Gas-Works—
Front View of Ovens.

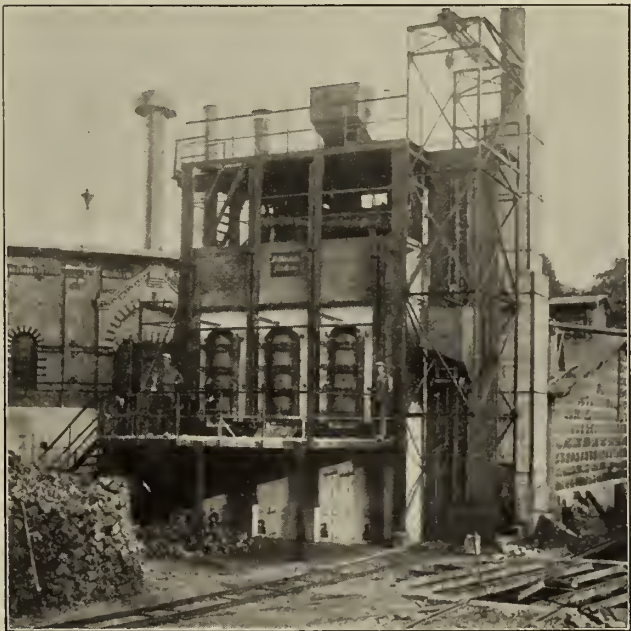
120 tons of coal are carbonized there per 24 hours, yielding 10,500 to 12,000 cubic feet of gas according to the kind of coal used. With a total area of 7000 square feet, 200 cubic feet of gas are made per square foot covered. The yield of gas per man employed per shift of from 8 to 10 hours equals upwards of 175,000 cubic feet.

Inclined chambers with vertical heating flues are also built by Messrs. Knoch. The special feature of this system (and on which particular stress is laid by the firm) is the absolute independence of each chamber. The chambers are not combined in threes or fours in one bed; but each chamber is enveloped in its own shell, and heated by its own flues—the heating gas being made, wherever possible, in a separate producer plant common to the whole installation. A plant at Halberstadt began working in April, 1908, and another one of nine chambers, and producing 350,000 cubic feet per 24 hours, with a charge of 3·4 tons per chamber, was erected at Boehlitz-Ehrenberg, near Leipzig.

Messrs. Klönne—who had made an early, although an



A Battery of Chamber-Ovens under Construction near Leipzig.

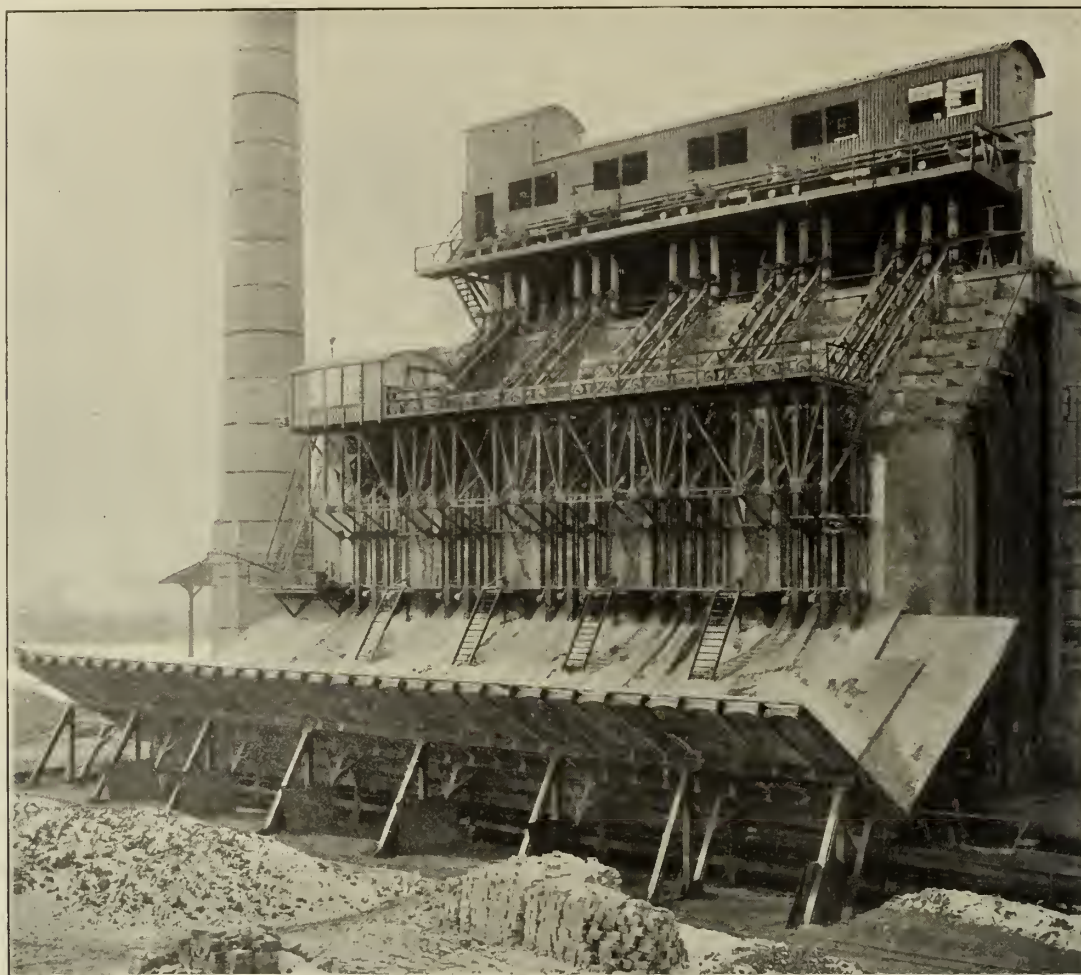


Knoch's Chamber-Ovens at Lauban.

unsuccessful, attempt at chamber settings in 1892, at Schalke —have again turned their attention to chamber settings. While all the plants so far described are of the inclined type, this firm have constructed and are building plants of the inclined, horizontal, and vertical pattern. Two settings of four inclined chambers have been at work at Königsberg, in Prussia, since the beginning of the present year. With a



Battery of Fifteen Koppers' Chamber-Ovens Erected at the Vienna Gas-Works, showing the Gas-Producer
Plant on the Right.



Battery of Fifteen Koppers' Chambers at the Vienna Gas-Works.

carbonizing capacity up to 7·2 tons per chamber, the yield of gas is 11,500 to 12,000 cubic feet, of a net calorific value of 550 B.Th.U. The fuel consumed is 14 to 15 per cent. of the coal charged. The carbonizing wages at this works are said to have dropped from 9d. with inclined retorts to about $\frac{3}{4}$ d. per 10,000 cubic feet of gas made in chambers. In consequence, four more settings of a capacity of 1,270,000 cubic feet are to be laid down at this place.

A specimen of the Klönne horizontal chambers has been at work at Rotterdam since Aug. 9, 1908. An illustrated article dealing with this plant, and giving working results, has been published by Mr. Sissingh, the Rotterdam Gas Engineer, in the "JOURNAL OF GAS LIGHTING" for Dec. 29, 1908, p. 902. I may therefore confine myself to saying that this is a setting of four chambers holding 2·75 tons of coal each, and making 12,000 cubic feet of gas per ton, of a calorific value of 560 B.Th.U. The coal is charged through two openings on top of the ovens from a travelling hopper; and the coke is discharged by means of an electrical ram—much after the fashion usual in coke-oven practice.

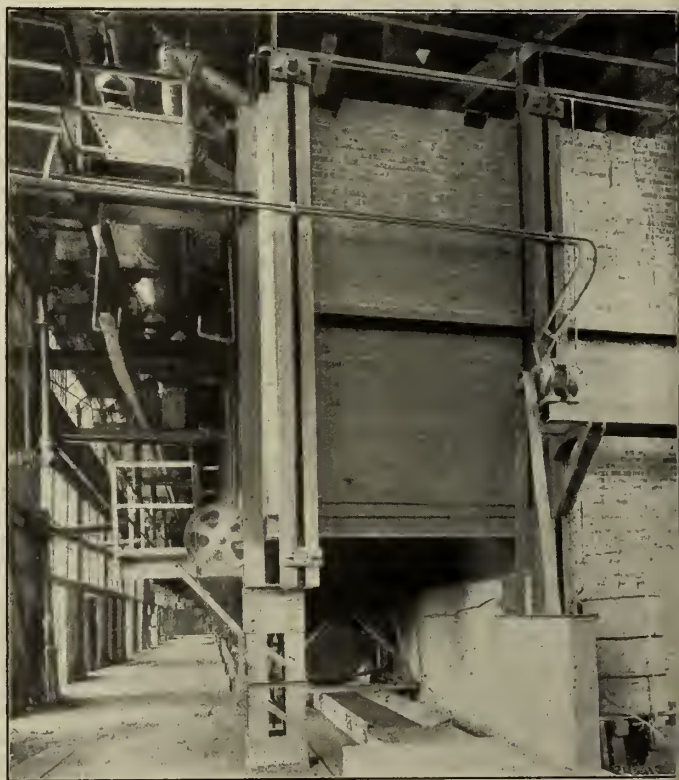
The horizontal chambers have the advantage of being about 30 per cent. cheaper than an inclined setting of the same capacity; and they do not require the more delicate manipulation desirable for the latter. However, they cannot compete in efficiency with the inclined settings at a make of more than 40,000 cubic feet per chamber.

A vertical furnace has been put up by Messrs. Klönne at the Dortmund Gas-Works. It contains five chambers, charged with 1·3 tons of coal each, which can be burned off in twelve hours. The yield is about 12,000 cubic feet per ton with a fuel consumption of 14 to 15 per cent. The make of gas is 550 cubic feet per square foot of area covered.

Messrs. Horn also build a vertical chamber-oven, for which many advantages are claimed. A plant of this design has recently been started at Hecklingen (Thuringia), of a daily capacity of 140,000 cubic feet which, so far, has worked satisfactorily.

CARBONIZING CHAMBERS IN ENGLAND.

Having so far considered doings on the Continent only, it must by no means be assumed that British engineers have been idle in exploiting this most recent problem of the gas industry. It is only fair to point out that attention has been paid to the subject, though progress has hitherto not been



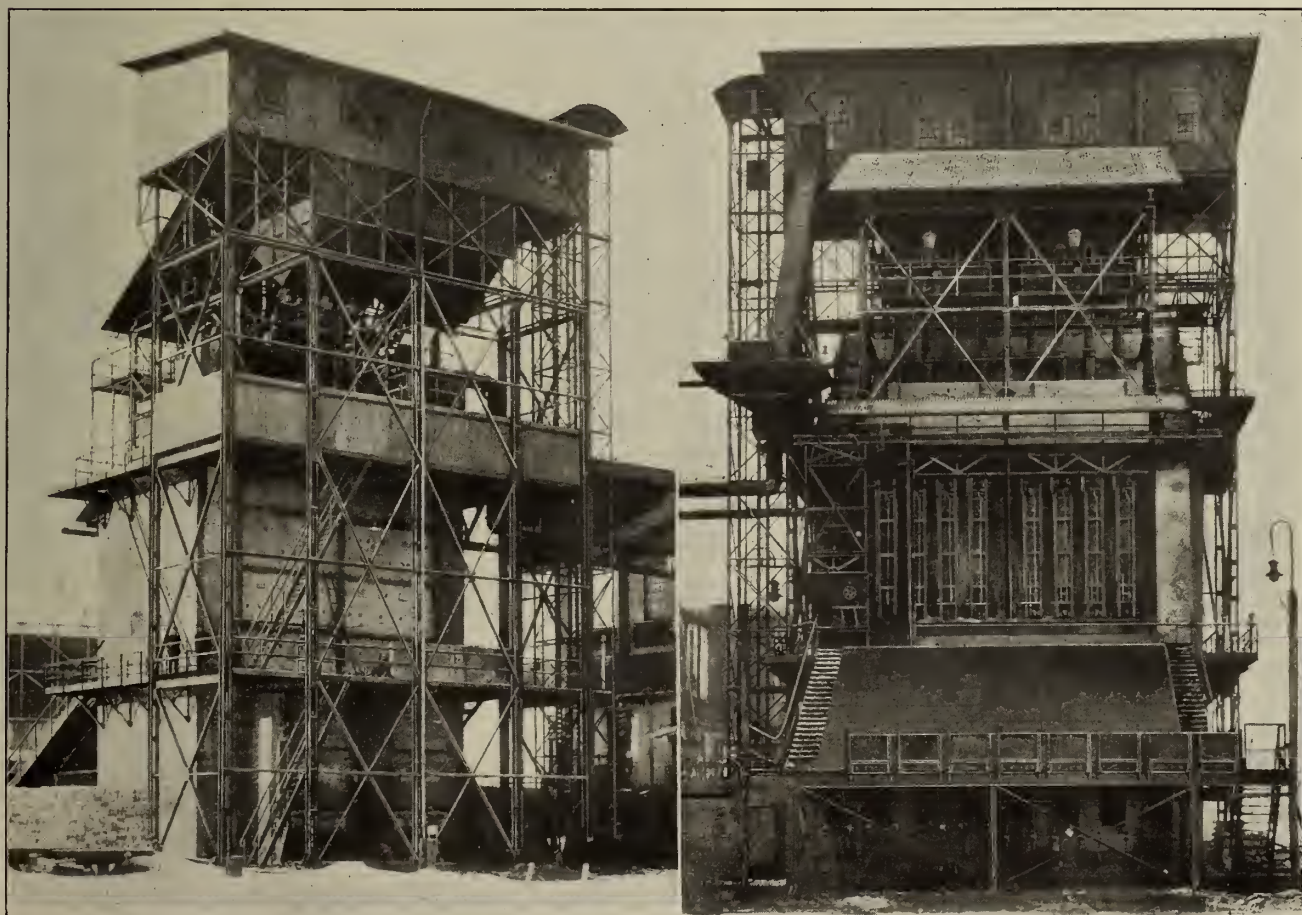
Klönne's Vertical Chamber Setting—Dortmund Gas-Works.

of as rapidly expanding a character as on the other side of the Channel. The Institution of Gas Engineers may be congratulated that their President was probably the first in this country to recognize the possibilities of carbonization in bulk. It is not for me to describe the system, or the details of its construction and working, in the presence of its inventor and designer. But, if I may be allowed, I would just point out its leading features, and compare it with the systems dealt with.

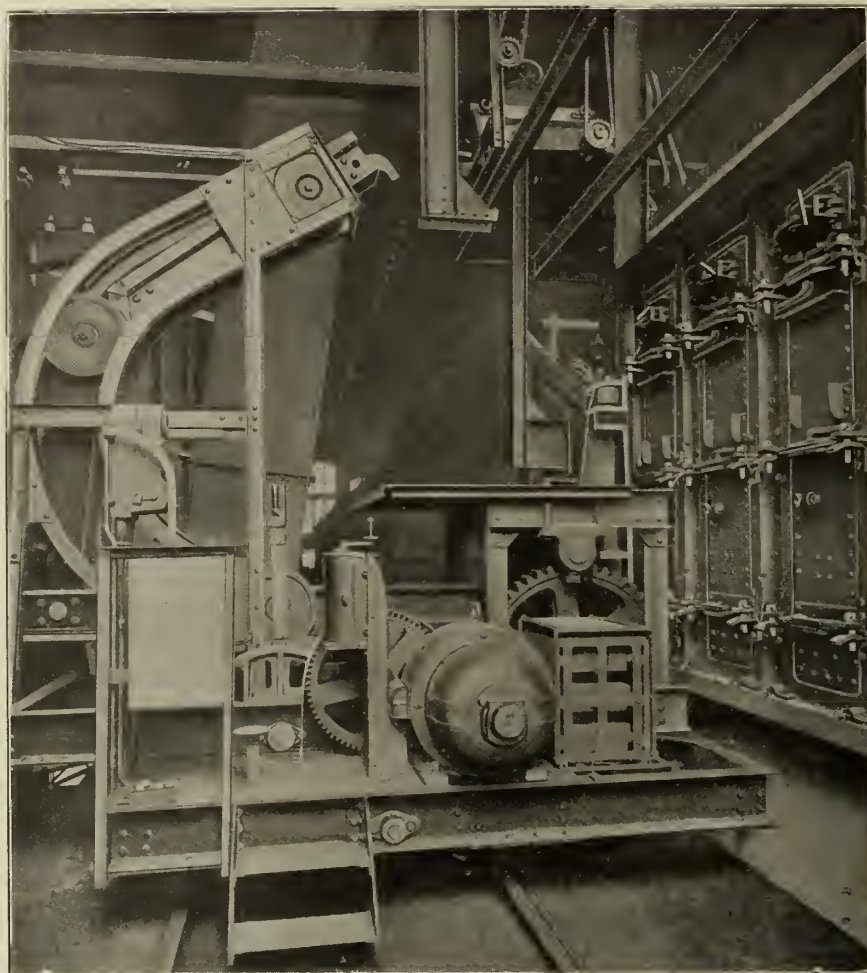
Mr. Thomas Glover has succeeded in obtaining a fairly



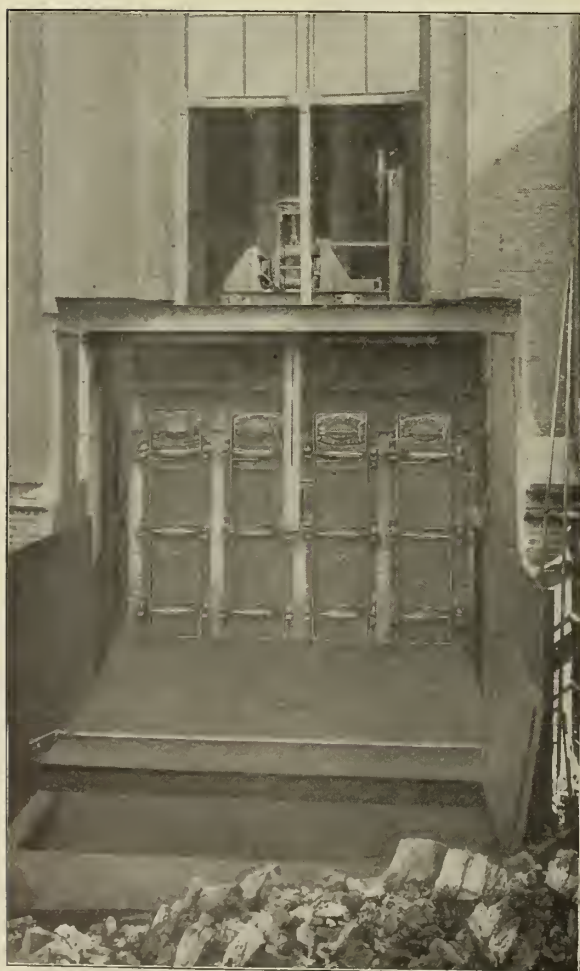
The Inclined Carbonizing Chambers at Königsberg.



Two Settings of Four Inclined Carbonizing Chambers at Königsberg.



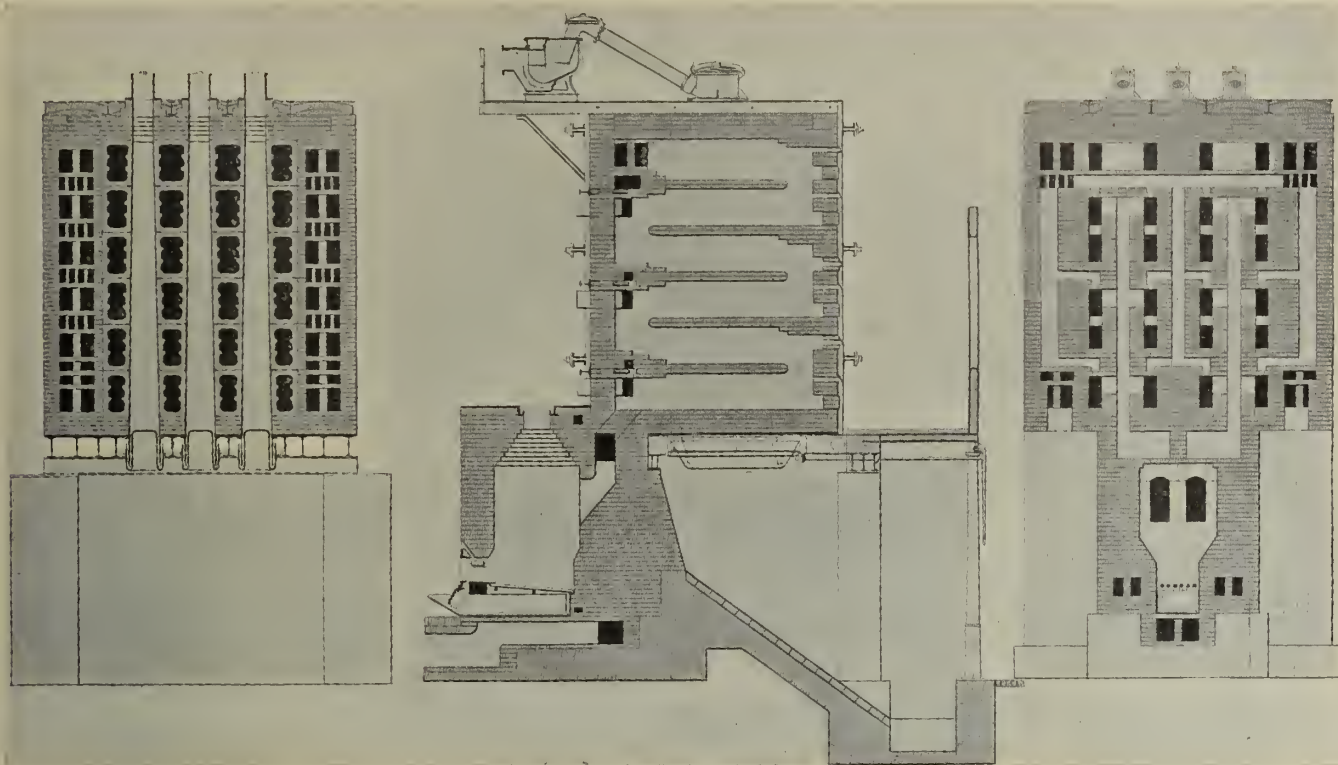
Coke Discharger with Electric Motor at the Back of the Klonne Setting at Rotterdam.



Front of the Klonne Chamber Setting at Rotterdam, with the Apparatus for Raising and Taking Away the Doors of the Chambers.



Side View of the Klonne Chamber Setting at Rotterdam, showing the Ascension-Pipes, Hydraulic Main, Charging Funnels, &c.



The Horn Patent Vertical Chamber-Oven.

heavy charge of 1 ton, at the same time not foregoing the general arrangement of the retort-furnace and certain of its undoubted advantages. The resulting chamber-retort* is a happy medium between the large-space chamber and the ordinary retort, and a consequent compromise between the principal characteristics of the two—notably a combination of large make of gas with a candle power more amenable to English taste than that acceptable to Continental ambitions. In regard to the labour involved, the system seems to stand midway between the retort of up-to-date equipment and the large chambers. On the other hand, an undoubted advantage of the system—more especially in connection with the smaller works—seems to be its more general applicability to existing plant, as probably any suitable retort-setting can be adapted to it without removing the main structure.

There is one other design of British origin which certainly deserves to be mentioned in this connection. This is a vertical chamber designed by Mr. A. O. Jones, of which an experimental setting is erected in Staffordshire. It is primarily designed as a coke oven, and consequently gas heated; but the intention is to adapt it to gas-works purposes, if results on the large scale should prove at all satisfactory. I have had an opportunity of closely studying this plant, and must confess I was equally struck by the boldness of design, the successful execution, and the smoothness of the running. This vertical chamber takes a charge of 6.5 to 7 tons of coal. It is evenly heated by horizontal flues with independent gas and air supply, which seem to be almost ideal in their accessibility. It is charged from a travelling hopper, the charging occupying only 20 seconds. The difficulty of designing the bottom door which has to stand the pressure of the charge, and yet keep gas-tight, has been successfully overcome; the door being of the sliding type, and the power to withdraw it from under the charge being very moderate indeed. As yet, no definite data as regards the make of quality of the gas are to hand; but the character of the bye-products—notably the tar—justifies the expectation of a close analogy with the results in vertical retorts.

ADVANTAGES AND DISADVANTAGES.

If we now turn to the consideration of the available data as regards carbonization in chambers generally, we may compare the advantages claimed for the system, and no doubt largely attained, in the following terms:—

Long-period charges permit a great saving in labour, and consequent reduction of carbonizing cost, particularly in the case of 24-hour charges, where no night



A. O. Jones' Vertical Coke-Oven.

work is required except for tending the producer fires and watching the process.

High make of gas, due to limited secondary decomposition; therefore, good calorific value.

Little carbon deposit; scurfing to be done easily and conveniently. Ascension pipes keep clear.

* Illustrations of the arrangement here referred to appeared in last week's "JOURNAL," p. 700-01.



A. O. Jones' Vertical Coke-Oven.

Small consumption of fuel, and little loss through radiation.

Coke of very good quality and size.

Tar thin, and containing little free carbon.

Smaller heated surface per ton of coal carbonized than in retorts, and less chance for decomposition and infiltration of flue gases.

Large yield of gas on small area covered.

Manipulation is simple and comfortable for the men.

The life of the plant should be considerably longer than that of ordinary retort plant.

Against this stand as disadvantages:—

Low illuminating power. This, of course, is in this country, and in view of parliamentary obligations, an all-important factor.

High cost of installation, which, however, can soon be made good by greater economy in working and smaller capital charges on account of higher durability.

THEORETICAL ASPECTS OF CARBONIZATION IN BULK.

The question of the illuminating power of the gas made in chambers of great capacity gives rise to some theoretical considerations. In an ordinary gas-retort, with a small charge in a comparatively thin layer, the manifold changes which a lump of coal has to undergo during the carbonizing process are confined within a small space and a short period of time. The consequence is that they are, as regards space and time, overlapping each other to a large extent, with the very desirable result of a fairly uniform quality from start to finish. In the chamber, on the other hand, it is only natural that these changes should occur in chronological sequence, and should proceed from one part to another, so that at any given moment the occurrences in different parts of the heavy charge would be different from each other, and the reactions proceeding on a given spot would vary from those taking place on the same spot at a different period of the process. While these conditions do not exactly favour the uniformity of the gas produced, they afford to the student of carbonization a splendid opportunity for investigating the process, dissected as it would be locally and by time in various and distinct stages.

With regard to most characteristics of the gas, these variations are really not as wide as to seriously upset the equilibrium of uniformity. Make of gas, calorific value, and specific gravity, show—on reference to Professor Bunte's diagram—appreciable discrepancies from the average values only during a few hours at the beginning and end of the 24-

hour charge. This fact, I believe, must be put down to the probability of the heavy charge acting, so to speak, as a fly-wheel, resisting the disturbing influences by its own inertia, and compensating the results of temporal and local influences. Professor Bunte's results were obtained with charges of only 3·2 tons per chamber. I should not be surprised to learn that, on repeating the experiments with the latest plant, the doubling of the charges would prove very beneficial in this respect.

The only curve which shows very serious variations is that representing the illuminating power of the gas made at different periods of the experiment. During the first 40 minutes, it rises to above 30 candles; then it soon drops, until it comes down to the average of about 11 candles; keeps this up throughout the first half of carbonization; and then gently and steadily falls to the level of non-luminosity at the end of the 24th hour. An explanation of this may be the following.

THE PROCESS OF CARBONIZATION.

Carbonization sets in at the walls of the chamber. The drying, the softening, and the decomposition of the layers of coal in the immediate proximity of the walls proceeds very rapidly, and with a very short (if any) time interval between these stages; they running practically in parallel. Hence the peculiar, cauliflower-like appearance of the outside layers of coke from ovens or chambers, quite distinct from the inner part. During these initial stages, the bulk of the coal is still cool, and retains its physical structure, thus allowing the gas made by the destructive distillation of the outer surface to pass freely through its entire mass. It is thereby, naturally, loaded with those hydrocarbons which have been released from their molecular bondage by the geological coking process in the coal seam, and are readily given off at ordinary or comparatively low temperatures upon the passage of a gas current. This period, I presume, is identical with the rising branch of the curve, indicating a very high illuminating power. Besides, the great mass of coal must, by means of its low specific heat, exercise a cooling effect on the chamber walls for a considerable length of time. The rich hydrocarbons therefore are passing undecomposed along the roof of the chamber.

As soon as the heat has sufficiently penetrated the outer layers to be able to soften the undecomposed coal, the conditions would be considerably altered. The coal, where it has become plastic, forms a zone which is, to a certain extent, impenetrable or semi-permeable to the gas, or at least offers an appreciable resistance to its passage through the

entire mass. Consequently, the gas would now be forced to find a convenient passage through the outer layers (which by this time would be coked to an increasing extent) and along the walls to the crown of the chamber. By contact with the hot coke, and by the surface and radiant heat of the walls, it would suffer a degradation, with incidental deposition of carbon. This finds outer expression in the rapidly descending branch of the illuminating power curve.

This theory finds, I believe, a certain support in two observations. It is a common experience, and well known to every coke-oven man, that the cake of coke stands off the side of the chamber at a distance of sometimes upwards of 1 inch. Further, it is split in the centre by a vertical plane along its longitudinal axis, which allows the cake, after removal from the coking chamber, to fall in halves to either side. This phenomenon is so marked that, even with inclined chambers, the two halves may be observed separating while coming down the slope.

The meaning of the first observation is, I think, that the coal, while softening, has a tendency to consolidation by filling the intervening spaces, and is assisted herein by the condensation of the heavier hydrocarbons. The slight pressure put on the gas by the resistance of this zone may be sufficient to influence this tendency in the direction towards the centre, making room for the escape of the gas along the chamber wall.

How little pressure is required for an action of this type may again be gathered from a parallel in coke-oven practice. To allow a coke charge to glide readily across the quenching platform, it is customary to turn the water-hose on the latter before discharging an oven. It is, no doubt, the steam cushion formed which brings about this "lubrication," by exercising a lifting effect on the mass of coke, which, though almost insignificant in itself, is by its momentary action sufficient to serve the purpose.

If this assumption is correct, it stands to reason that the gas pressure during the period of plasticity or semi-permeability of the coal may suffice to push the charge away from the wall. During this period, the gas current coming from the interior would have a great velocity, and consequently not be subject to considerable decomposition on its course along the heated walls, which explains its fair illuminating power.

While the softening is proceeding towards the centre, the destructive distillation follows suit; the less volatile hydrocarbons being condensed and taken up by the plastic coal, practically dissolving it. Receding from both sides, these layers of coal solution in pitch meet finally in the centre, forming a very soft mass indeed. This layer yields to the influence of heat; its volatilization being more akin to tar distillation than to the destructive carbonization of original coal. The rather brittle tar coke which is left behind, and which has none of the characteristic features of either the compact principal product or of the rapidly formed external part, allows the two halves to be easily separated; and its formation can explain the second observation referred to.

I hope I shall not be accused of transgressing the permissible limits of imagination, if I suggest that in the small maximum at the eleventh hour of the illuminating power curve, we recognize the distillation of this tarry product. As soon as it is permeable enough for gas to bubble through, the distillation of the more pitchy part left or produced in the coal begins. The gas now formed finds a free passage wherever it goes; and by reason of its now decreased velocity, and the larger and hotter surface it has to pass, suffers decomposition which must be correlated to the descending branch of the curve.

CONCLUSION.

Having considered the practical possibilities and the theoretical aspects of carbonization in bulk, I venture to hope that sufficient interest attaches to this problem to justify my claims upon your patience and indulgence. I have not brought this subject before you to advocate its ready acceptance in preference to any other system of carbonization, but rather to chronicle events and stimulate enterprise and progress by showing its remarkably rapid development. This system is by no means perfect. It is only in its infancy, and has not even gone through its infantile diseases. Many improvements will have to be effected to bring it anywhere near perfection; but just this lack of perfection opens a promising field for the activity of gas engineers.

So far no plant of large dimensions has been erected in this country, though rumour has it that there will be some chamber-settings before long. No doubt the defective illu-

minating power of the gas to be obtained is partly responsible for this. Great difficulties have to be overcome in this respect. Perhaps it is left to the world-renowned mechanical skill of the British engineer to devise means for the application to the chamber system of the continuous principle which has found such favour in connection with retorts in this country. A device of such a description should prove exceedingly useful as a gas, coke, and bye-product making machine; and the realization of this pious wish would possibly permit the gas industry to again rest on its laurels for many years to come.

REPORT OF THE CARBONIZING COMMITTEE.

The Carbonizing Committee have much pleasure in presenting a report which has been prepared by Dr. R. Lessing, at their request and under their direction, showing the progress which has been made in carbonizing processes in this and other countries during the last twelve months, from which it will be seen that the year has been remarkable for the enormous development of the vertical retort and the carbonizing chamber systems on the Continent.

The outstanding developments in this country during the year include the commencement of an installation of Dessau vertical retorts at Sunderland, and one of the Woodall and Duckham vertical retorts on the continuous system at Burnley; also the starting of the Young and Glover vertical retorts at St. Helens.

Another distinct feature is the increasing use of heavier charges and longer periods in the working of horizontal retorts. The great improvements effected by this method of working are clearly set forth in the paper to be presented by Mr. J. Ferguson Bell, of Derby.

(Signed) THOMAS GLOVER.

CHARLES CARPENTER.

ARTHUR E. BROADBERRY.

SYDNEY Y. SHOUBRIDGE.

Southampton House, No. 317, High Holborn, W.C.,
June 10, 1909.

To the Carbonizing Committee, Institution of Gas Engineers.

Gentlemen,—In accordance with the instructions received from your Committee on the 24th ult., I have pleasure in submitting to you the following report on the progress in the methods of carbonization during last year. In doing so, I have to ask your indulgence with regard to the shortcomings of this document; the time available having been very limited for the collection and the compilation of the necessary data. The report can therefore, at best, be regarded as of a preliminary nature only; but I should be pleased to supplement it in its details if that be desired.

After a hundred years of steady, and consequently rather slow, progress by methods of evolution, the gas industry has entered a new era. The commencement of the second century of its existence has been heralded in by some revolutionary changes, more especially as regards the methods of gas production. Developments have, during the last five years or so, assumed so rapid a pace, and are of so varied a character, that it renders the task of picturing the state of advance at any given moment an extremely difficult and delicate one. New principles are proposed, tried, tested, and applied in rapid succession, only to be equalled, replaced, or overtaken by the results of competitive methods within the shortest periods of time.

In reviewing the progress made, it therefore seems the most feasible course to take each system of carbonization by itself, and inquire into the advances it has made during the time under investigation.

VERTICAL RETORTS.

Dessau Intermittent System.—This system deserves mention in the first place on account of its having, up to now, enjoyed more success than any of its competitors. As will be seen from the accompanying list of installations,* its rapid progress seems to continue unabated. When, on the occasion of last year's visit of the Institution of Gas Engineers, the Dessau retort was seen in operation for the first time by a large number of British engineers, it had already been installed in a great number of gas-works. Through the activity of its patentees and promoters, and enjoying

* See Appendix I., p. 844.

the technical, financial, and moral support of a powerful group of industrialists, it has further gained in favour, and been adopted in a progressively increasing number of works. It is significant that, out of about 4022 retorts erected or under construction, more than 1000 were to the order of one individual company.

As to the working results of the Dessau system, there is nothing to add to the reports submitted through your Committee at last year's meeting by Messrs. A. E. Broadberry and H. G. Colman, and the exhaustive investigation of Professor Bunte's Testing Institution carried out at the same time at Berlin-Mariendorf and Zurich-Schlieren, which practically confirmed the statements made previously on various occasions by the authorities of the Dessau Vertical Retort Company. A statement recently issued by Mr. Edward Körting, together with reports by Messrs. Prenger and Weiss, indicate a durability of the Dessau retort of 900 to 1000, or even more, firing-days, after which probably only the lower parts of the retorts will have to be renewed.

As to the technical advance made in connection with the Dessau retort, there is little to be recorded—a fact which should not cause surprise in view of the extremely careful working out of all details before putting it on the market.

The question of water-gas production in the retort received a good deal of attention during the last twelve months. Mr. E. Körting, to whom the success of the Dessau retort is largely due, and Dr. Geipert, claim several advantages for the "wet carbonization"—i.e., admission of steam into the retort, while Messrs. Kobbert, Strache, Terhaerst, and Trautwein regard the production of water gas in separate plant, and its subsequent admixture to the coal gas, as a more advantageous course to follow.

Dessau plants have been erected outside Germany—in Spain, Switzerland, Italy, Austria, South America, and the United States. In this country there is only one plant, comprising six beds of ten retorts each, which is in course of construction by the Sunderland Gas Company, and is expected to be in operation in September next.

Other Systems of Vertical Retorts.—A number of patents have been applied for in connection with vertical retorts; but as no information as to their erection has come to hand, they need not be dealt with here.

Two beds of vertical retorts have been in operation for a short time at the gas-works at Étapes, in France. They were built to the designs of M. Derval; but no details of construction or working results are as yet available.

VERTICAL RETORTS IN GREAT BRITAIN.

From the higher building record which the German pattern of vertical retort has attained, it must by no means be inferred that sufficient attention has not been paid to the problem in this country. One of the causes of the slower progress is rather to be sought in the more ambitious task that English engineers have set themselves by making the continuity of feed and discharge a principal feature of their various designs. Considering all the factors involved, and in view of the wider experience gained, it must be admitted that this principle is not only a perfectly sound one, but appears to be preferable to that of an intermittently charged and completely discharged retort, both from theoretical and economic considerations.

Woodall-Duckham System.—Considerable progress has been made with this system; and it may be said that it has overcome most of the initial difficulties. There is now working a setting of four retorts at the Nine Elms works of the Gaslight and Coke Company; a bench of ten settings, of four retorts each, is being constructed at the Kensal Green station of the same Company; and nine settings, of four retorts each, are nearly completed at the works of the Burnley Corporation.

By the kind permission of Mr. Thomas Goulden, the Chief Engineer of the Gaslight and Coke Company, the following results obtained in a recent test of 6½ days' duration with the Nine Elms plant may be given:

Total gas made	787,175 cubic feet.
„ coal used	61.39 tons.
Gas made per 24 hours per four retorts	124,290 cubic feet.
Gas made per ton	12,839 cubic feet.
Candle power	15.2 (No. 2 "Metropolitan" burner).
B.Th.U. gross	571
„ net	509.7

An installation of these retorts is being erected in America at the Grange, in the neighbourhood of Chicago, in order to

test the local coal. Should the trial prove successful, a very considerable plant will be put down in the same place.

In France, one setting is at work at Lyons; three more being contemplated at these works.

Young and Glover System.—This system has only within the period of review really assumed practical shape. A setting of eight retorts, 20 feet in length, was erected at the St. Helens Corporation Gas-Works by West's Gas Improvement Company, Limited; and operations on it commenced about seven months ago. After various trials and slight alterations, the plant has recently been repeatedly tested by independent experts with most satisfactory results. Special condensing, scrubbing, purifying, and measuring plant being provided, the results can be absolutely determined. So far, local (Lancashire) coals only have been carbonized; and these being of rather inferior quality, the results should be improved upon when carbonizing good gas coal. From these, about 11,500 to 11,800 cubic feet of gas were made per ton of coal of an illuminating power of about 16 candles tested by the "Metropolitan" No. 2 burner, and of a net calorific value of 530 to 540 B.Th.U.

The gas was of a very satisfactory composition, showing not more than 3 per cent. of nitrogen. The yield of dry coke was 14.2 cwt. per ton, of very superior quality, and the fuel consumed amounted only to 12.06 per cent. of dry coke. Of bye-products, about 33.5 lbs. of sulphate of ammonia were produced per ton of coal carbonized, and 16 gallons of tar of a very satisfactory composition.

The good results obtained seem to be largely due—quite apart from the continuous principle involved—to the very excellent heating arrangements in horizontal compartments, which permit of a convenient and independent adjustment of the temperature at every height of the retort. The uniformity of the gas, of course, is largely safeguarded by the continuity of feed to the retort. The mechanical appliances—notably, the coke discharging arrangement—have so far worked very smoothly.

Other Systems of Vertical Retorts.—Mr. W. R. Herring is at present erecting a setting of vertical retorts at the Edinburgh Gas-Works, for which a capacity of 30 tons of coal per day is anticipated. This will be distinguished from all other existing types by being so arranged as to allow of continuous or intermittent carbonizing. In its construction, the lines so successfully adopted in the shale oil-works in Scotland were closely followed, and satisfactory results are expected. It is hoped to have the plant at work during next winter.

Mr. Alexander Wilson is also experimenting with vertical retorts at Glasgow; but no definite results are so far available.

An installation of vertical retorts has been built at the Cleethorpes Gas-Works by Messrs. R. Dempster and Sons, Limited, which is at present under test, and of which particulars are expected shortly.

In this connection, mention may be made of the trials carried out by the late Mr. Love, at the Guildford Gas-Works, with a setting of eight inclined retorts set at an angle of 45°. Their working seems to be largely analogous to that of vertical retorts. Settings of this type have been erected at Market Harborough, Swindon, and in Wales; but no new results have come to hand.

CHAMBER SETTINGS.

Although the birthday of the chamber system of carbonization lies back several years, its more general adoption and the erection of the existing installations come within the period here under review. Moreover, I have no hesitation in saying that I consider the coming of the chamber settings by far the most important event in the carbonizing branch of the gas industry during the past twelve months.

As I shall have the honour of bringing this subject before the members of the Institution of Gas Engineers at the forthcoming annual meeting, it may perhaps be advisable not to go into details of construction and working here, but confine myself to the statistical and economic aspect of the problem, and the more so as these considerations form, at the present moment, the only reliable evidence for a discussion of the merits of the system.

A year ago, only one plant of this class was at work at Munich—erected by the original designer and patentee, Herr H. Ries. This installation, which is still at work, consists of a bench of five settings of three chambers each, and has a carbonizing capacity of 48 tons per twenty-four hours. A good deal of attention was and is being paid

to the problem of carbonization in large bulk, notably in Germany; and there are now plants of quite a number of makers and of various designs on the market.

The rapidity of expansion of the system may be gathered from the fact that to-day there are eleven installations at work, with a daily carbonizing capacity of about 640 tons of coal; and chambers of various systems, of an aggregate carbonizing capacity of over 2000 tons, are in course of construction. Most of these are expected to commence working before the end of this year.

Particulars, as far as these are available, in respect of these plants are compiled in the accompanying table (Appendices II. and IIA.); but with regard to the results given, the very short period of operation must be borne in mind. It will be gathered from the table that the results of all systems seem to be of approximately the same character—viz., a make of gas of about 12,000 cubic feet per ton of coal carbonized, of a net calorific value of about 550 B.Th.U. The coke yield would be somewhere near 15 cwt. per ton, and its quality practically equal, or not much inferior, to metallurgical coke. With a fair yield of ammonia is combined the production of a light tar, containing very little free carbon.

Most of the works which have adopted chamber settings are situated in Germany, with two in Austria, one in Holland, one in France, and two in Italy. The majority of these chambers are inclined, as in the original Munich type; but horizontal and vertical chambers are also being built.

The advantages and disadvantages of the chamber system, I have discussed in my paper. It may therefore suffice to mention here that the system seems to yield all the advantages which, it is now generally accepted, attach to the carbonization of heavy charges. Against these stand the drawbacks of a comparatively low illuminating power and a rather higher initial capital outlay, although this latter point is compensated to a certain extent by the economies of working and the longer durability expected.

In this country, Mr. Thomas Glover, of Norwich, the President of the Institution, has patented and erected a plant which is intended to combine the advantages of the horizontal retort with that of the large-space chamber. His chamber retort is capable of carbonizing about 21 cwt. of coal in twelve hours. The yield is about 12,300 cubic feet per ton of Yorkshire small coal, of a gas of about 15 candles and 500 B.Th.U. net. The coke produced is much superior to ordinary gas coke; and the yield of bye-products is quite satisfactory. The chambers are charged by a "De Brouwer" projector and discharged by a "Jenkins De Brouwer" ram. If these results are maintained in extended working, the system has much to recommend it, more especially for the smaller and medium-sized works.

Experiments with inclined chambers of a capacity varying from 15 to 25 cwt. per chamber are being carried out by Mr. Johnston at the Brentford Gas-Works. Considerable interest should attach to the outcome of these trials, as attempts are made to guide the travel of the gas through the charge in a direction most conducive to obtaining a high quality, by providing a vertical partition wall, which, by means of suitable recesses, collects the gas in the centre of the charge.

HORIZONTAL AND INCLINED RETORTS.

To characterize the feeling on the Continent with regard to the ordinary types of carbonizing plant, I think I cannot do better than quote from the replies of two of the leading German firms to independent inquiries submitted to them. One firm writes:

The systems of horizontal retorts with charging and drawing machines and of inclined retorts have been overtaken by the systems of vertical retorts and chamber settings to such an extent that we should like to refrain from communicating any results relating to the former.

The other observation is as follows:—

Besides these large type chamber settings, I have been adapting same to smaller gas-works, and am building one for trial to be worked and served by hand (to the order of a German gas works) which will be under fire shortly. Should this latter type prove successful, then there is no doubt that in this country at any rate, retort-furnaces have seen their best days.

To fully appreciate the serious meaning of these remarks—made absolutely independent of each other—it might be well to state that both firms are makers of ordinary retort plants in a large way, both having a great number of specialities of patented devices, and should be expected to be pushing along the lines in which their organization has proved successful.

It may be added that in Germany mechanical manipulation of horizontal retorts has never found as much favour as in this country. During the last few years, previous to the introduction of verticals and chambers, the more important works had been adopting inclined retorts when re-erecting or extending plant.

Progress in Great Britain.—The position in this country with regard to what I may term ordinary plant is a rather different one. For various reasons the most recent systems of carbonization have not been adopted to a considerable extent by English gas-works. On the other hand, engineers have found ways and means to very much improve their methods, and to lessen the cost of production.

The more clumsy types of charging and drawing machines for horizontals have given way to very efficient machines of high capacity. The tendency seems to be to combine both operations in one stroke; and as a very successful specimen of this type, the Fiddes-Aldridge machine deserves mention. The cost of carbonizing has been reduced by the employment of this machine to 8d. (from coal into breaker to coke outside retort-house) at the Linacre works of the Liverpool Gas Company, and to 7½d. (at Metropolitan rate of wages) at one of the stations of the Gaslight and Coke Company. During 1908, eight, and during the first months of 1909, fourteen, of these machines have been installed or are building, out of a total of 28 so far supplied.

Messrs. West have also under construction for the Aarhus Gas-Works in Denmark a simultaneous charging and discharging machine electrically driven.

The De Brouwer projector has been adapted by Messrs. W. J. Jenkins and Co., of Retford, to the charging of coke-ovens and chamber retorts.

The development of the mechanical manipulation of horizontal retorts is the more important, as there is an undoubted tendency in various quarters to work these with heavier charges and less vacant space between the coal and the crown of the retort.

This tendency—most likely influenced by the experience with fully-charged vertical retorts—is very remarkable, and yields, in practice, interesting and useful results. Though the movement has not yet become general, it is likely to gain ground as the reduction in illuminating power goes on.

A set of very exhaustive investigations which Mr. J. Ferguson Bell has carried out at the Derby Gas-Works in regard to heavy charges in horizontal retorts will be communicated at the forthcoming meeting of the Institution.

Low Temperature Carbonization.—During last year, a plant of two benches has been erected on the premises of the Plymouth and Stonehouse Gas Company to work the "Coalite" process; and a third bench is being built. Each bench consists of 32 castings of twelve tubes; each casting taking a charge of 6 cwt. of coal, or ½ cwt. in each tube. The plant has been in operation since the middle of February. At a recent test with Barnsley coal, 4951 cubic feet of gas were made per ton, having an illuminating value of 20·3 candles in the jet photometer. The bye-products produced are about 22 gallons of tar rich in light oils, 15 lbs. of ammonium sulphate, and 12 cwt. of "Coalite" per ton.

The introduction of retort-house governors makes steady progress; their value in maintaining the uniform pressure inside the retort, and consequently favouring the production of a more uniform gas, being highly appreciated.

One factor which must not be lost sight of when considering economic advances is the successful introduction of up-to-date coal and coke conveying plant, which is to a very large extent responsible for reductions effected in carbonizing costs.

In considering the progress in different countries, I regret to be almost exclusively confined to what has been done in Great Britain and Germany. Several French firms who were approached seem to feel rather reluctant in furnishing information. It was not deemed necessary to gather information from other European countries; most of their plants being of either British or German origin or design.

For the collection of material from the other side of the Atlantic, I was unfortunately prevented through lack of available time.

I have in these lines confined myself to the practical aspects of carbonization. But I think it only right to draw attention to the studies in coal carbonizing by Mr. R. Forbes Carpenter, to which another excellent piece of research has been added in this year's "Alkali Report," which has been published during the passage through the

plate gangway, with handrail in front, is fixed directly over the centre of the bridge-pipes to afford easy and safe access to the pipes, fittings, and valves.

The author's experience with 8-inch diameter ascension-pipes on one side of the bench only is that this is preferable to ascension pipes on both sides, as with through retorts towards the end of charge, when little gas is being made, the gas generally all goes up one pipe, with the result that the other gets hot and dry—tending to cause stopped pipes.

The ascension pipes should preferably be fixed on the charging side, as when the gas is taken off on the discharge side, the coke is liable to be deteriorated by tarry matters on the mouthpieces.

Each dip-pipe is fitted with Simmond's patent anti-dip valve, opened and closed by a weighted lever operated by vertical down rods, which on being released close the valve—converting it into ordinary water-sealed dip-pipe.

Perhaps a brief description of Simmond's anti-dip valve will be of interest, as it is not so well known as it deserves. It consists of a faced slide-valve on the side of the dip-pipe, which when full-open gives an area of 48 square inches, allowing the gas to pass from the retort direct into the hydraulic main without increase of pressure or oscillations such as occur when dip pipes with even only light seals are used, with *minus* pressure in the hydraulic main. The slide that covers the port of the valve as it descends wedges against the valve face, and forms a gas-tight joint. The

short connecting rod from the lever that actuates the valve passes through a stuffing-box gland bolted on top of the hydraulic main, the flange of which is made large enough to cover the hole in the top of the main through which the anti-dip valve may be passed; so it is an easy matter to take out the valve and clean or replace it with another. It will be seen from fig. 7 that the whole forms a neat and compact arrangement. For nine months 80 of these anti-dip valves have been continuously at work on ten beds of retorts, without trouble of any kind. The simplicity and non-interference with the gas-way, along with the ease with which any retort may be worked under hydraulic seal or free gas-way, will commend these anti-dip valves.

The hydraulic main is in one length for the eleven beds, with division plates to isolate each setting, with separate gas take-offs. The whole of the gas-valves are fitted with Drory's indicators; and the tar is removed by means of Dillamore tar-columns at each end of the bench.

Mr. Charles Carpenter's retort-house governors, of the enclosed type, control the suction on the 18-inch diameter foul-gas main; and the author finds that the combination of Mr. Simmond's anti-dip valves with these retort-house governors adds to the efficiency of working and gives improved carbonizing results.

The quantity of carbon formed on the inside of the retorts worked with anti-dip valves is less than one-half that formed on retorts worked with light seals. In the former instance,



Photograph No. 1—Waggon Tipper for Unloading Coal at the Litchurch Gas-Works, Derby.

scurfing once in three months and in the other once every six weeks is sufficient to keep the retorts clear of carbon—it being allowed to accumulate only about $\frac{1}{4}$ inch to $\frac{1}{2}$ inch in thickness. One retort out of 88 is allowed to stand each day for scurfing.

As already mentioned, special provision is made for dealing with stopped pipes—the *bête noire* of carbonizing. But up to the present there has not been a single stopped pipe, and the whole of the carbonizing plant has worked smoothly without hitch or trouble of any kind.

The retorts are charged by a "De Brouwer" projector and are discharged by a "Jenkins De Brouwer" pusher. Both travel on one side of the house and are capable of easily operating double the number of retorts at present installed. The intention is to add later another eleven settings.

The coal is unloaded by means of a waggon tipper, which lifts up one side from underneath, and the end door of the waggon being released, the coal slides out into a 12-ton hopper fixed below the rails. Photograph No. 1 shows a 12-ton waggon being unloaded. The coal in the hopper is fed by an automatic feeder into a 40-ton per hour coal breaker. By this means the breaker and elevator are regularly fed, which is of importance; and the coal breaker is made perfectly safe when working.

A 50-ton per hour bucket elevator delivers the broken coal on to a push-plate conveyor, which fills the overhead coal storage hoppers of sufficient capacity to hold 24 hours' supply, as shown by fig. 4.

The power required to operate the waggon tipper, coal breaker, bucket elevator, and push-plate conveyor, is obtained from a 43 H.P. "National" gas engine.

The De Brouwer projector and pusher are propelled and operated by electric motors; the current being generated by a belt-driven direct-current dynamo driven by a high-speed gas-engine.

The coke is discharged by the pusher into a De Brouwer hot-coke conveyor, which runs in front of the settings. This differs from the ordinary type of hot-coke conveyor, in that it is enclosed; so that when the conveyor is not at work, the top forms a chequered plate platform in front of the bench. On each side of the furnace, central with each tier of retorts, are strong double doors. These, when open, form an inclined shoot to direct the hot coke into the conveyor. Photographs Nos. 2 and 3 give a view of each side of the retort-bench. These, along with the outline drawings will, without further description, give to the members a clear idea of the carbonizing plant.

The coke as it travels is quenched, and passes up an inclined conveyor at the end of the house; thence on to a jiggling screen; and then on to a horizontal conveyor that delivers it on to inclined shoots, fitted with loose swing-doors to break the fall of the coke into overhead storage hoppers, from which carts or railway trucks are loaded. Photograph No. 4 shows a view of the coke conveying and screening plant which is worked by a 22 H.P. "National" gas-engine fixed at the end of the retort-house.



Photograph No. 2—View of the Charging Side of the Retort-Bench, Litchurch Gas-Works, Derby.

WORKING COSTS.

Much diversity and confusion often arise when costs of carbonizing are given for working various types of retort-settings, either for manual labour—which is laborious and trying—or when operated by machinery with the necessary adjunct of coal and coke handling plants. Some include items which form only part of the costs chargeable to the retort-house, whereas others include all kinds of diverse items, which although perhaps reasonable to be charged under this head, unless explained, render any comparison misleading.

The author desires to state explicitly that the costs stated are the actual expenses incurred over the past six months for working ten through settings—being 80 retorts in all, or 160 mouthpieces. They include all outlays which are or should be charged to carbonizing—such as the unloading of coal from railway waggons by means of a wagon tipper, attending to the coal breaker, elevators, and conveyors, gas-engines, coke conveyors, operating the De Brouwer projector and pusher for charging and discharging retorts, opening and closing retort-lids, jacking pipes, running-off tar from tar towers and flushing out hydraulic mains, cleaning mouthpieces and retort-house, scurving retorts, clinkering and all attention to furnaces, wheeling-out clinker, and all labour upon coke to its being deposited either into overhead storage hoppers or coke store. In other words, the labour charges

are inclusive of everything from coal out of waggons to coke into store. The whole of this work is easily performed by five men per shift, and two shifts are worked per diem; the work being arranged so that the men have ample time for meals, and get away each afternoon or morning about 4.30. They start work at 6 a.m. or 6 p.m.

The retorts are worked at a moderate heat, which prolongs the life of the settings; the coal being carbonized at the rate of one cwt. per hour per retort—small coal and slack generally being used. When working six-hour shifts, 6 cwt. charges are put in; eight-hour shifts, 8 cwt. charges; 10-hour, 10 cwt.; and 12-hour, 12 cwt. When working 6 cwt. charges, an extra man is added to each shift.

There is no difficulty in filling up the retorts by means of the De Brouwer projector, and heavy charges of 12 cwt. will push out almost as easily as the lighter charges, provided that the coal is properly carbonized.

The coal carbonized by these ten beds amounts to from 95 to 100 tons per diem, and the cost for carbonizing, which includes all retort-house labour as mentioned, is for six-hour charges 7½d. per ton, and for eight-hour, ten-hour, and twelve-hour charges, 6½d. per ton. When working the whole bench, which comprises eleven beds, the cost for six-hour work is just under 7d.; and for the longer and heavier charges, 6d. per ton of coal carbonized.

When working six beds at the Cavendish Street works,



Photograph No. 3—View of the Discharging Side of the Retort-Bench, Litchurch Gas-Works, Derby.

carbonizing 60 tons of coal per diem with a De Brouwer combined stoking machine—without hot-coke conveyor—with six-hour charges, the average cost inclusive of coal from carts or stores to coke into store (thrown up a height of 10 feet, if necessary) is 10d. per ton of coal carbonized.

In these figures the wages of the boiler and exhaustor men or works foreman are not included, or any other payments than those stated.

The author's experience in working this type of stoking machinery over the past five years is that the cost of repairs and maintenance is small; the machines are reliable and easily operated; and the wear and tear upon the retorts is less than with hand charging and drawing, which is an important point.

The gas used by the high-speed gas-engine to drive the belt-driven dynamo generating current to travel and operate the charging and discharging machines averages 2000 cubic feet per 100 tons of coal carbonized; for waggon tipper, coal breaker, elevator, and scraper conveyor 1800 cubic feet; and for hot-coke conveyor, jigging screen, and scraper conveyor on top of overhead coke storage hopper, 1200 cubic feet. Thus the gas used for power required to operate the stoking machines and coal and coke handling plants averages 50 cubic feet per ton of coal carbonized, which at 1s. 6d. per 1000 cubic feet, is 0'9, or (say) 1d. per ton of coal carbonized.

The cost of the installation complete, as shown in the various illustrations (exclusive of the retort-house—comprising the retort-bench, eleven Klönne retort-settings, steelwork, retort-bench mountings, overhead coal and coke storage hoppers, waggon tipper, coal breaker, elevator, conveyor, hot-coke conveyor, 42 and 22 H.P. gas-engines, fixing same, elevator pit, &c.), is £12,500, and for the twenty-two settings complete the amount will be £20,000.

CARBONIZING RESULTS.

The tests given are the results obtained with the time of carbonizing varied from six to twelve hours' duration, and the weight of charges from 6 cwt. to 12 cwt., and also in each case the results are those obtained from similar quality of coal such as may be classed seconds or ordinary Derbyshire with 25 per cent. of good rough Derbyshire coking slack added; the author being of opinion that trials carried out with the lower grades of coal would be of more value than if South Yorkshire or other high-class gas coals had been used, although the results obtained are of course correspondingly lower. There is little doubt that it is to the lower grades of coal that gas makers will in future require to turn their attention. For the purpose of comparison, the results are given of tests made with the better class of Yorkshire screened coal and small gas nuts, and slack.

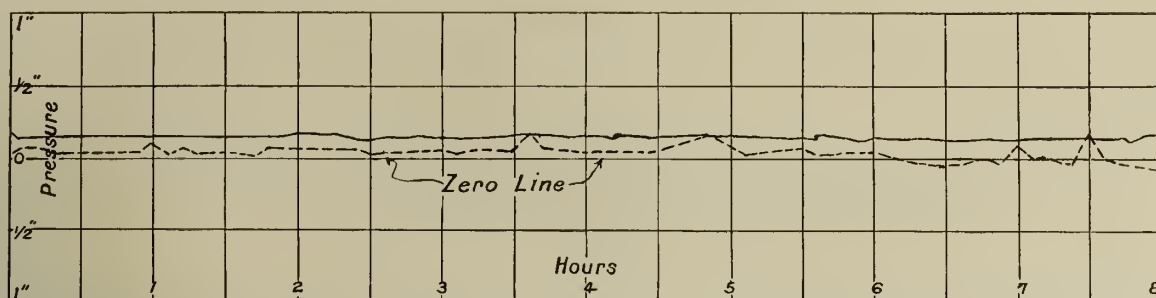


Diagram of Pressures when Working with Carpenter's Retort-House Governor and Simmonds's Anti-Dip Valves.

[The unbroken line shows the pressure at the top of the ascension-pipe; the dotted line, that at the bottom.]

Care was taken to work all retorts under a slight *plus* pressure; so that there would be only coal gas, not a mixture of coal gas *plus* spent furnace gases, which are simply harmful diluents.

So that the conditions may be known under which the coal was carbonized, a pressure chart is given which shows, in tenths of an inch water column, the pressure of gas in the collecting main with Carpenter's retort-house governor, and also inside the retorts with Simmonds's anti-dip valves, open during the whole period of an eight-hour charge.

The readings were taken simultaneously every minute with a King's gauge indicating one-hundredths of an inch pressure or vacuum. It will be noticed $1\frac{1}{2}$ -tenths pressure on the top of the ascension pipes gives $\frac{1}{2}$ -tenth *plus* pressure to zero inside the retorts. The pull on the outlet of the retort-house governors was maintained at between 3 and 4 inches vacuum; the inlet at $1\frac{1}{2}$ -tenths of pressure. The variation during the eight hours was less than one-tenth of an inch, as shown by the firm line on the pressure chart. The dotted line indicates the pressure inside the retorts. The slight variations are due to the times of charging; and, as will be seen, the retorts are worked if anything on the pressure side.

Retorts are much more porous than many think, with the result that pressure on the retorts during the early part of the charge may mean loss of the richest gas, and vacuum serious depreciation when the gases coming away are the poorest.

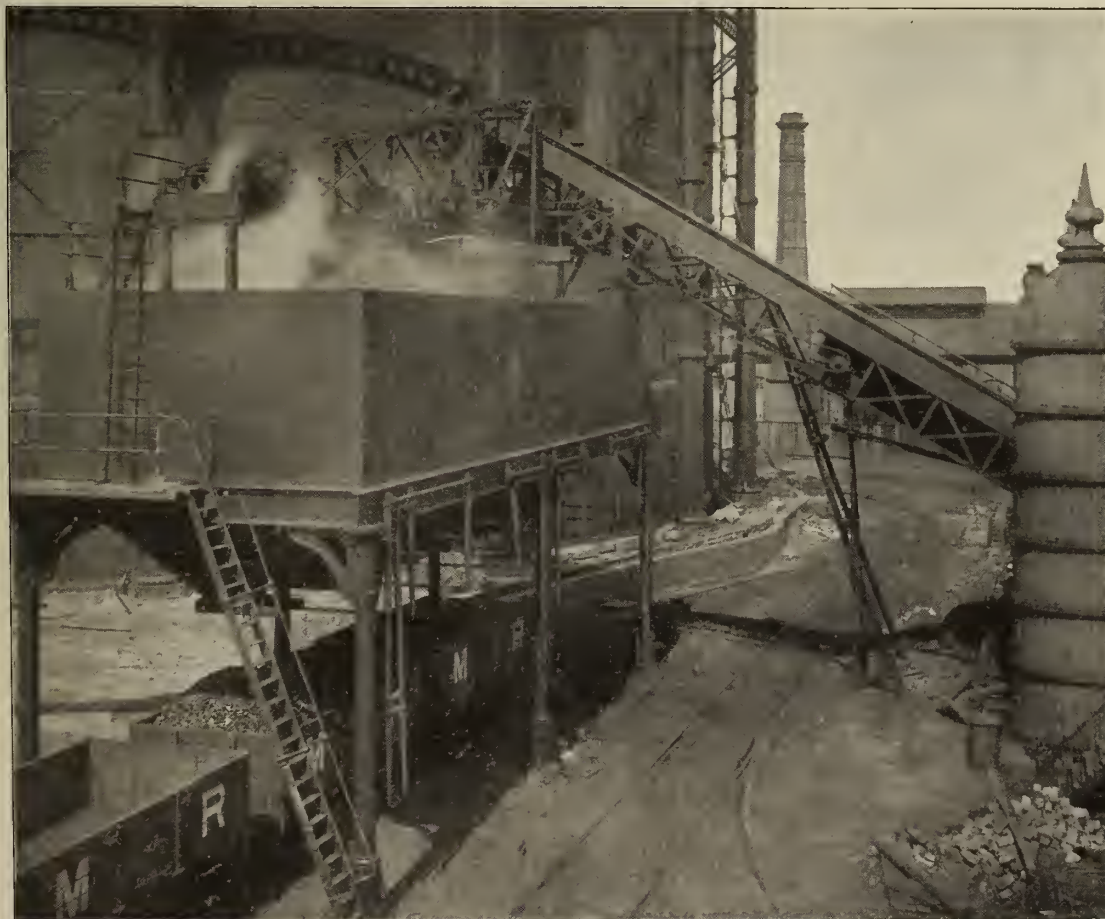
Pressure measured in tenths or hundredths of an inch,

unless taken with sensitive gauges fixed close to their work, are apt to be misleading; and when working with anti-dip valves, it is most important to be in a position to know exactly the pressure or vacuum inside the retorts during the whole period of carbonization.

BYE-PRODUCTS.

The proportion which the secondary products of gas-making contribute to the revenue has, during the past decade, undergone considerable variation; and their value will no doubt continue to fluctuate in the future. While it is impossible to control prices, the production and utilization of bye-products is in a measure within the power of those responsible; and much depends upon turning them to profitable account. The author's experiments were partly undertaken to ascertain what effect varying the weight and the period of carbonization had upon the production of the residual products.

Gas-Coke.—This is now the most important of the bye-products, and although any endeavours towards improvement of its quality must, within certain limits, so far as gas makers are concerned, be subordinated to the main end of obtaining the maximum yield of gas of highest illuminating power (or perhaps rather calorific value) from the coal carbonized, the value of this fixed residue of coal distillation is of such importance that in districts favourably situated, it may return as much as one-half of the cost of the coal. Hence any appreciable improvement in the quality of the



Photograph No. 4—The Coke Screening and Storage Plant at the Litchurch Gas-Works, Derby.

admixture of 25 per cent. of good coking slack be made to produce a better all-round coke.

The slight packing of the coal in the retorts makes the coke produced more dense and less friable. The particles lie more closely together, which tends to fusibility; and this, with a longer period of carbonization, produces coke of more uniform quality and better appearance, upon which much depends.

The author's experiments with charges of six, eight, ten, and twelve hours duration—the weight of charge being varied directly proportional to the time of carbonization—prove conclusively that heavy charges, by which the period of distillation is prolonged, are a means whereby a higher grade of coke is produced, the colour is brighter and more lustrous, and the coke is more dense and less friable—of great importance if it has to be transported any distance.

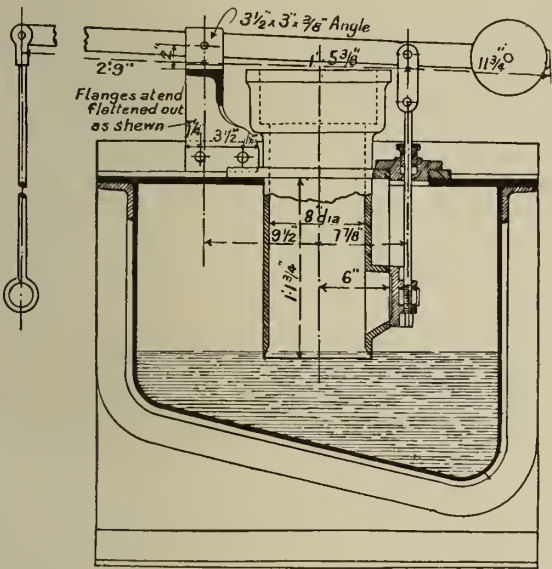


Fig. 7.—Sectional Elevation of the Simmonds Valve Dip-Pipe.

Below are analyses of coke produced from medium Derbyshire coal, mixed with 25 per cent. of good rough Derbyshire slack, carbonized in periods of six to twelve hours:—

Duration of Charge.	Weight of Charge.	Carbon.	Volatile Matter.	Sulphur.	Ash.	Moisture	Real Specific Gravity.
6 hours	Cwt. 6	84'40	1'06	1'89	11'98	0'03	1'598
8 "	8	81'43	0'75	1'94	9'65	1'97	1'540
10 "	10	86'78	2'67	1'76	8'64	0'64	1'658
12 "	12	86'21	2'30	1'75	9'81	0'54	1'686

It will be noticed from the percentage of ash present in the coke that the coal from which it was produced is, as stated, of only medium quality—in fact, with four or five hour charges it would entail great loss in consequence of being so soft and crumbling up into breeze. As would be expected, with more drastic carbonizing, the sulphur present decreases, and there is a decided increase in the specific gravity as the weight and duration of the charges are increased.

The experiments indicate that heavier charges with longer periods of carbonization produce a more dense and improved quality of coke, better suited for many trade purposes. But it should be borne in mind that if the coke is very hard and dense, it is more difficult to kindle, and not so well adapted for domestic use.

The results obtained from 24 hours' experimental tests of coke made for sale and used on the furnaces, per ton of coal carbonized, are as follows:—

Coke Made for Sale.

Duration of Charges.	Large Screened Coke.	Small Screened Coke.	Screened Breeze.	Coke Dust.	Total.
6 hours	7'69	2'06	1'96	0'54	12'25
8 "	8'07	1'87	1'80	0'42	12'16
10 "	8'27	1'81	1'59	0'41	12'08
12 "	8'55	1'79	1'33	0'37	12'04

Coke Used on Furnaces.

Duration of Charges.	Cwt.	Percentage of Coke Made.	Pounds of Coke per 100 lbs. of Coal.
6 hours	1'89	15'35	10'24
8 "	1'95	16'04	11'23
10 "	2'10	17'39	12'17
12 "	2'13	17'61	12'32

From the above summarized returns, it will be seen that the quantity of large coke for sale increases with the duration of the charges; and that there is less breeze made, due to the coke being harder and less friable. It appears that with larger and heavier charges of longer duration the percentage of coke used in the furnaces somewhat increases.

Ammonia.—Numerous processes have been devised for the production of NH₃ by synthetic and other methods; but so far these have not proved remunerative, though at Notoddes, in Norway, large works are being erected for the manufacture of nitrates from the atmosphere by the Birkeland-Eyde process, by means of electric flame chambers in which the temperature exceeds 3000° C. The nitrous gas produced is converted into nitrate of lime containing about 13 per cent. of nitrogen.

However, up to the present the principal sources of supply are from gas-works, coke-ovens, and shale and iron works; but by far the largest contributors is still the gas industry. Last year the total production of ammonium sulphate in the United Kingdom was 317,000 tons, of which gas-works contributed 165,000 tons. Hence this bye-product is not only of great importance, but so far is fortunately a profitable one, as it may yield a return of over 2s. per ton on the coal carbonized.

Derbyshire gas-coals generally contain from 1 to 1·3 per cent. of nitrogen in a form favourable to the production of ammonia during the process of destructive distillation. Unfortunately, only about one-fifth is recovered in saleable form, as, under the conditions prevailing, serious loss occurs through dissociation, and destruction of ammonia by decomposition after formation, due to the temperature of carbonization, with the result that more than twice the quantity obtained as ammonia appears as nitrogen in the gas, one-half or more remains in the coke, a small proportion forms cyanogen compounds, and there is also some in the tar.

The results obtained by varying the weight and period of carbonization are given below, and obviously will vary with the quantity of nitrogen in the coal, the temperature of distillation, and conditions prevailing:—

Ammonia Obtained per Ton of Coal Carbonized.

Duration of Charges.	In Virgin Liquor.	Condensed from Drain Boxes and from Tar.	From the Gas.	Total Ammonia.	Nitrogen in the Coal Recovered.
	Lbs.	Lbs.	Lbs.	Lbs.	Per Cent.
6 hours	4'03	0'35	2'88	7'26	0'216
8 "	4'26	0'39	3'61	8'26	0'245
10 "	4'40	0'50	3'55	8'45	0'248
12 "	4'30	0'42	3'68	8'50	0'253

The experiments indicate that slower carbonization tends towards an increase in the production of ammonia, there being an increase of over 17 per cent. between charges of six and twelve hours duration.

Coal-Gas Tar.—Obviously, upon the kind of coal carbonized depends the condensable hydrocarbon distillates, which are of extremely complex nature, grouped under the generic name of tar. In addition, this bye-product varies with the time and temperature of carbonization. In order to differentiate between the various kinds of tar now produced from various sources, it is advisable to designate the product from gas-works as coal-gas tar. Although the return for this valuable product is not at present commensurate with its importance, it seems to the author that it might be worth while to grade the tars produced so as to sell them to better advantage. For instance, it is probable that a large demand for tar will arise for road-making; the special quality required being that it will easily set and bind the road materials together. For this purpose the more easy condensable and heavier tars are the most suitable, which means the hydraulic main tars freed from water.

It is well known that if the supply of any product exceeds only slightly the demand, prices are depreciated out of all proportion to the amount of the surplus. This is, unfortunately, the case with coal-gas tar at the present

time, with the result that the return obtained for this by-product is only about 1s. per ton of coal carbonized.

Below are the results obtained by carbonizing similar coal under the same conditions as those already given for make of coke and ammonia:—

Tar Made per Ton of Coal Carbonized.

Duration of Charge.	Hydraulic Main and Condensers.		Tar Extractor and Drain Boxes.		Total.
	Gallons.	Specific Gravity.	Gallons.	Specific Gravity.	
6 hours.	9'68	1'192	0'96	1'126	10'64
8 " "	10'01	1'173	1'70	1'118	11'71
10 " "	10'20	1'168	2'15	1'110	12'35
12 " "	10'55	1'160	2'29	1'108	12'84

It is noticeable that with heavier charges of longer duration the quantity of tar produced is greater, and found to be lighter and much thinner, and in addition, the gas leaving the condensers carries forward a larger quantity of light, tarry matters—to be removed by the tar extractor.

The author has not been able to fractionate, by distillation, the four samples of tar produced; but the firm of tar distillers who take the tar have remarked upon it being thinner, and that it contains more light oils than formerly.

GAS MADE.

Variation in Make and Quality of Gas.—In order to determine the quantity and quality of gas given off as the process of distillation proceeds, 32 retorts were all charged within one hour with about 8 cwt. of coal in each; the heat of the retorts being regulated for eight-hour charges. The gas made was isolated, separately measured, and tested each half hour for illuminating power, calorific value, sulphuretted hydrogen, bisulphide of carbon, and carbonic acid. The results that were obtained are given in Appendix I.

During the first four hours the gas is given off at a fairly even rate. But the quality gradually declines from 19'49 to 14'40 candles; and over the next four hours from 14'40 to 5'56 candles. If distillation be continued for another hour-and-a-half, the gas produced is only of about two candles, and the calorific value is down to 52'7 calories. Thus if the carbonization is carried beyond a certain limit, the effect is only a small gain in quantity at the expense of the quality. For instance, during the extra 1½ hours that carbonization is prolonged, the gain in candle feet is only 1'6 per cent. of the total, whereas the reduction in candle power is over 7 per cent.

The reduction in candle power from 19'49 to 5'56 candles or less, and in calorific value from 162'6 to 73'4 calories

per cubic foot at the beginning and the end of the period of distillation, will indicate the importance of regular charging at short regular intervals, so that the gas made may be of uniform quality.

It will be observed that the calorific value is relatively higher per candle for the lower candle power gas, even with the No. 2 "Metropolitan" test-burner; but if tested with the old No. 1 "London" burner, which unduly depreciates all gas of a lower quality than 18 candles, the detraction increases as the candle power decreases. The difference is very striking.

The author expected to find the carbonic acid, sulphuretted hydrogen, and bisulphide of carbon to increase relatively to the gas made towards the end of the period of distillation; but this does not appear to be so. The carbonic acid is fairly regular throughout, so long as the retorts are worked upon the pressure side; but a slight vacuum, especially towards the end of the period of distillation, rapidly increases the percentage of carbonic acid present. The sulphuretted hydrogen is highest during the first hour, and the bisulphide of carbon during the fourth and fifth hours. But later on both these impurities appear to relatively decrease.

Charges of Six, Eight, Ten, and Twelve Hours' Duration.—On the chart is plotted the gas made, candle power, net calorific value, and impurities present in the crude gas each hour during trials of six to twelve hours' duration. The temperature of the retorts was as near as possible kept equal for each trial; and the gas made, quality, and impurities tested each hour over the whole 24 hours.

The four lines on the top of the diagram indicate the gas made each hour during the tests. Both horizontal and vertical small divisions represent 2000 cubic feet; so that each wave-line depicts the actual variation in the gas made from hour to hour, and the same applies to candle power and calorific value.

The make of gas per hour and candle power are most regular with six-hour charges, and appear to vary most as the time of carbonization is prolonged—due no doubt to the periods between the times of charging being longer. On the chart (which is reduced from larger diagrams made to indicate variations in make of gas and candle power), it is interesting to observe a series of reverse curves. As the make increases so the candle power decreases, and the calorific value curve follows to some extent the candle power curve, showing a certain relation between the two.

It will be seen from Appendix II., which gives a summary of the results obtained, that so far as total sperm value is concerned, it appears to make little difference, whether the coal is carbonized during six, eight, ten, or twelve hour periods. With the lighter charges and the shorter time of

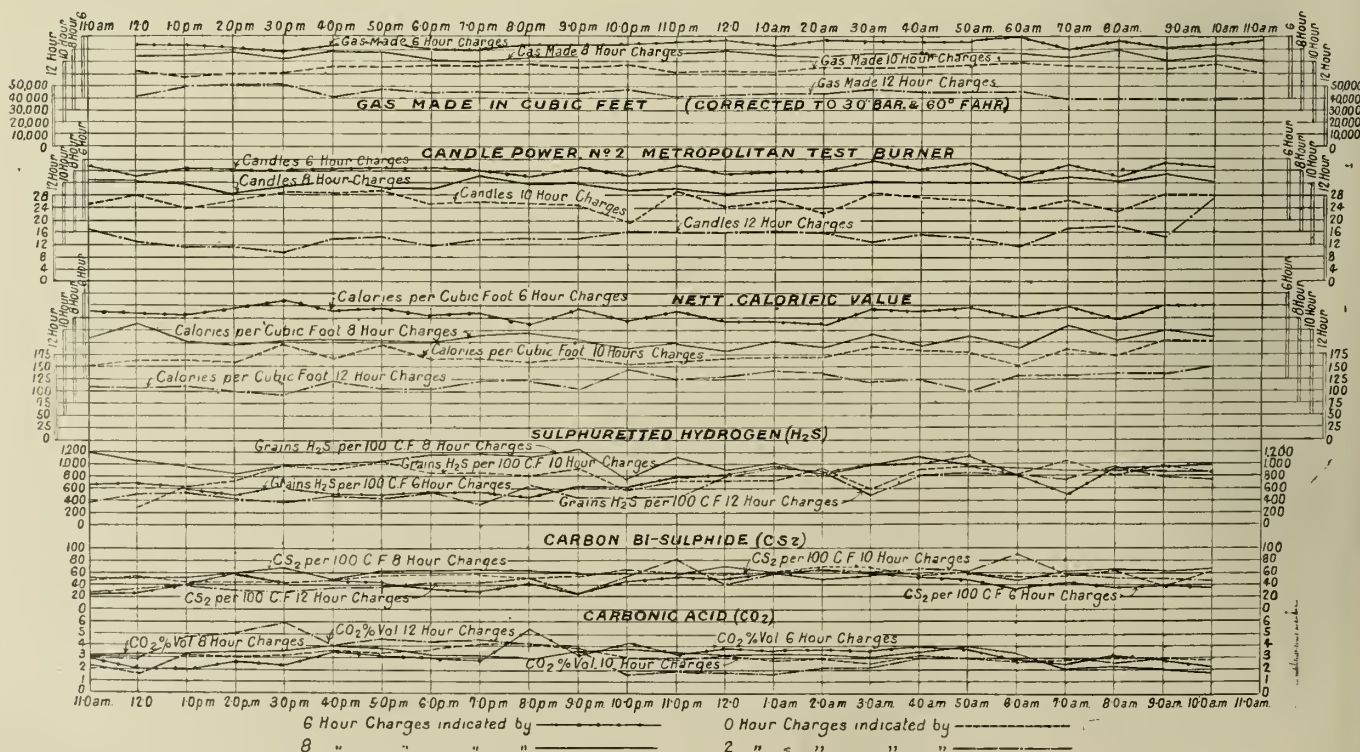


Chart Showing Gas Made, Candle Power, Net Calorific Value, H₂S, CS₂, and CO₂ present in Crude Gas each Hour.

carbonization, the quantity of gas made is less, but the candle power is higher; and with the longer periods, the make increases while candle power decreases.

It is surprising to find so little variation in the total carbonic acid present in all four tests. The average difference is only 3·10 to 3·25 per cent. by volume in the crude gas.

There do not appear to be any definite deductions to be drawn from the sulphur impurities present—only to remark that in all four tests, when the quantity of sulphuretted hydrogen given off is greatest, then also the bisulphide of carbon is highest.

The naphthalene is considerably less in quantity in the purified gas (without special treatment for this troublesome constituent) when working heavier and longer charges. It is on an average about 50 per cent. less—due no doubt, to some extent, to the solvent action of the lighter tarry vapours.

The results are given of 24-hour trials with eight-hour charges of high-class Yorkshire Silkstone coal with the fine slack removed, small nuts, and rough slack, so far as make of gas, candle power, and coke produced are concerned.

Yorkshire Silkstone Coal.	Gas Made per Ton of Coal 30" Band 60° Fahr.	Illu- minating Power, No. 2 "Metro- politan" Burner.	Sperm Value Per Ton of Coal.	Coke and Breeze Per Ton of Coal.			
				Large Coke.	Small Coke.	Coke Breeze.	Coke Dust.
	Cub. Ft.	Candles.	Pounds.	Cwts.	Cwts.	Cwts.	Cwts.
Screened . .	12,788	16'25	712	10'49	0'63	0'49	0'32
Small nuts .	12,544	15'35	660	9'77	1'40	1'28	0'39
Rough slack .	12,607	15'00	648	9'51	1'79	1'08	0'32

The above returns are not from the highest class of Yorkshire silkstone, which gives over 13,000 cubic feet per ton of 16½-candle gas, but from such coals as can be readily obtained at moderate prices.

The experiments indicate that heavy charges with longer period of carbonization tend to give higher and better results from the coal, more especially as regards the yield of bye-products; and the author feels that the subject is one well worth more extensive and closer investigation than he has been able so far to give it.

APPENDIX I.—Quantity and Quality of Gas Produced each Half-Hour from 32 Retorts, "D" Section, 22 in. by 16 in. by 18 ft. through, all charged simultaneously with about 8 cwt. of Medium Quality Derbyshire Gas Coal and 25 per cent. of Slack added.

Time.	Gas Made each Half-Hour.	Candle Power by No. 2 Metropolitan Test Burner. Candles.	Candle Feet Produced each Half-Hour.	Calorific Value.		Calories per Candle.	CO ₂ Per Cent. by Vol.	SH ₂ per 100 Cubic Feet. Grains.	CS ₂ per 100 Cubic Feet. Grains.
				Gross Cal.	Nett Cal.				
1.0	4,100	18'57	15,228	175'7	161'2	8'68	3'4	911	45'6
1.30	9,900	19'49	38,590	167'2	155'1	7'95	3'0	1005	31'6
2.0	10,200	18'26	37,250	177'6	162'6	8'90	3'0	969	44'0
2.30	9,700	18'22	35,347	150'0	136'9	7'51	3'0	770	41'6
3.0	9,500	17'02	32,338	152'7	141'8	8'33	2'9	..	48'2
3.30	9,500	15'47	29,393	136'4	125'9	8'14	3'4	456	58'7
4.0	9,600	13'05	25,056	127'6	117'7	9'01	4'5	613	59'5
4.30	9,600	14'33	27,513	118'8	110'1	7'68	4'0	1413	57'4
5.0	8,500	15'40	26,180	117'7	110'3	7'16	3'2	524	54'3
5.30	7,700	14'05	21,637	121'0	113'7	8'09	3'0	681	65'0
6.0	7,500	12'93	19,395	121'2	112'4	8'69	2'4	702	65'0
6.30	7,100	12'58	17,864	113'3	105'5	8'38	2'6	544	55'5
7.0	7,200	10'76	15,492	109'0	100'6	9'35	3'0	424	65'8
7.30	6,600	9'92	13,094	95'9	88'1	8'88	3'0	471	63'2
8.0	4,800	7'35	7,056	88'7	82'3	11'20	3'6	407	48'5
8.30	4,800	7'86	7,545	86'4	79'2	10'08	3'4	340	32'0
9.0	5,400	5'56	6,005	79'7	73'4	13'20	4'0	440	28'0
9.30	3,200	4'55	2,912	68'1	62'1	13'65	..	..	..
10.0	3,800	2'03	1,543	52'7	49'1	24'18	..	..	..
10.30	4,700	1'73	1,626	..	..	..	..	..	..
	143,400		381,064						

APPENDIX II.—Summary of Results Obtained from Medium Derbyshire Gas Coals with 25 per cent. of Good Rough Derbyshire Coking Slack Added with Charges of 6, 8, 10 and 12 Hours' Duration.

Duration of Charges.	Number of Retorts.	Average Weight or Coal per Charge.	Gas Made per Ton of Coal 30" Bar. 60 F.	Candle Power No. 2 Metropolitan Test Burner.	Gas Made per Retort 22 ins. by 16 ins. by 18 ft.	Sperm Value per Ton of Coal in Lbs.	Calorific Value of Gas,		Impurities in Crude Gas.			Coke per Ton for Sale,		Tar per Ton of Coal.	Ammonium Sulphate per Ton of Coal.
							Calories per Cubic Foot.	Calories per Cubic Foot.	CO ₂ per cent. Volume.	SH ₂ per 100 Cubic Feet in Grains.	CS ₂ per 100 Cubic Feet in Grains.	Coke.	Breeze.		
		c. q. Lbs.	Cubic Feet.		Cubic Feet.		Net.	Gross.				Cwts.	Cwts.	Gallons.	Lbs.
6 hours.	80	6 0 20	10,594	16'31	13,090	592	135'75	149'8	3'20	736	43'40	9'75	1'96	10'64	29
8 „ . .	80	7 3 12	11,245	15'59	13,248	601	130'77	141'6	3'19	996	60'20	9'94	1'80	11'71	32
10 „ . .	80	9 2 17	11,499	14'53	13,318	574	123'00	134'3	3'10	814	56'10	10'08	1'59	12'35	33½
12 „ . .	80	11 2 4	11,463	14'77	13,178	580	122'00	134'6	3'25	620	47'40	10'34	1'33	12'84	34

SOME ADVANTAGES AND DISADVANTAGES OF
A HOT-COKE CONVEYOR.
By ROBERT WATSON, of Doncaster.

There is little doubt that, while coke conveyors pay on large works, a line of demarcation, dividing gain from loss, exists on the scale running down to the smaller undertakings. The line is probably lower than many are disposed to think; and it is in support of this suggestion that the following paper is offered. It will be admitted that in the smaller works a conveyor used solely for the purpose of removing coke does not result in great pecuniary gain. The charges due to interest on capital, depreciation, wear and tear, and breeze production are factors of such moment that they tend to neutralize the benefit to be derived from reduced labour costs. When, however, the indirect advantages are fully considered and added to the direct saving of labour, the economic possibilities of conveying plant become much more certain. The incidental gains are many, and include the quickening of retort-house operations by the rapid removal of the coke; the facility with which this can

be stacked in the yard; and the applicability to screening methods where coke is graded for sale.

Among the indirect reasons thus rendered by a conveyor the last-named is not the least important; and in relatively small works the full value of conveying plant is more easily appraised from the point of view of the coke yard than from that of the retort-house. The monetary necessity of preparing coke suitable for the varied needs of customers is too well recognized to be discussed here. The work is becoming part of the routine of most coke departments, and special steps have to be taken to achieve the end in view. These steps may consist of the provision of a breaking and screening plant independently dealing with the coke after removal from the retort-house, or of plant connected with, and fed by, conveying appliances—a combination which at once seems to commend itself.

It was primarily the necessity of finding an outlet for surplus coke that brought the general question to the attention of the writer. Some 10 to 12 per cent. of Doncaster coke went outside the home district at cut-prices, involving an annual loss of £250 to £300; and to avoid this, it was

decided to stimulate local custom by offering broken coke—a branch of work which had not previously been undertaken. Consideration of two schemes, one covering a power breaking plant with elevator, screen, hoppers, &c., fed by barrowed coke, and the other of much the same apparatus worked in combination with a coke-conveyor, led to the adoption of the latter. The question which caused doubt was whether the scale of work warranted the capital outlay and the probably disproportionate maintenance charges of a conveying plant. In Doncaster, gas-making operations were carried on in one of two retort-houses; the maximum daily make being about a million cubic feet and the minimum only 400,000 cubic feet. The effect of capital and maintenance charges per ton of coal handled might therefore easily prove to be relatively heavy and outbalance any possible saving in working. To keep the capital expenditure within reasonable limits, the writer contemplated the use of a conveyor on one side only of the through retort-beds. It was thought that by the concentration of coke on to a single chain, the wear and tear charges would also be reduced. The retort-house had previously been equipped with two sets of West's manual stoking machines, one on each side of the bench. The beds were heated by single furnaces; and to feed these the whole contents of through retorts were used—the half on the furnace being drawn direct, and that on the dummy side backed by rake to the generator side, and then drawn in the usual way. Such a use of manual rakes obviously suggested that twin conveyors were scarcely necessary, and that a chain put down on the dummy side of the beds would carry the whole of the coke if partly pushed and drawn in the way indicated. This method, from the point of view of the men, was certainly preferable to the hard and unpleasant task of barrow wheeling. The somewhat reduced capital and maintenance charges thus rendered probable, led to the installation of a combined coke and screening plant, on the lines suggested; and it may be said at once that, in the light of nearly four years' experience, the decision has not been regretted.

A general consideration of the question from the humanitarian aspect is altogether in favour of mechanical conveyors. The removal of 2 cwt. to 3 cwt. of red-hot coke in heavy unwieldy barrows scarcely seems the work of human beings; and one will welcome the time when modified costs will bring such means within the reach of all gas undertakings. Each reversion to barrow wheeling on the occasion of a breakdown accentuates this feeling in the minds of both manager and men. The use of a conveyor serves as a further benefit to the retort-house staff in that the continuous removal of the coke subjects them to much less heat during the process of drawing, and affords greater leisure between the draws by shortening the time occupied in stoking.

Obviously, the acceleration of charging operations by the rapid removal of coke is also of consequence in the general and economical working of the retort-beds. It is particularly the case with all forms of charging plant, whether manual or power. But this feature is too well recognized to warrant discussion. The fact that the hot coke is to be dealt with by a machine makes generally for more equal and better charging. There is ever a tendency in the usage of barrows to lessen the quantity of coal placed in the retort in anticipation of some relief when the resultant small bulk of hot coke has to be wheeled away. It frequently happens, too, that the bottom retorts are lightly charged for another reason—that of the difficulty of filling the coke barrow, since the mouthpiece precludes full loads without much spilling and subsequent work of clearing up. These and similar factors (apart from stacking and screening facilities) make the method a useful auxiliary to the retort-house. They are nevertheless difficult to appraise or to include in the profit and loss account of mechanical conveying.

The two prominent disadvantages incidental to conveyors are found in the wear and tear to which the plant is undoubtedly subjected, and the amount of breeze produced during the working of the chain and delivery of coke into the yard. Both are responsible for some anxiety, and would appear at first to neutralize the gains, direct and indirect, otherwise obtained. They may, however, be kept within certain limits; but this paper will serve a useful purpose if the discussion elicits some suggestions as to the narrowing of these limits. It is the fear of wear and tear and of breeze charges that acts as a deterrent to the adoption of conveyors so far as the smaller works are concerned.

The Doncaster coke-conveyor, of the West pattern, was first installed to serve a retort-house 91 feet long, equipped

with seven beds of through retorts. The hoppers were placed some distance from the retort-house, in view of a contemplated extension of the latter. The chain was in one continuous length, travelling, after leaving the horizontal, up an incline of 15° to the hoppers. Shoots were provided on the inclined section, to enable a portion of the coke to be discharged on the ground where required; the balance passing to the top, through the breaker or its bye-pass, into the screen and hoppers. The general arrangement is shown in figs. 1, 2, 3; the position of the inclined conveyor being indicated by dotted lines.

The plant was well designed, and worked all right; but there were several troubles, in the way of wear and tear, and water saturation of the coke. The first was principally due to the fact that the chain, being in one length and actuated by a sprocket wheel at the top of the inclined section, was subjected to some little strain. The chain was kept taut by an admirably arranged heavy tension wheel suspended in the return path. The double strain, however, gradually wore the links, as these rode the teeth of the sprocket-wheel, with the ultimate result of breakage. In the modified plant, this strain has been eliminated; and the conveyors are now working under normal conditions and satisfactorily. The other trouble was due to the over-quenching of the coke; and this is not an unknown thing with conveying plant. The bend in the conveyor trough, as this left the retort-house, held up a quantity of water, despite the provision of the usual overflow arrangement. The coke and breeze were consequently saturated with water, to the disadvantage of the screens and the detriment of customers. The sprinklers had to be reduced in order to limit the water; but there was ever difficulty in adjusting these to suit varying quantities of coke on the chain.

Two years ago, the retort-house was extended to accommodate five additional through beds; and the conveyor was adjusted to suit the new conditions. To obviate the difficulties referred to, the conveyor was converted into two sections, whereby the horizontal or house chain could work independently and feed its coke on to the inclined chain (see fig. 4). There have been distinct gains resulting from the alteration. The division of the continuous chain into two lengths, with separate drives, and the replacement of the overhead tension wheel by ordinary gear at the foot of the conveyor, have reduced the wear and tear. The renewal of links is now a comparatively easy matter. The coke is in a better condition, and can be more effectively screened, since the water flows naturally from both the horizontal and the inclined sections into the sump hole, leaving the coke to go forward practically dry. The difference in possible moisture is best indicated by the fact that the hopper coke does not, under normal conditions, contain more than 2 to 3 per cent. of moisture; while the small dust breeze collected at the bottom of the conveyor occasionally holds as much as 18 to 20 per cent. Dust breeze carried along the conveyor would seem to serve a useful purpose as a moisture absorbent. Tests of the coke breeze taken from the first hopper show a moisture average of some 13 per cent.; the coke itself being to all intents and purposes dry. This relative dryness is of considerable importance so far as the local coke trade is concerned.

In dealing with the question of breeze, it should be borne in mind that this is produced whether the barrow or the conveyor is in use. The latter is, of course, the greater offender, but not to the extent which is generally supposed. As a matter of fact, the conveyor, *per se*, does not increase the breeze production to any serious degree. This has been previously pointed out and proved by tests. Results necessarily vary with intrinsic hardness; but the following data have been obtained with coke from the same class of South Yorkshire (nut) coal and under like conditions of carbonization. Where removed by barrow, the coke was taken into the yard, quenched, and thrown out in the usual way; in the case of the conveyor it was collected at the extreme end of the inclined section (see point B, fig. 2). In all the tests the coke was carefully screened by hand into large coke (over 2-inch mesh), domestic coke (over 1-inch), smithy coke (over ½-inch), and small dust breeze (through ½-inch). The average results were as follows:—

TABLE I.

	Coke Removed by	
	Barrow.	Conveyor.
Large coke	77·7 per cent.	74·0 per cent.
Domestic coke . . .	14·2 "	15·0 "
Smithy coke	3·5 "	4·5 "
Breeze	4·6 "	6·5 "

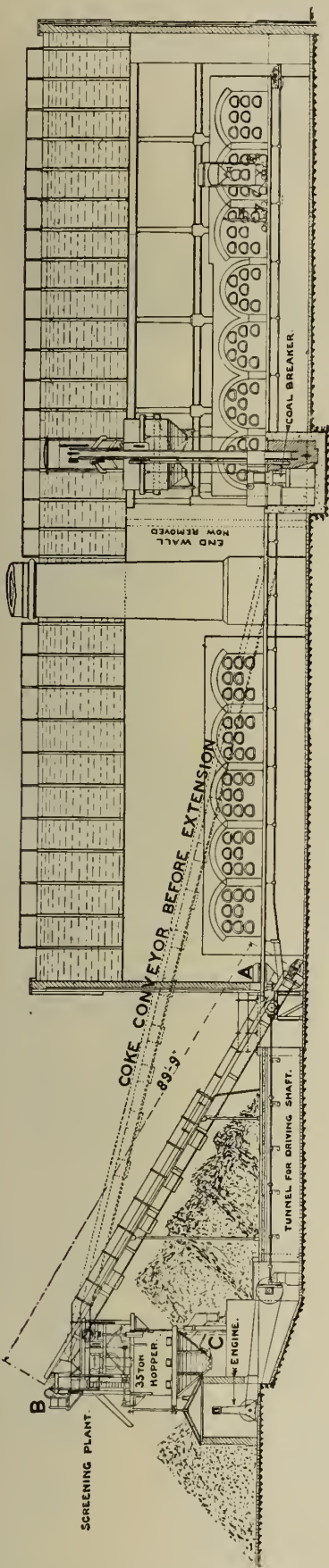


Fig. 1.—Longitudinal Section through the Retort-House and Coal-Stores.

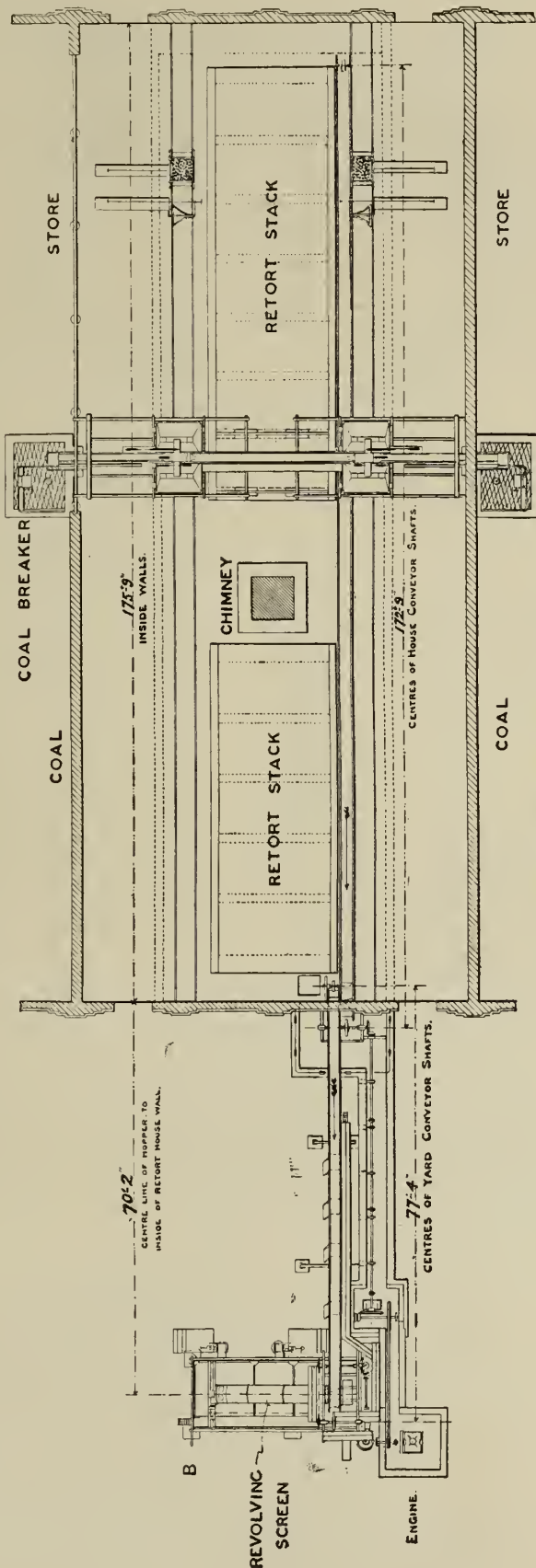


Fig. 2.—Plan of the Retort-House and Coal-Stores.

Probably with barrow coke the proportion of breeze is not so apparent, since in the process of cart-filling a certain amount is picked up and goes with the large. The slightly increased quantity in the case of the conveyor may be due to several causes, as, for instance, the movement of the chain, the change of direction in the travel, or the occasional riding of the links on the coke. The latter is not likely to happen unless the bottom linings project or are uneven. It is interesting to note that in the improved West link the cross-bar is provided with a lip in order to lessen the possibility of coke getting under and lifting the chain. The breeze mischief is, however, first started by the mere drop of the coke from the retort into the barrow or on to the chain; and it is increased to a greater or less extent in subsequent stages wherever coke is allowed to fall. This is particularly the case where the fall is great and on to any hard surface, such as the iron of shoots and hoppers. Some tests have been made of coke which has travelled from the retorts and has been allowed to go through the screen into the hoppers.

The breaker is outside consideration; the jaws having been removed in view of the fact that sufficient domestic coke can be obtained by the simple process of screening. In case A, the coke fell straight from the end of the inclined conveyor into a steep iron shoot leading to the screen and thence dropped into the empty hoppers. In case B, the steep shoot was replaced by three others following successively, and arranged as far as possible to allow the coke to slide.

TABLE II.

	A.		B.	
	Large coke.	48·5 per cent.	Large coke.	55·5 per cent.
Domestic coke.	32·2	"	Domestic coke.	29·9
Smithy coke.	9·2	"	Smithy coke.	7·6
Breeze.	10·1	"	Breeze.	7·0

These tests suggest that breeze production can be kept within certain limits.

It will be understood that, in the ordinary way of working, not more than half the coke goes to the top and through the screen; the rest being deposited through the side shoots of the inclined conveyor on to the heaped coke below. Further, where coke is taken through the screens, the fall therefrom is broken by the coke already in the hoppers. While this may help in reducing the actual breeze percentage, it is not always easy to keep the whole of the smithy coke separate. Through enlargement of the screen apertures or through occasional spilling at the shoots, a certain proportion will find its way into the breeze hopper. As a second screening

is expensive, the total quantity of so-called breeze to be dealt with is therefore somewhat greater than the above table indicates. For this reason the data in subsequent calculation is based upon the average of the breeze produced at the top of the inclined way (6·5 per cent.) and in the hopper (7 per cent.) *plus* (say) 1½ per cent. for the admixture of smithy coke.

The breeze produced under separate coke-breaking conditions appears, according to data obtained from various sources, to reach as much as 6 to 7·5 per cent.; and the proportion due to this, added to what may be called the

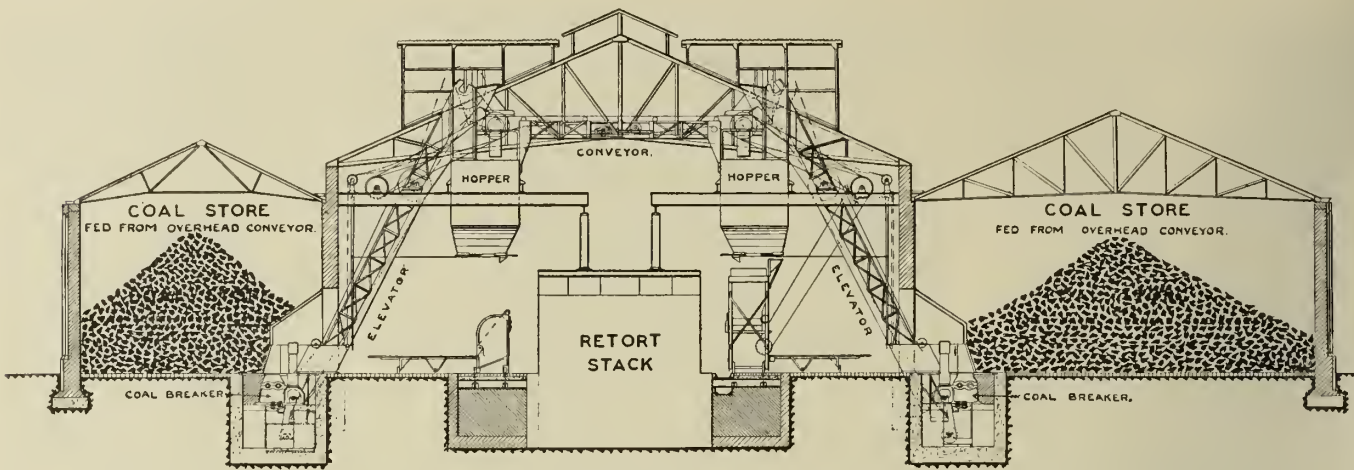


Fig. 3.—Cross Section of the Retort-House and Coal-Stores.

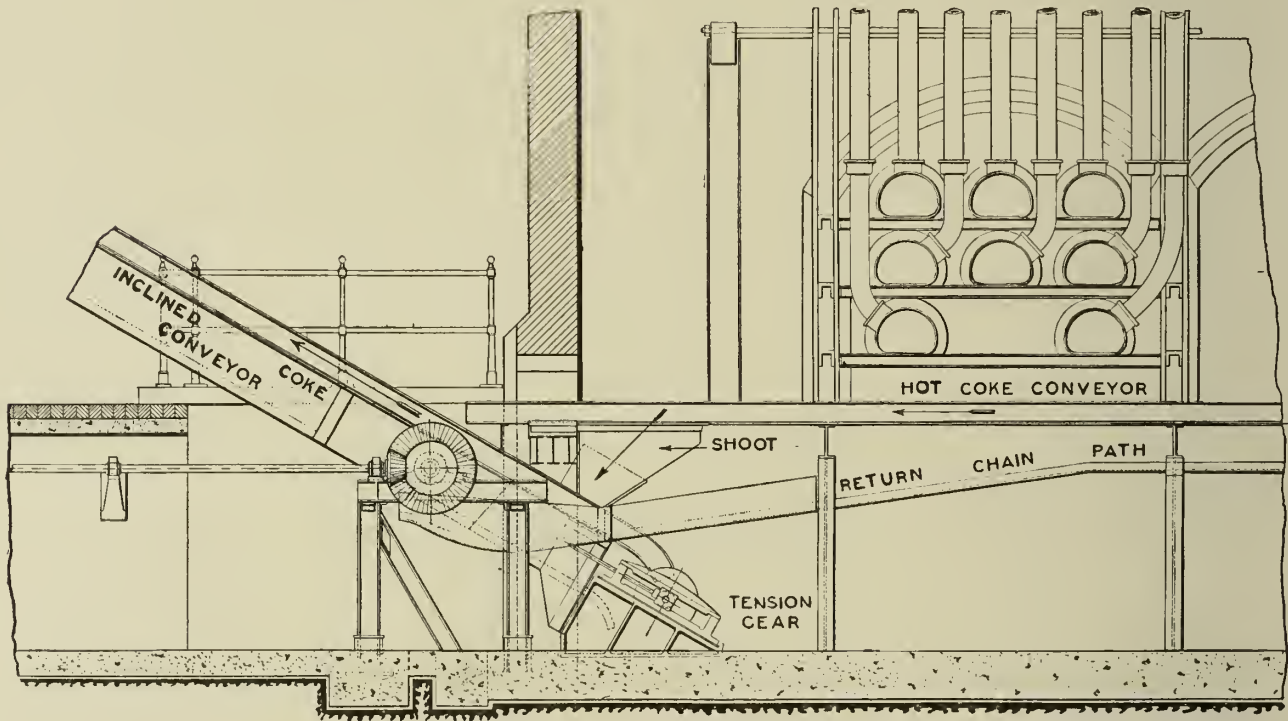


Fig. 4.—Side Elevation of the Coke Conveyor in the Retort-House.

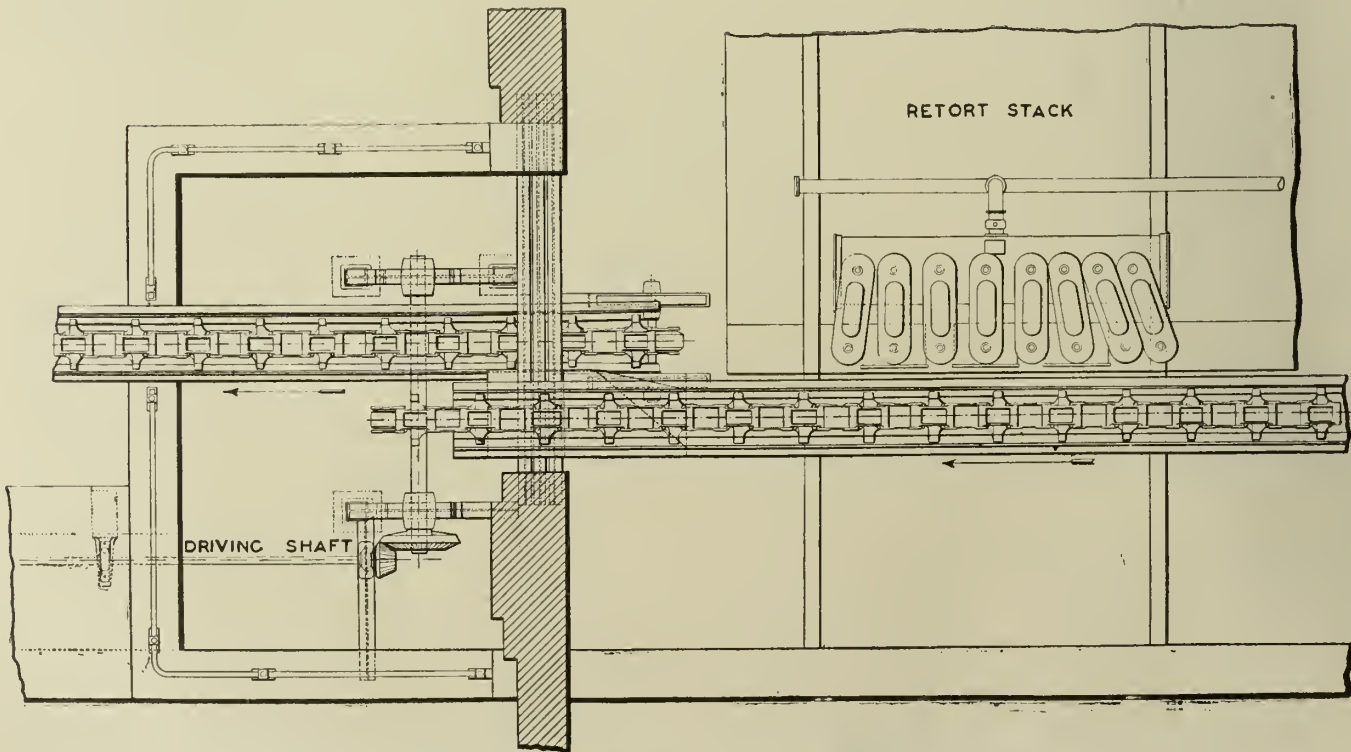


Fig. 5.—Plan of the Coke Conveyor in the Retort-House.

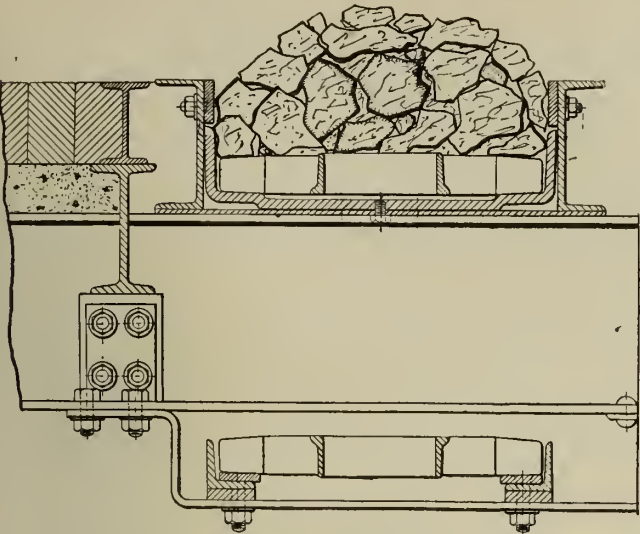


Fig. 6.—Cross Section of the Coke-Conveyor.

normal quantity in barrow coke, will yield an average percentage not far short of that obtained under conveyor conditions. It is not likely to be much less than 7 per cent. The breeze due to mere stacking is taken to be the same in each case, and does not therefore affect comparison. So far as breeze production is concerned, there does not therefore seem much to choose between the two methods. The excess is not great, but sufficiently so to cause trouble on some works from the point of view of disposal and pecuniary return. It is to an extent unavoidable where the breaking of coke is undertaken, and has to be faced. It was for this reason that a steam-engine in preference to a gas-engine was chosen to drive the Doncaster conveying plant. The effect on the boiler fuel account is, of course, appreciable; the breeze thus used being about $\frac{1}{8}$ cwt. per ton of coal carbonized.

From the data given, the quantity of breeze resulting from the handling of (say) 12,000 tons of coke—based on 22,000 tons of coal carbonized per annum—under the different conditions referred to may be compared as follows.

TABLE III.

Coke.	Perc ntage of Breeze Produced.	Tons of Breeze.	Excess Over (a).	Consequent Loss at 7s. 10d. per Ton.
(a) Wheeled into the yard . . .	4·6	552	—	£ —
(b) Mechanically conveyed . . .	6·5	780	228	89
(c) Wheeled, broken, and screened . . .	7·0	840	288	113
(d) Mechanically conveyed and screened	8·0	960	408	160

[NOTE.—Coke is priced at 10s. 10d. per ton, and breeze at 3s.— difference, 7s. 10d.]

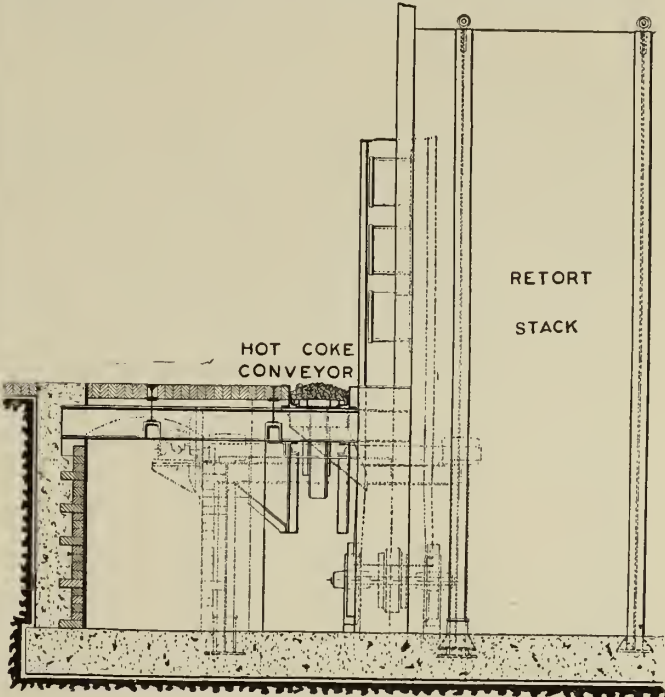


Fig. 7.—End Elevation of the Coke Conveyor in the Retort-House.



Head of the Coke Conveyor and Revolving Screen at the Doncaster Gas-Works.

Turning, now, to the matter of maintenance, the chief and inevitable expense (as with all conveyors) is caused by the wearing of the links, trough linings, and screen plates. The wear of the West link is usually on the under-side of the cross-bars of the block, and particularly where caught by the sprockets of the driving wheel. The bearing arms are protected by renewable hard cast-iron slippers, and they last remarkably well, easily outliving the trough linings and wearing strips. The joint pins and side links naturally come in for very great wear at points where pulling contact takes place. But these to some extent can be reversed, and their renewal is not expensive. The channel linings serve tolerably well; but it does not pay, from the point of view of breeze production, to allow them to wear irregularly—that is to say, to present inequalities of surface to the travelling chain.

The various considerations lead naturally to the important question of working costs, and the hazardous attempt of computation will be made for the different methods of coke handling, based, as far as possible, on actual data. The capital expenditure of the Doncaster plant, including foundations, subway, engine-house, &c., as shown on the Drawing No. 1, was £1816. Taking a plant installed for the sole purpose of delivering coke into the yard—that is, without hoppers and screens—the cost is estimated at £1500. The total expenditure for renewals, repairs, &c., works out at the rate of £219 per annum, of which £40 may be placed to the debit of the screening section.

TABLE IV.—Costs per Ton of Coal Carbonized.
(Basis, 22,000 Tons per Annum.)

Items.	Conveying and Screening.	Conveying Only.
Interest and sinking fund on £1816 = £106.	d.	d.
" " " " £1300 = £76 .	1'16	—
Maintenance stores—£219	—	0'83
" " " " £179	2'39	—
Conveyor attendants	—	1'95
Steam— $\frac{1}{3}$ cwt. breeze at 3s. per ton	1'75	1'75
Loss due to excess breeze—408 tons, £160.	0'60	(say) 0'50
* " " " " 228 tons, £89 .	1'74	—
	—	0'97
Credit, Increased value of (say) 2000 tons of domestic and smithy coke at 1s. 3d.—£125	7'64	—
	1'36	—
Total cost per ton of coal	6'28	6'00

* These items are included, although as a matter of fact no breeze is sold; all being used on the works.

The present plant could easily deal with 30 to 40 per cent. more coke; and as there is a growing demand for both gas and coke, the proportionate costs will naturally drop with the increasing output from the retort-house.

To get some appreciation of the comparative value of the above costs, it is necessary to add those for the removal of coke from the retort-house by barrows, and for the subsequent breaking and screening for the market. The figures in Table V. are in part estimated and based on Doncaster conditions. The cost of a power plant, covering engine and house, breaker, elevator, large hoppers, &c., would be about £500.

TABLE V.—Costs Per Ton of Coal Carbonized.

Items.	Wheeling, Breaking, and Screening.	Wheeling Only.
Interest and sinking on £500—£29 $\frac{1}{2}$. . .	d.	d.
Renewals and repairs of plant—say £30 .	0'32	—
Barrows and repairs—say £50	0'33	—
Wheeling and part stacking (actual) . . .	0'55	0'55
Yard help in stacking during winter, £52 .	5'57	5'57
Breaking and screening labour—2000 tons at 8d. = £66	0'56	0'56
* Loss due to excess breeze—288 tons, as per Table III. = £113	0'72	—
	1'23	—
Credit—	9'28	—
Increased value of 2000 tons of domestic and smithy coke	—	—
	1'36	—
Total cost per ton of coal carbonized .	7'92	6'78

* See note to Table IV.

Judged by the costs given in the above tables, it would seem that the gain as between barrows and conveyors used for removal purposes only is not very great; but the small

profit shown, added to the important advantages indirectly accruing to retort-house working and to the men, would justify the use of the conveyor in comparatively smaller gas-works than Doncaster.

The results, when the effect on the disposal and sale of coke is taken into consideration, are much more decided. The difference in favour of the full conveying and screening plant, as compared with barrow wheeling and separate breaking and grading appliances, is as much as 1'64d. per ton of coal carbonized. The gain in the case of Doncaster is really greater, inasmuch as the loss indicated as due to depreciated coke in the shape of excess breeze is not fully incurred, since the latter is used on the works. The further fact is to be remembered—and this applies to other gas undertakings—that the supply of broken coke thus afforded has had the effect of withdrawing surplus coke from the outside market to be sold at full prices in the home districts.

Discussion on Dr. Lessing's, Mr. Bell's, and Mr. Watson's Papers.

Mr. CHARLES HUNT (London) said he had followed these papers with very great interest; and, with regard to the first two, he thought the most satisfactory feature of them was that they indicated the great progress which was being made in carbonizing arrangements. The days of the old costly and wasteful methods of carbonizing were likely to be numbered; but there were so many forms of carbonizing nowadays for gas managers to choose from, that it was rather an embarrassing matter to select one. Naturally, one turned to the Carbonization Committee for guidance in the matter—not necessarily as a recommendation of any particular method, but as an indication of the general principles to be followed. In this sense, he ventured to suggest that the report they had had presented was somewhat disappointing, as it indicated rather that they would have to depend in the future, as they had done in the past, upon individual effort rather than combined effort. Dr. Lessing's paper brought him back to the time, some fifteen years ago, when he was so much impressed with the progress then being made in Germany and Belgium with coke-recovery plant, that he suggested its application in this country as an adjunct to gas-works where there was a demand for metallurgical coke. He could not see any essential difference between the present chamber-setting and the coke-recovery ovens, which, as they knew, were horizontal chambers; the coal being dropped from above, and the coke being pushed out at one end. It was quite possible that, by putting the chamber on an incline, some little wear and tear of the setting was saved; but from what he had seen, then and since, of the operation of the pusher in the coke recovery ovens, he could not conceive anything more simple. With regard to the illuminating power—a matter into which he went very carefully before reading his paper in 1896—when he first began his inquiry into the subject, he said to the manager of a coke-works, "Why don't you use your gas for illuminating purposes?" He replied, "It is no good whatever." This put him (Mr. Hunt) on inquiry into the matter; and he had analyses of the gases taken, from which he discovered that the depreciation of the gas was entirely due to the method of working. They had an exhauster; and they overworked it. The consequence was that the gas was full of air. When the exhauster was properly controlled, and care was taken to keep the chamber perfectly sound, there was no difficulty whatever about the gas. It did not differ, practically, from the gas then being made in Birmingham, or from the analyses that he had taken of London gas. Therefore, he was rather surprised to hear that the gas made in these chambers was of low illuminating power—not that he attached any very great importance to the illuminating power, so long as the calorific value was kept up. Incidentally, all these new processes seemed to show that, not only were they able to maintain the comparatively low standard of the present day candles, but that the time was approaching when a new departure might be made, and they would go in for a much lower illuminating power, or the abolition of it altogether—maintaining, of course, the calorific value test. Mr. Bell's paper further indicated that there was life still in the horizontal retort. He was able, by heavy charges, to obtain very much of the result secured from the other methods. Of course, it was largely a question of the quality of the coke one desired to produce. One could not, with any system of horizontal retorts, obtain quite such a good coke as the President was

able to make with his chamber-setting at Norwich, or was made by coke-recovery ovens, or even by vertical retorts. There was only one point in Mr. Bell's figures which struck him, having had some little experience of Midland coals. He did not remember ever getting so much as 14 cwt. of coke out of any Midland coal; and if Mr. Bell had any secret about it, he should like him to impart it. He (Mr. Hunt) certainly had obtained it from Durham coal; but never from Midland coal. The Institution were much indebted to the authors for their papers, which would constitute a valuable addition to the proceedings.

Mr. EDWARD ALLEN (Liverpool) said the three papers indicated that the retort-house was still the centre of the greatest interest; and the old saying was as true as ever, that dividends were either made or lost in the retort-house. With respect to Dr. Lessing's paper, they were much indebted to him for the historical information he had given; and the subject of chamber retorts and coke-ovens was one which could not be left out of consideration when they realized how much was being done in Germany, on the Continent generally, and in America. But he felt more especially interested in Mr. Bell's paper, which he welcomed as valuable evidence in favour of the old-fashioned horizontal retort. It was true that some of the merits and advantages of the vertical retorts and coke-ovens could be enjoyed by those who used horizontals. If they went in for heavy charges and longer duration, they might obtain almost as good results as from coke-ovens; and, considering that their customers for coke were mostly those who desired it for domestic use, he thought they would obtain better results by means of horizontal retorts. The details of the installation had been very skilfully designed, as one would expect from Mr. Bell; and the working results were correspondingly successful. Some might be of opinion that hot-coke conveyors had great disadvantages, to some of which Mr. Watson had referred, such as wear and tear and damage to the coke; and there were those who thought that a telpherage system, or one in which the coke was carried, not pushed or dragged, was better than that of hot-coke conveyors. The analysis of the coke as given by Mr. Bell rather surprised him, because with regard to the small percentage of dust and fine breeze he was not quite in harmony with the figures given in Mr. Watson's paper. With reference to the retort stoking-machines, he must congratulate Mr. Bell on the actual results obtained with the De Brouwer machine, and the low working costs he was able to obtain; but he thought it was to Mr. Bell that the credit should be given. His ability, perseverance, great capacity for dealing with small details, not only in design but also in workmanship, and his untiring energy, had drawn from them for some years the greatest admiration. It was Mr. Bell, rather than the machine, who filled the eye. He believed that with other machines Mr. Bell could get as good, or possibly better, results. He did not wish to be misunderstood in any way; he thought the De Brouwer machine was a very excellent one. It was the best machine at a certain time. But there were now others; and he was of opinion that the result achieved by Mr. Bell with the machine he was using could be equalled if he had some other. With regard to the details given, he should like to emphasize the value of deep producers. He was quite sure that by using them Mr. Bell secured very good working; but he thought there was a little slip in the paper where he spoke of the ascension-pipes being on the charging side, because, looking at the photograph, they were on the discharging side.

Mr. BELL: It was a reference to what ought to be done.

Mr. ALLEN said there was no difficulty in pushing the coke from horizontal retorts as he had seen it practised. By getting a coke which was hard and large, they were able to command a better market. They also knew that coke must not be too large, if it was to be used satisfactorily in open fires or stoves; but still the consumer seemed to have a great prejudice in favour of large coke. As regards the cost of machines and wear and tear of retorts, their own experience with another machine quite carried out Mr. Bell's opinion as to the effect on the retorts. He attached great value to all these papers. As to Mr. Watson's paper, the great value he attached to it (apart from admiring his working at Doncaster) was that it would have the effect of making them all more concerned about preparing their coke for local markets, and doing away with the dumping process which had to be carried out under present conditions, but which interfered so much with neighbouring undertakings, and played into the hands of coke factors, who were delighted

with the chance of getting cheap coke at one place to spoil the market in another—pocketing the difference.

Dr. H. G. COLMAN (London) said he found it extremely difficult to take part in this discussion, not because one did not know quite what to find to say, but because there was such a large amount of material covered by the papers (which he presumed included the report of the Carbonization Committee), that practically the whole of the wide subject of carbonization was open for discussion. As the President had pointed out in his address, at the present time all their ideas with regard to carbonization had been put into the melting pot, and were in a state of flux; and they were anxiously looking on waiting to see what new combinations were going to develop out of this melting-pot. They felt that whether they were looking at it from the point of view of understanding exactly, or getting as near to the truth as possible of what was going on in carbonization, or from the point of view of those who wanted to know what was the best plant to adopt for the future, they were all in a state of great perplexity. In view of these circumstances, he thought it would be advisable if he confined himself to one or two points which had been rather strongly in his mind in connection with this subject during the last year or eighteen months. In carbonization, they had to consider two main points. In the first place, they had, in order to drive out from the coal the maximum quantity of the volatile matter, to heat the coal finally to the highest temperature they could obtain. On the other hand, the volatile products, which were first formed by the distillation of coal, themselves, under the further action of heat, underwent decomposition, which, up to a certain point, was favourable to the gas maker, but after that became disadvantageous. They wanted to hit the happy mean, whereby in carbonizing they could obtain the first of these desired ends—the raising of the coke finally to a very high temperature—without at the same time subjecting the volatile products to over-cracking or to too great an extent of decomposition. This was really, in broad outline, the problem before them. Considering the second point a little further, they saw that the extent of decomposition of the volatile products must depend upon the manner in which the volatile products first formed, travelled onwards, and how they were subjected to heat in their travel. In the first place, they were affected if they passed through a large quantity of already formed red-hot coke. They were also affected by traversing a free space, where such was present above the coal in the retort; and beyond that there was a still further point at which an alteration in the character of the gases produced took place—a point perhaps less noticed than any other. This was the changes which took place in the hot gas after it left the retort itself, and before the point at which it was cooled to a temperature at which no such decomposition could take place—namely, in the ordinary horizontal or inclined retorts, in the ascension-pipe. No doubt, considerable changes in the character of the gas did take place in the ascension pipe, which were deleterious, not only by the formation of stopped pipes, but also with regard to the composition of the gas itself. In considering all these new developments—intermittent and continuous working of vertical retorts, and also large bulk carbonizing in coke-ovens up to 10 tons at a time—they must remember that there was no doubt variation in the manner in which the gas travelled through the coal or the coke after the first volatile products were produced and underwent decomposition; and what was true for one was not necessarily true for the other. On this account, they got considerable differences, according as the coal was carbonized either in small or in large bulk, or in horizontal or vertical retorts. Whereas up to some seven or eight years ago the general practice was to carbonize in relatively small charges, leaving a large amount of free space above the coal in the retort, the tendency now was all the other way; this being a direct result of the increase in knowledge which had come about through the newer development of the vertical retort. This was not an uncommon experience; it had occurred in almost every other industry. Any new development of an old-established method always, by the increase of knowledge it brought, put it into the power of those who worked the old method to operate it to better advantage. This had been well illustrated that day in the interesting paper by Mr. Bell; and it should be the endeavour of them all, as far as possible, to accumulate such information as would help in the ascertaining of the best manner of bringing about this optimum

decomposition of the volatile products, so as to obtain the maximum of gas of good calorific power—he supposed he must also say at present illuminating power, though he was in hopes that in a few years time they would no longer have to consider illuminating power, any more than their brethren in Germany had at the present time. In this question of the travel of the gases through the retorts, it seemed to him what they should aim at was to produce a gas which contained the maximum quantity of marsh gas or methane. This was, from a gas maker's point of view, even at the present time—and would be still more so when the illuminating power had no longer to be maintained—the constituent of far the greatest importance. It was on the question of how to obtain the maximum production of marsh gas, that their knowledge was at present distinctly limited. The newer processes for the manufacture of gas, either in intermittent or continuous vertical retorts, or in coke-ovens, did not yield the same amount of marsh gas as could be obtained from the same coals in horizontal retorts; and this, he must confess, came to him as a very great surprise. He fully anticipated that, in view of the fact that in vertical retorts, the volatile products which were formed did not get heated to so great an extent in their passage through the retort as they did in the horizontals, the percentage of marsh gas would be higher and that of hydrogen lower, because the marsh gas would not be so much broken up into free carbon and hydrogen as was the case with the horizontal retorts where there was a free space about the coal. But the analyses of the gas from practically all these sources, speaking generally (individual analyses might not quite agree), showed that the percentage of marsh gas was lower in the case of vertical retorts than it was from the same coal in horizontals, and the hydrogen was higher. This matter puzzled him very much last year when he had just completed his analyses of the gas in the Dessau vertical retorts; and he had had his preconceived notions upset. But just about twelve months ago, the explanation was given in that very room, in the lecture which they would all remember by Professor Bone, on the thermal decomposition of the hydrocarbons. Professor Bone then examined the decomposition of four gases—marsh gas, ethane, ethylene, and acetylene, and was very much puzzled for a long time to account for the fact that in the decomposition of the three last-named gases he always got a very large quantity of methane produced. But the explanation Dr. Bone gave—and which he (the speaker) believed was correct—was that the first act of decomposition of these gases was the formation of hydrocarbons which could not exist under ordinary conditions, but which at high temperatures had a temporary existence. He could perhaps make this clearer by putting the formulæ on the blackboard. Taking C_2H_4 , the first action of the heat was to give the hydrocarbons CH_4 , CH_2 , and CH —that was the simplest possible hydrocarbons. There was very much evidence in favour of the supposition that these could be formed at high temperatures; but Professor Bone pointed out that, in cases where such hydrocarbons were formed by thermal decomposition, there was always hydrogen present as well, which would combine with those hydrocarbons, and would in all cases give CH_4 . Carrying this forward to what was taking place in a horizontal retort, where the gases passed through a free space, one had there, not merely ethylene and acetylene, on which Professor Bone experimented, but also large quantities of tar vapours, which, when subjected to heat, broke up. The ones he had in his mind more especially were classed together as the light oils of tar, which, in passing through the free space, were largely broken up, giving benzene, naphthalene, &c. In doing so, they would all undergo exactly the same decomposition that Professor Bone suggested in the case of ethylene, and would yield these bodies—the simple hydrocarbons capable only of transient existence—among their products. One always had under these conditions a very large amount of hydrogen present, so that in such a case also one would expect that by the decomposition of these tars at high temperatures the percentage of marsh gas would be increased; and, on the other hand, the percentage of hydrogen would be decreased, because the hydrogen yielding the marsh gas would give less than its own volume. If this explanation of Professor Bone, modified in the way he put it, were correct, one would expect that the gas from horizontal retorts, where the tars were over-cracked, would tend to increase the percentage of marsh gas and decrease the percentage of hydrogen; and this was exactly what happened. He (Dr.

Colman) thought, therefore, that they might regard it as at any rate reasonably probable—he did not like to say anything more certain than this at present—that the breaking-up of the tars did considerably increase the percentage of marsh gas, and therefore yielded beneficial results. So that, in the case of carbonization, they had the formation of marsh gas affected by high temperature in two different ways—in the first place, owing to the cracking-up of the tars and the action he had just mentioned increasing the quantity and, on the other hand, by the gas passing over the crown of the retort there was the decomposition of the marsh gas and the formation of scurf. But in the horizontal retort, in this respect, the increased quantity of marsh gas formed by synthesis was greater than the amount decomposed by the hot walls of the retort, with the net result that the percentage of marsh gas was increased. This being so, how were they going to get the highest amount of marsh gas from the tar in the other systems? It seemed to him they could not expect, in the retort, to get the full amount of marsh gas under any of these systems which could be secured in horizontal retorts. If they were going to manufacture marsh gas from the tars in this manner, they must make the tar which was left richer in carbons and poorer in hydrogen, with the result that the tar would contain increasing quantities of free carbon and of naphthalene, and decreasing quantities of these light oils, which were necessary to effect anything like a complete removal of the naphthalene from the gas during condensation. So it seemed to him they must aim at the cracking-up of the tars which were produced in the vertical retorts and the coke-ovens, just to the extent—they had to find out what it was—where the tar gave up its maximum quantity of carbon to the gas, without at the same time increasing the amount of free carbon and of naphthalene to an abnormal extent. This was the problem; and it would require a great deal of work before they could successfully solve it. But if they bore this in mind, and worked at it, no doubt eventually they would obtain the full benefit of the gas manufactured from the tar. They did not want to make more tar than at present. In fact, if they could reduce the quantity it would be to their advantage; and if they decreased the amount of tar by converting a part of it into valuable gas, the advantages would be very great indeed.

Mr. J. P. LEATHER (Burnley) remarked that he did not wish to add much to the discussion of these three papers, as he considered that the greater portion of their value would consist in the record left on the "Transactions" of the great body of facts they contained. But he should like to ask a question, with a view to adding a little to the information given by Dr. Lessing. He stated the length of the chambers he had described, and the coal capacity; and it would be interesting to know what was the width of the chambers. The President in his address referred to the influence of the width of the chambers—that was, the distance the heat had to travel through the coal in carbonization; and it seemed to him an important point, which he regretted was not definitely dealt with in Dr. Lessing's paper.

Mr. A. T. HARRIS (Market Harborough) said there was one question which he should like to ask Mr. Bell. He understood from him that he had no difficulty in filling up his retorts by means of the coal-projector; and he took it that he filled them solid from end to end, leaving no space between the top of the coal and the top of the retort.

Mr. BELL: There is a space of from 2 to 3 inches.

Mr. HARRIS (continuing) said, with regard to the chambers described by Dr. Lessing, he took it that they were filled solid from end to end; and, if so, he should like to ask whether Dr. Lessing experienced any pressure at the opposite end of the chamber to which the gas was taken off. He asked because he found his experience with 45° retorts coincided exactly with what Dr. Colman had said. The passage of the gas was not always the same in every case. In working with Derbyshire coal, he found, no matter what was the rate at which the coal was projected into the retort, or the size of the coal, they got no pressure on the bottom mouthpiece. The gas was taken off at the upper end of the retort; and they had no difficulty at all in working. But immediately they got to the richer Yorkshire coal, they began to get trouble. This, however, was only due to two points practically—the question of temperature, and also the density of the coal in the retort. In working a bed of eight, the centre retort got hotter than the others, and in a seven-hour charge this retort towards the end got a considerable amount of pressure on the bottom mouthpiece; but

it did not occur in the others which were charged under exactly the same conditions. It seemed to him that in these chambers and in a full retort, they were practically governed by the temperature most suited to the class of coal used; and he was afraid that with a full horizontal retort, working with certain coal, there would be considerable difficulty with regard to the pressure, and also with regard to getting the coke out of the retort. If he had coal which expanded, he found with his 45° retorts that he had to push the whole of the coke out; and he was afraid that in horizontals there would be such an enormous quantity of power required that there would be considerable trouble with the retorts. He thought probably the little experience he had gained with the 45° inclined retorts would be of use to those who had also to consider the question of full retorts; and he should like to have Dr. Lessing's experience on the point he had named.

Mr. D. IRVING (Bristol) said that, however much they might admire the various systems of carbonizing which had been brought before them, there was one point with regard to chamber-settings which he should like to emphasize. However successful they might be for carbonizing coal, it could never be regarded as a really scientific method of working, having regard to the intermittent nature of the charge. It seemed to him it could never be a correct system of working to pass into a chamber 5 or 6 tons of coal, and there let it distil for 24 hours. For a great portion of this time, the conditions of proper carbonization must be wrong; and therefore, whatever might be the future of chamber-settings or vertical retorts, he thought they must look to the continuous process as being most likely to produce the best and the most scientific results compared with either the chamber-setting or vertical retorts worked intermittently. Whatever doubts and perplexities they might have about the future of carbonization—either in a chamber or in vertical settings worked intermittently or continuously—it was a great pleasure to hear the very optimistic and cheerful account which was so generously brought before them by Mr. Bell. He was to be congratulated on the excellent results he had secured; and they were much indebted to him for the full details he had given, and the generous way in which everything was brought forward and tabulated. At Bristol, they prided themselves on being able to give their friends at Derby a lead with regard to working costs, and even with reference to the amount of coke sold per ton—which, after all, was the most important point in regard to coke. But after the results they had heard, he was afraid that at Bristol they would have to look to their laurels. With regard to the third paper, however admirable coke-conveyers were—and he believed they were admirable—for large works, they were scarcely suitable for small ones. In some of the larger gas undertakings, he did not know how it would be possible to secure the smooth working and admirable results which were being obtained, for instance, at Derby, without the aid of a hot-coke conveyor. But, of course, there were conveyors and conveyors; and a great deal depended on the design, and still more on the circumstances under which the conveyors might be called upon to do their work. From his own experience, he year by year grew more and more in favour of conveyors. They had at Bristol conveyors which had been in use for three years continuously; and though he could not give detailed figures, he was sure the result would be fully satisfactory as regarded economy.

Mr. JOHN WEST (Manchester) wished to add his thanks to Dr. Lessing and Mr. Bell for the admirable papers they had produced. Perhaps no one present could appreciate Mr. Bell's work more than he (Mr. West) did, because he knew what time it must have taken to get out all the figures he had given; and he had put before them something they should all try to copy. It all went to show that, while there was a great deal of talk about verticals, horizontals with good machinery still "wanted killing." They knew from the "JOURNAL OF GAS LIGHTING" that he had again been paying attention to carbonization—it was not for the first time. He had applied himself to almost every new thing which had come forward in the shape of carbonization. All his life long, he had endeavoured to keep himself awake, and had watched every new process that came out. Two or three years ago, he made a study of vertical retorts; and then there came an opportunity to co-operate with certain others in trying to work out some of these problems. Fortunately, his friend, Mr. Samuel Glover, was able to convince his people at St. Helens that it would be a good thing to get some absolute facts and figures that might be

compared with those of the old system of working; and, having been associated with Mr. Glover so long, he was called in to assist, and see if they could not collaborate, and work the matter out on definite lines. The Corporation of St. Helens said they would put up the plant if he and Mr. Glover would put up the retort-settings, and everything in connection with them. This was on certain stringent conditions—namely, that if he did not succeed in carrying out his part, he would get nothing for it. He had courage enough to undertake it; but it was not done without a considerable amount of thought. They made their plans, and devised methods whereby they could work out the theories which had been advanced, but which had never been thoroughly and practically tested. He devised certain pipes and bye-passes, so that they could shunt off from one side to the other, and see which was the best; and finally, they got to the present condition of working, some of the results of which had been published, and would no doubt receive due consideration. What they aimed at was to get a simple working apparatus to give the best possible results. The work was all done in the most suitable way; and at last they found that they could work best by gravitation—dispensing with all mechanism for feeding the retorts with coal—and by a new system of heating the retorts, whereby they heated them in chambers, so that they could regulate the temperature where they liked (the top, the bottom, the middle, or anywhere), and could alter the temperature at will, and throw the heat where they thought it was required. They succeeded very well in this respect. Then they introduced a method of abstracting the heat from the coke at the bottom, by passing the secondary air round the bottom, so as to get as much heat out of the setting as possible. In this way, the fuel account had been reduced to a very low figure—lower than anything he knew of in connection with vertical retorts. The coke extraction, too, was of a very simple character, and worked very well. What they desired was to get some comparative figures; and so they decided to test the work of the new verticals against the horizontals worked by a West manual machine, which distributed the coal in a very even layer, and gave off a large yield of gas per ton. Therefore, the comparison he had to work against was a tolerably severe one. They used the same coal in both tests, to see which produced the best results; and these results had been published. The difference was very great. They obtained a much larger yield of gas per ton from the verticals; they got the illuminating power; there was an increased quantity of tar; and a very superior coke, which was no doubt an important question. They took the coke out as large as some of the specimens on the table; and they were able to get 2s. 6d. per ton more for it. It was denser and better; and their customers preferred it to the coke produced in the other part of the works from the same coal. They had only been dealing with low-priced coal so far, because it paid the St. Helens people to buy the cheap coal in the district. But the question arose, "What would be the result if they used a superior kind of coal?" They proposed to try some Durham coal; and then gentlemen in the North and South would be able to compare their results with those produced by this system. A friend of his wrote him the other day saying that he had read all his reports, which appeared to be very good; but he was getting satisfactory results by the aid of West machinery, and he did not know how he could improve upon them with verticals. He could only say that if he (Mr. West) had the same coal that his friend used, he believed he could do much better with verticals. He had shown that they could get a very great improvement with common coal; and the only question was, "What advantages would be derived from using better coal?" He believed there would be considerable advantage there also. Again, with regard to the cost of working, his cost was very low; but they knew there were several gentlemen working at very low figures, which could be put side by side with what he had published. For instance, Beckton, the South Metropolitan works, Croydon, and the President himself and many others, could show figures which would compare favourably with the larger figures they gave, if they simply took the volume of gas. But then they were not being compared relatively. If he used similar coal, the question was, "What would be produced from that?" They were shortly going to try and determine this point. Dr. Colman was going to try some Durham coal; and they would then be able to judge of the differences in the systems. He could assure them there was a very wide field for the

development of these vertical retorts. With coal which on an average gave about 10,000 cubic feet per ton, he had got 12,300 cubic feet of gas, but not of a very high illuminating power—13·75 candles with a Carpenter burner. This would be good enough for Germany; but it was not good enough for England. They had everything under complete control, and they could regulate the machinery at will; so that, if they liked to leave the coal in a little longer, or work it a little faster, they could do either. There were no doubt elements in connection with it which lent themselves to the proper carbonization of coal. He knew of nothing against it; and the more he worked upon the system, the more he found out of its many advantages, though no doubt it would take a little time to develop them fully. They would be very pleased if anyone would come down and see the works, and criticize them. This question of the carbonization of coal was not a new one for him, especially in connection with trying to work out a continuous system. Forty years ago, he commenced trying to do this; and, in the year 1873, he patented a system for almost continuous working—using, of course, horizontal retorts—the coal being spread in the retorts, and the coke pushed out at the other end by the same apparatus. From that time onwards, there had been a gradual development, not only of his own machines, but of others; and he had had in his mind a system of continuous charging. He got a large volume of gas and high illuminating power using a thin layer of coal. They had now gone from the thin layer to the thick; but his method was having a very thin layer spread in the retort every half-hour or every hour, as required. As he said, they got a large volume with high illuminating power; but there were other difficulties which were objectionable.

Mr. A. F. P. HAYMAN (Berlin) said, in his opinion, the relation between the weight of coal to the heating surface of the chamber was not a favourable one in the system that had been described by Dr. Lessing. They had tried vertical chambers in Berlin; and they found they did not answer at all, because the amount of fuel was so much higher, and there was no advantage to set against this. The saving of labour by charging only once in 24 hours was considerably nullified by the irregular quality of the gas, which Dr. Lessing admitted to be a fact. He (the speaker) believed that in Hamburg the quality had been so irregular that complaints had been made by the Inspector of Public Lighting; and there was the difficulty of dealing with such large quantities of coke which had to be removed sufficiently quickly by machinery. In Munich and Hamburg, there was employed a large moveable tower, which delivered the coke after being quenched on to the trays. The quenching also led to the coke being much destroyed; and the lumps were not larger than was the case with ordinary gas coke. He believed that the enormous cost of this tower would almost frighten any gentleman present from introducing it—he thought, it was as much as £3000. In his opinion, it was not yet proved that gas making in a retort was not the best system for gas-works practice. He thought it was proved that carbonization in an absolutely full vessel was the proper thing; but this vessel must be a retort, and not a chamber, because the former had a much greater heating surface.

Mr. H. TOWNSEND (Wakefield) said he only proposed to address himself to Mr. Watson's paper, although he heartily appreciated the two others. Like a former speaker, he was a great believer in coke-conveyors, and he had had one in operation for nine years, which was still "going strong." But there was a good deal of difference between their conditions and Mr. Watson's, because they had inclined retorts with a stage floor, and Mr. Watson a horizontal house without a stage floor. Consequently, they got rather different results. Last year they dealt with all their coke by means of coke-conveyors; and they sold of the large coke 77·05 per cent., domestic coke 8·86 per cent., smith's breeze 6·67 per cent., and used in the works 7·42 per cent. They found that when they simply tumbled the coke from the retorts into the barrows it resulted in a considerable amount of breeze. If it was dropped into the barrows, the large coke was 70·47 per cent.; the domestic coke, 19·23 per cent.; smith's breeze, 6·15 per cent.; and dust, 4·15 per cent. This brought him to the point that the production of breeze was due to a very much larger extent to the dropping of the coke than to the carrying of it. He found that the dropping of the coke from the retort on to the conveyor had the result that they got 86·57 per cent. of large; 6·5 per cent. of domestic; 4·47 per cent. of smith's breeze; and 2·46 per cent. of dust. The

retort-house conveyor, in taking the coke the whole length of the house, only diminished the large coke by 0·72 per cent., and only increased the domestic by 0·75 per cent., the breeze by 0·07 per cent., and it created no dust at all. Theirs was a De Brouwer conveyor, which was a different type from Mr. Watson's; but it showed that the actual working of the conveyor did not produce breeze or break the coke—it was the dropping which did this. Their conveyors consisted of a retort-house conveyor, an inclined conveyor, and a rotary screen. At the point where the coke dropped into the yard in the final conveyor, the breeze was not materially greater than in the retort-house conveyor. The great sinner in the production of breeze was the rotary screen, which reduced the large coke by no less than 10 per cent. Then when the coke was dropped finally into the yard, the large coke was again reduced by 11 per cent. So that he had come to the conclusion that the principle of the coke-conveyor was correct, if they could only improve the practical application of it, and do away with dropping as much as possible. Last year, when they had to extend their retort-house, they bore this point closely in mind; and, as the conveyor was at present, there was a great diminution in the amount of breeze. In fact, they could now hardly make enough for their own requirements.

Mr. THOMAS CANNING (Newport) said he greatly appreciated all the papers; but there was one big principle involved in both the first two, which was that they should increase as far as possible the value of the by-products. Taking this as a broad principle, it would appear that the system so ably explained by Dr. Lessing aimed at the production of a very high quality of coke; and he had heard it hinted more than once that it was good for metallurgical purposes. Coming from a county on the other side of the Severn where metallurgy had its centre—especially near Swansea, where coke-ovens of the newest type were in full operation, and were being largely introduced—he would ask the members present whether they were likely to do much business in supplying gas coke for metallurgical purposes. Again, with regard to Dr. Lessing's paper, he should like to have some explanation of how, by the system of carbonization which he had described, he got such considerably higher calorific power. He said nothing about the illuminating power; but he wondered where the amount of benzol was to come from which would be necessary to make it good. Then, again, repairs and so on would, he thought, very much militate against the system. Mr. Bell had read an admirable paper; and he (the speaker) only wondered why he took off the pressure by an anti-dip, and then, apparently, put it on again. As regarded the question of coke conveying, he held a strong opinion. He did not say that those gentlemen who got good results from the hot-coke conveyor were not correct, nor did he wish to oppose them in any way; but he preferred the telpherage system, electrically driven, which lifted the coke, carried it to the spot required, and dropped it on the heap, and, above all, had the immense advantage that one could make up stocks with it.

Mr. H. W. WOODALL (Bournemouth) said these papers were of the very highest order; and he did not think they had ever had contributions of greater interest to the gas industry. It seemed to him that the one thing they demonstrated was that, so far as carbonization was concerned their state was pretty much that of chaos. As Dr. Colman said, all their ideas had been put into the melting pot; and nobody knew what was to come out of it. With regard to vertical retorts and continuous carbonization, everyone must understand that it would be impossible for Mr. West and Mr. Glover to start on any process without bringing to bear on it ideas of the greatest value; and he was glad to hear that Mr. West thought so highly of it.

Mr. W. H. Y. WEBBER (London) said it had occurred to him, when listening to the remarks made by Dr. Colman and others, that the time had come when perhaps it would be an advantage to try to standardize some of their ideas of what was possible in the treatment of coal. In his studies of the subject, he had always been in the habit of looking with great respect at a certain table which was inserted in Mr. Hunt's paper read before the Institution of Civil Engineers in 1886, in which some very striking results were published on the carbonization of coal in $\frac{1}{2}$ cwt. quantities in iron retorts. No doubt these figures would be in the minds of some members present. They ran up to about 13,000 or 14,000 cubic feet to the ton. But, as Mr. Hunt was at that time rather tied on the subject of sperm value,

he did not push his researches further than the point at which the sperm value appeared to be falling. It certainly had occurred to him, while listening to the remarks made that day, that it would be of considerable advantage, and might relieve the Carbonization Committee from the gentle reflection which Mr. Hunt put upon them that morning, if these experiments, or something like them, could be repeated with the larger views, and with the more exact methods (especially of estimating the illuminating power) of to-day. Possibly, in the course of the experiments, some little light might be thrown on such questions as that of the formation of methane, so ably touched upon by Dr. Colman.

Mr. E. A. HARMAN (Huddersfield) called attention to the fact that the cost per ton of coal could only have local importance, unless the rate of wages paid in the respective districts was also given.

Mr. J. H. BROWN (Nottingham) thought there was one omission from Dr. Lessing's description of the apparatus, which was of particular interest in connection with what they heard from Dr. Colman that morning as to the increased production of methane. In the Koppers ovens, he understood the flue was not taken above the height of the coal in the oven. The heating surface was kept below the top of the coal undergoing carbonization; and, by this means, they were able to increase the illuminating power of the gas very considerably. Of course, there was a certain amount of radiation; but the heating took place below the level of the coal.

Mr. H. E. COPP (West Bromwich) said a point which had struck him very forcibly in Dr. Lessing's paper was the fall of the illuminating power on continuing the charge. This seemed to him to indicate that the conditions of carbonization in the chambers were most improper, especially in view of the remarks of Dr. Colman, in which he pointed out that the task before the Carbonization Committee was to determine the point at which polymerization should cease. It seemed to him that this was a very important point. He had also found in the course of his modest investigations that illuminating power had some relationship to the temperature of the gases coming off; and the temperature was some measure of the extent of polymerization. He would suggest that, by some such means, the limit could be arrived at, and the temperature at which the breaking-down of the hydrocarbons must cease could be determined.

Mr. J. G. TOOMS (Waterford) suggested that the Carbonization Committee should not lose sight of the fact that there was a large percentage of members of the Institution for whom machinery of any kind was impossible, beyond an exhauster; and there were a number of other usually called small works where only modified machinery could be used. He thought the paper most likely to interest the bulk of the members, and to be of service to them, was Mr. Bell's. It showed how gas-works, however small, could improve their results by working on the lines and principles there enunciated. One question he should like to ask Mr. Bell, which no doubt he had considered, was why he went to the trouble and expense of raising his retort-house walls, when external producers would have accomplished his purpose just as satisfactorily. Working with external producers himself, without any regeneration, and using Durham unscreened gas coal, he was able to sell 10.8 cwt. of coke; there being 0.8 cwt. of coke breeze. He wondered, on looking at one of the tables where Mr. Bell pointed out the coke used per charge, when he had only 6 cwt. in his retort, what would be the result of carbonizing 10 cwt. in the same time as he carbonized 6 cwt., and whether he would not get practically the same result, and require less fuel for the same amount of work, with a consequent saving in the cost. Of course, he understood there might be difficulty about the coal.

Mr. W. H. MORGAN (Rhayader) said the question had been mooted now, for the first time as far as he remembered, of carbonizing coal scientifically. In his opinion, it had been done from the commencement in the most unscientific way possible; and it was a question whether they would ever be able to make gas in a really scientific way, because science had to give way to commercial expediency. His experience of manufacture of both hard and soft coke for fifty years was that, to make hard coke, the larger bulk of coal one got together the better; but to make gas, the less quantity of coal there was in bulk the better. Most of their difficulties were due to the large bulk of coal in the retort, which led to trouble because the gas could not get away. The smaller the quantity of coal the better, because they wanted to get as much coal as possible exposed to the same

heat. He thought that Mr. West was nearer the scientific method of producing gas in his earlier efforts in 1873. It was a question whether they would ever be able to produce gas scientifically to pay, because there were so many things to look to. There was the sale price of the gas and the formation of bye-products as well. They were all interesting papers; but in his opinion they were working upon wrong lines, except Mr. West in his earlier experiments.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) remarked, on behalf of the Carbonization Committee, that after the tests which were made by Dr. Colman and Mr. Broadberry last year in vertical retorts, the Committee felt there was no reason to make any further tests this year, and also that the continuous retorts in this country were not in such a state that the Committee could give really definite results with regard to them. It would not be fair to the inventors of the two systems to present a final report on them; the same with regard to the carbonizing chambers. They had not reached that stage of development in which it was thought wise to incur the expense of making very costly tests—such as tests on the Continent necessarily must be; but they had by no means lost sight of the necessity of doing so at some future time. The Committee would bear in mind the suggestions made by Mr. Webber and Mr. Tooms, and see what could be done in the matter. He would call attention to the fact that the Committee had not unlimited means at their disposal. The funds for this work were very limited indeed, and they had to be careful of them. He should like to join in thanking Dr. Lessing for calling attention to the development in carbonizing chambers which had taken place on the Continent, and also to thank Mr. Bell very heartily for his most careful and accurate paper. It was extremely interesting to him, because he had put up a very similar, but somewhat larger, installation of retorts two or three years ago at the Lower Sydenham works with De Brouwer machinery with large coal charges and eight-hour periods; and he could confirm in almost every particular all that he had said about them. There was one item in which he could not confirm Mr. Bell absolutely, and that was the low cost of carbonizing wages; for while they were carbonizing for 9d. per ton, Mr. Bell succeeded in getting it down to 6d. Possibly the difference might be somewhat accounted for by the fact that their rate of wages was higher than in Derby, and that they had three shifts instead of two. With all his other conclusions, he was heartily in accord, except that he did not regard the arrangement of conveyor as quite the best. He thought that an enclosed conveyor, which held the steam in, tended a great deal more to corrosion than one which allowed the steam to escape; and it must to some extent block up the regenerator flues, and add to the cost of getting at the chain of the conveyor. He also desired to thank Mr. Watson for his paper.

Mr. T. S. LACEY (Nine Elms) asked whether Mr. Bell purified the gas for carbonic acid before the illuminating power was tested, and also whether as a rule he worked with eight-hour charges.

Mr. BELL said the gas was not purified for carbonic acid; and he used six, eight, ten, and twelve hour charges. During most of the time it was twelve hours.

Dr. ELLIOTT (New York) said he had listened with great interest to the explanation which Dr. Colman had given that morning, which was entirely on the line of work that he had done of a similar character.

The PRESIDENT said he must now call upon the readers of the papers to reply; and, as time was limited, he might inform them that they might send in further replies for inclusion in the "Proceedings." The same would apply to any members present who had anything of value to add to the discussion.

Dr. LESSING, after thanking the members for the patient hearing they had given him, said he was much obliged to Mr. Hunt for his criticism, because Mr. Hunt was the first man in this country to point out the possibilities of such a system, and he first investigated the working of recovery ovens in the Brymbo works in 1896. He had done very useful work in this direction. Mr. Allen had explained that his paper had more especially an historical value, which was quite true. It was merely brought forward with the intention of showing what was going on. He (the speaker) was not in a position to criticize the work—first of all, for lack of material; and, secondly, because he did not believe that it was possible to criticize properly a process which had only been going on for about two years, and on a large scale for something less than one year. For this reason, he could

not, from personal experience, answer certain questions which had been put. With regard to the width of the chamber, on which Mr. Leather asked a question, he did not like to load his paper with information which had been already published; and it was already stated in the "JOURNAL OF GAS LIGHTING" that in the Munich system the middle chamber was 2 feet wide, and the two outer ones 1 ft. 10 in. He had not got the dimensions of the other systems, because firms were rather reticent on matters of detail. The principle of having a wider centre chamber had been pointed out; and one speaker referred to a difficulty of this description in connection with the retorts—viz., that the centre retort in the setting got more heat than the two outer ones. This had been considered in the present case. As to the pressure in the chamber, it had been found useful in the newer installations to have a second ascension-pipe put in, which joined the short ascension-pipe at the top before leading into the hydraulic main, and which acted as a pressure equalizer. By this arrangement one could secure a pressure of about $\frac{1}{4}$ inch inside the chamber with the greatest ease; and the pressure did not rise much higher even during the period after charging. The difference with various coals—Derbyshire and Yorkshire—had been referred to, which opened up a very wide subject. Every coal would behave differently, because it would be in a different geological state, and its composition or structure might be different. Therefore one really had to consider every kind of coal under a different heading, especially as it would behave differently in consolidation and coke formation. These remarks had, therefore, to be taken generally, and must not be applied to any special kind of coal. Mr. Irving had referred to the question of intermittent and continuous working in the charging of chambers. He himself was rather in favour of continuous charging, believing it to be more scientific to maintain a certain state of carbonization at every point of the distillation vessel. On the other hand, one had to contend with enormous difficulties; and the possibility of carrying the problem into practice seemed to be rather far ahead. But it might be practicable, with recent experience of retorts and large distillation vessels, to combine them so as to form a useful instrument, as he had referred to in his concluding remarks. Mr. Hayman, whose criticisms were of very great value, referred to the comparison with vertical retorts, and to chambers tried at Berlin, which those members who had visited the Mariendorf works, or who had read the various descriptions given of them, knew were of a slightly different character. They were rather smaller, and more on the lines of a retort. This had been considered an advantage; and Mr. Hayman made a point of the small heating surface, by which presumably he meant the thinner layer of heated coke. The results were then not satisfactory. With these chambers, the width of each charge was rather larger; and therefore the conditions were different. The heating surface he referred to, in putting down the advantages of the chambers, was rather more the heating wall-surface; whereas Mr. Hayman had referred to the heated coke surface. This question of the width of the charge opened up the problem which Dr. Colman had so ably dealt with; and he thought his explanation was quite correct. He disclaimed from the outset any advocacy of this system of carbonization; his only purpose was to report progress, and show what had been done. On the other hand, he should like to discover for himself, and for the industry as a whole, what advantages and disadvantages there were. He believed that what he had termed the "flywheel" action of a large charge came somewhat near to what Dr. Colman asked for in ideal carbonization. They had a very large mass, which must not be assumed to be a mass of heated coke, because during the greater part of the period it would be coal, or partly decomposed coal; whereas heated coke would be present only in the final hours. If they had this large bulk, he thought it was possible—combining the actions, on the one hand of decomposing the volatile products released from the coal, and on the other hand of methane formation by combination with the hydrogen of the highly-heated hydrocarbon particles or molecules—that they would have a chance of striking the happy mean, and that they would get a compensating action in a large charge. In a small charge, it was very easily possible to run beyond the mark. All the different actions which went on in the retort overlapped each other; and they could not fix a certain point. But with a large charge there should be a possibility of doing this. One might, of course, happen to fix on the wrong point; but he believed, with

longer experience and more knowledge of the occurrences in the chamber, one should be able to direct the process in a certain manner and by proper regulation of temperatures do it with a fair degree of success. Mr. Copp had asked a question with regard to the illuminating power; and it must be remembered that the Bunte curve (p. 834) did not represent an ordinary working curve. It was an experiment where the conditions were so selected as to be able to follow up the course accurately during the whole period. In an ordinary case, the curves would be rather different. He had some showing the work done by Dr. Sissingh in horizontal chambers, and they were much more like the curves obtained in working horizontal or full retorts. They were more on the level line, because by working in rotation one got the high illuminating period of one chamber following on to the other; and the gas to a certain extent mixed. The only drawback was that when charging only in daytime over a twelve-hour shift, the night shift would be producing rather different gas. It was, however, claimed that by this arrangement it was possible during the hours of highest consumption to get the best gas. Some, perhaps, would not like even this advantage, and would rather have a uniform gas throughout the 24 hours. With regard to the calorific power referred to by Mr. Canning, if methane only, or even principally, was produced, this would be quite sufficient to explain the calorific power; but it was not so much a question of heavy hydrocarbons or of hydrocarbons at all. There was a great difference between having gas of poor illuminating power, brought about by a lot of nitrogen drawn in from the flues, and one of low illuminating power being directly produced by the non-luminous hydrocarbons like methane. What had been mentioned with regard to the Koppers ovens explained a good deal. The flues did not extend to the height of the charge, and therefore it was possible to obtain a cooler space at the top of the charge.

The PRESIDENT said he ought to explain that they were under a great debt to Dr. Lessing for giving them this paper. He did not come as an advocate for these chambers; but he had given an account of carbonizing in chambers as he had seen it on his visits to the Continent, and he was kind enough to undertake this work at very short notice. They had a promise from Herr Schilling, of Munich, to do so; but nearly at the last moment he was prevented, and Dr. Lessing was good enough to take up the work, which they would all agree he had carried out in a very admirable way.

Mr. BELL said he was sure the meeting would not wish him to deal then with the various points raised; and he would take advantage of the offer to send in a written reply. He would simply thank the members for the kind way that his paper had been received. They must all be glad to know that the discussion had elicited a vast amount of information on the subject of carbonization. It was the work of Mr. Woodall, Professor Bone, and the President which had stirred up those who had horizontal retorts to see what they could do; and it was for each member to decide, in case of making any extensions, what system he would adopt.

Mr. WATSON thanked the members for the kind consideration they had given his paper, and Mr. Townsend more especially for the corroboration he had given to his figures. He would only say further that he was sure they would all be glad to hear from any gentleman who had the telpher system in use some statement as to the results. There was no doubt a good deal in it; but some points they would like to hear about, and one of them was labour.

The following contribution to the discussion has been forwarded for publication by the Secretary of the Institution.

Mr. A. OWEN JONES (of the Staffordshire Chemical Works, Tunstall) writes: The Institution is to be congratulated on its choice of such valuable papers as we have had before us. The importance of the subject of these papers, and the prominent place held by the contributors, can only tend one way, and that is to increase our knowledge of such complex question as gas heating, carbonizing, and the best methods of transit of the hot coke. Dr. Lessing's paper prominently places before us the importance which bulk carbonization is making for itself as evidenced by the rapid developments on the Continent. The question as to whether horizontals, slopers, or vertical chambers are the most efficient, seems to me to be just in the same interesting position as that of the smaller gas-retort. Mr. Irving wishes the paper contained more data as to dimensions, &c. The Chairman's statements that only at the last minute Dr. Lessing was

asked to prepare his paper, no doubt, explains their absence; but I hope to be able to supply the information in a few days, as far as it applies to my vertical chamber. The theory of carbonizing in bulk as expressed by Dr. Lessing is an interesting one, and one which I have reason to believe is largely borne out by facts. Contraction of bulk is not sufficient in itself to explain why the coke leaves the walls; and the theory now put forward by Dr. Lessing is a very reasonable one. Dr. Colman's lucid explanation of the reasons of the altered conditions in the larger chambers resulting in the lowering of the percentages of marsh gas, is highly interesting. It occurred to me that the vertical oven with horizontal heating chambers would lend itself very well indeed to the conditions suggested by Dr. Colman for obtaining the critical point where the tar is cracked just to such an extent as to make the calorific value of the gas exactly what is desired. I mean that if the top flue were heated just to the point at which the tars were so cracked-up, the desired end could be attained. In my vertical oven, the arrangement of heating has for its object the means to a separate control of every portion of the chamber from the top to the bottom, to suit any conditions desired. Mr. Hayman does not seem impressed with the economy of coking in large bulk; but I think my experience in this respect is very convincing—that there is an enormous economy to be had. I understood Mr. Hayman to say that the relations of the heated surface to that of the coal in the vertical chamber and that of the vertical retort, were not to be compared; but I presume Mr. Hayman will admit that conditions that give tar practically identical with that obtained in the Dessau retorts with the same class of coal, are the conditions that tend to give the same quality of gas; and it may interest members to know that such conditions exist in my vertical chamber. I cannot see any reason whatever why gas of uniform quality in a properly-managed plant of large chambers cannot be obtained. The question of tight walls is very important, and can be attained. The lowering of the quality of the gas towards the end of the carbonizing period can be compensated by arranging that other chambers adjacent are producing gas of the best quality coinciding with this period. Therefore, with double the amount of gas made per square foot of ground covered, considerable reduction in working costs, better quality tar, possible increase in bye-products, and simplicity of arrangements for the controlling of heats (thus prolonging the life of the oven), are advantages which I hope will be considered of sufficient importance to merit the interest and investigation of members. Mr. Bell's paper interested me very much—especially where it showed how careful management in looking after details resulted in great economy; and the figures given by him are excellent results for the horizontal type of retorts.

ILLUMINATING EFFICIENCIES OF CARBON MON-
OXIDE AND HYDROGEN USED IN CONJUNC-
TION WITH INCANDESCENT MANTLES.

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INTRODUCTION.

The belief has recently become prevalent that the illuminating efficiency of a combustible gas used in conjunction with an incandescent mantle is proportional to its net calorific value. The basis of this belief seems to be the investigations carried out by Messrs. White, Russell, and Traver in the United States in 1901-2,* and, more recently, by M. Sainte-Claire Deville, of Paris, in 1907.† The experiments of Messrs. White, Russell, and Traver, which were embodied in a paper read before the Michigan Gas Association in 1902, consisted in a comparison between the net calorific values of various gases and their illuminating efficiencies in conjunction with the incandescent mantle when burnt in an ordinary atmospheric burner properly adjusted to give the maximum effect. They concluded:

1.—That no matter what gas was being used with the mantle (water gas, coal gas, or natural gas), the point of highest efficiency corresponded also with the point of maximum illumination.

2.—That the illuminating efficiency was proportional to the calorific value of the gas approximately in the proportion of 1 candle power cubic foot for every four calories increase in the net heating value.

An examination of the table of results published with their paper—the essential parts of which, together with an additional column showing the number of calories per candle per hour, which should be a constant, are reproduced below—shows that, whereas out of fifteen different gases, ten behaved in a manner consistent with the second of their conclusions, and two others approximately so, three gases—viz., water gas, carbon monoxide, and natural gas—were notable exceptions.

White, Russell, and Traver's Table.

Gas.	Net Calorific Value.	Candles per Cubic Foot.	Calories per Candle.
Water	60·24	5·53	10·89
Water and coal	108·9	17·5	6·22
Decarburized coal.	130·9	21·86	5·99
Coal	144·3	25·4	5·68
Coal and carburetted water	147·86	28·48	5·19
Coal gas and benzolated coal	153·83	27·4	5·61
Benzolated coal	156·1	29·75	5·25
Carburetted water.	169·6	32·9	5·15
Carbon monoxide	67·03	5·54	12·10
" and coal	112·11	20·69	5·42
Hydrogen	62·39	9·67	6·45
Pintsch	239·38	41·63	5·75
Natural	219·28	22·94	9·56
Coal and natural	162·96	25·43	6·41
Coal	140·55	25·60	5·49

M. Sainte-Claire Deville investigated a number of different composite gases, comprising "blue" water gas, coal gas, and various mixtures of the two, whose net calorific values varied between 76·8 and 208·8 calories per cubic foot (water gas to cannel gas). He employed an atmospheric burner specially constructed so that the relative proportions of air and gas in the mixture could be accurately measured. He found that the duty of a given gas (defined as candles per cubic foot per hour when the proportion of air admitted with the gas is so adjusted as to give the highest illuminating effect for the particular rate of gas consumption) invariably increased with the rate of consumption up to a certain maximum. Beyond this maximum, an increase in the rate of consumption caused no further increase in the duty, which, after remaining constant within a certain limited range of consumption, depending upon the size of the mantle, at length fell off considerably. Taking in each case this maximum duty as the proper basis of comparison with the different gaseous mixtures examined, he concluded that:

1.—The duty obtained for the expenditure of a given number of units of heat per hour remains constant within 15 per cent. throughout the whole range of illuminating gas, from neat water gas to neat cannel gas.

2.—That, therefore, it must be granted that the specific or normal illuminating duty in the incandescent burner is proportional to the calorific value of the gas.

Without questioning the accuracy of M. Sainte-Claire Deville's observations, it seems difficult to attach any physical meaning to the supposed simple connection between the calorific value of a gas and its illuminating efficiency, whatever view is taken of the cause of luminosity of the mantle. For if it be supposed that the mantle is a "light heat-engine," which in some way emits intense luminous radiations as the result of its being heated in the flame to a high temperature, the proposition that the luminous effect is proportional to the calorific value of the gas (which probably would bear some simple relation to the flame temperature) hardly seems consistent with what is known concerning the relationship between the total amount of radiation emitted by an incandescent solid and its temperature. Or, on the other hand, if it be argued that the luminosity of the mantle is connected with a supposed power of inducing surface combustion—a cause which may at least in part be operative—it must be admitted that its action in this respect will probably be selective with regard to the constituents of a given combustible mixture, and that any such selective action will depend chiefly on chemical factors, and will have no necessary, or even obvious, connection with the total calorific value of the gas.

It may be observed that, with few exceptions, the comparisons so far made between the illuminating values of various gases and their calorific powers have had reference

* See "JOURNAL," Vol. LXXVII., p. 879; Vol. LXXIX., p. 892; and Vol. LXXX., p. 562.
† *Ibid.*, Vol. C., pp. 22, 173.

to more or less complex mixtures of gases, and that the results of such experiments as have been made with single gases, or with mixtures of two gases, are precisely those which do not conform to the conclusions drawn from the more complex cases. This is particularly so with regard to the results obtained by the American investigators. When, therefore, it was suggested to the author, at the time of his appointment to the Gas Fellowship at the University of Leeds, that he should, as part of his work, investigate the question *de novo* from a fundamental standpoint, it seemed desirable that a careful series of comparative experiments should be first of all made with one or two gases in a state of purity; and for this purpose hydrogen and carbon monoxide seemed to possess qualities which eminently fitted them for such a comparison.

In the first place, these two gases are similar in having nearly the same net calorific values—namely, carbon monoxide = 85.9 kg. cent. units, and hydrogen = 72.8 kg. cent. units per cubic foot at 0° C. and 760 mm.—and also in requiring exactly the same proportion of oxygen (or air) for their complete combustion. But here their similarity ends. They differ in two important respects—namely, in density and in what may be termed, for want of a better phrase, their “combustion intensities.” The density of carbon monoxide is fourteen times that of hydrogen (and therefore their relative diffusibilities are as 1 is to 3.74); and not only is the rate of combustion of hydrogen known to be very much higher than that of carbon monoxide, but also their rates are unequally accelerated by the influence of hot surfaces.

It was therefore decided to make a systematic investigation of the mantle efficiencies of these two gases, and the conditions requisite for the attainment of the maximum illumination from each, with a view to determining whether—with two single gases having nearly the same calorific values, but exhibiting considerable differences in the character of their flames and their modes of combustion—the supposed dependence of illuminating effect upon the calorific values could be verified.

EXPERIMENTAL.

A.—Preparation and Storage of the Gases.—At the outset of the investigation, it was necessary to instal a photometric equipment specially adapted for the investigation of single gases; and one of the first requirements was an arrangement for the preparation and storage of the two gases in quantities sufficiently large for continuous and satisfactory working. The hydrogen was prepared by the action of pure dilute sulphuric acid upon the “Crescent” zinc as now manufactured by an electrolytic process by Brunner, Mond, and Co. This brand of zinc has a high degree of purity. It is guaranteed “arsenic free,” and contains only traces of carbon, but no sulphur. It is therefore well adapted for the preparation of hydrogen on a large scale. The gas as it was evolved from the generating apparatus was passed through a series of large wash-bottles containing a hot alkaline solution of potassium permanganate, and was then collected over water in a 10 cubic feet gasholder. The gas usually contained between 0.4 and 1.35 (average 0.85) per cent. of methane, and had an average net calorific value of 73.9 kg. cent. units per cubic foot, as compared with 72.8 for pure hydrogen. As a convenient means of storage, the gas was compressed into iron cylinders at 200 atmospheres pressure; the largest cylinders employed having a capacity of 60 cubic feet of gas at this pressure. In the photometer room, the cylinders of compressed gas were connected with two automatic reducing valves in series, whereby the pressure was reduced down to nearly atmospheric pressure at the point of delivery to the meters leading to the special burners on the photometer bench.

Owing to the exceedingly poisonous character of carbon monoxide, it was not considered safe to store it under high pressure; and, therefore, other arrangements had to be adopted. The gas was generated by dropping 90 per cent. formic acid into hot concentrated sulphuric acid contained in a large round-bottomed flask. To ensure its freedom from acidic impurities, it was passed first of all through a bottle containing a strong solution of caustic soda, and afterwards up a coke-tower, down which a stream of the same liquid was kept running. The gas was finally collected in a 5-feet holder over water. Analysis showed that it contained, on an average, between 97 and 98 per cent. of carbon monoxide, and had a calorific value of 83.5 kg. cent. units, per cubic foot, as compared with 85.9 for the chemically pure gas.

B.—Photometric Arrangements.—The photometer bench was of the open-bar type, 12 feet in length, and graduated into centimetres. It was provided with suitable wheeled carriers for the photometer head and for the special burner or burners used during the investigation. The standard of comparison was a Harcourt 10-candle pentane lamp, which was fixed to a sliding table resting on the photometer bar. In accordance with the advice of Mr. Charles Carpenter, the pentane standard and the special burner used for the tests were fixed at a distance of 150 centimetres apart for all illuminating powers up to 100 candles. Above this limit, it was found necessary to increase the distance to 200 centimetres. The actual tests were always made with the aid of the Simmance-Abady “Flicker” photometer, which was very kindly presented to the department by Messrs. Alexander Wright and Co.

Since it was considered desirable to measure not only the rate of consumption of the gas under investigation, but also the proportion of air mixed with it at the burner nipple, arrangements were made for using compressed air from storage cylinders of 60 cubic feet capacity at 200 atmospheres. This air was compressed in the laboratory, and the cylinders were afterwards connected with the meters on the photometer bench through two reducing valves similar to those used in the case of compressed hydrogen. Both gas and air supplies were passed through suitable meters and governors before delivery to the burners on the photometric bar, and a King's gauge on the gas supply showed the pressure at the injector nipple.

C.—Construction of the Burner.—The burner was in its

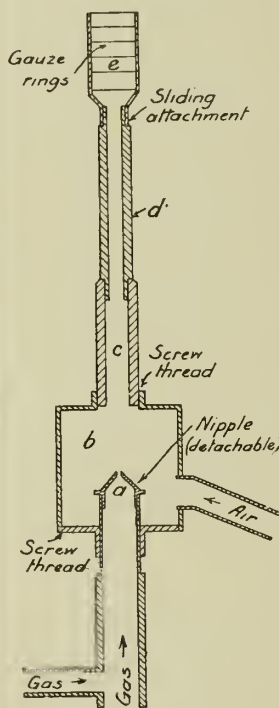


Fig. 1.—Burner with Head No. 2.

essential parts a copy of M. Sainte-Claire Deville's burner. It is illustrated in fig. 1. The gas enters by the bottom pipe, and, passing upwards, arrives at the injector nipple *a*, from which it issues into the mixing-chamber *b*. For carbon monoxide, it is necessary to use a nipple with a larger aperture than for hydrogen. The nipple is therefore detachable, and the air-chamber can be unscrewed to give access to it. In the top of the mixing-chamber is placed the ascension-pipe *c*—provided with a screw-thread, by means of which its height above the nipple can be adjusted. The upper part *d* of the ascension-pipe is of small diameter ($\frac{1}{4}$ inch), to increase the velocity of the upward flowing mixture of gas and air. Finally, the burner-head *e*, containing gauze-rings, fits the end of *d*. The mantle is held in position by an outside support attached to *d*, and not shown in the illustration. For the making and subsequent modification of the burner, the author is indebted to Messrs. George Bray and Co., who kindly gave him the advantage of their experience. The burner heads are of two sizes, No. 0 and No. 2, which were designed to fit the Welsbach mantles No. 0 (50 mm. long by 14 mm. diameter) and No. 2 (75 mm. long by 25 mm. diameter at the bottom). The Welsbach Company kindly supplied several dozens of each size of mantle—all made from the same batch of material.

D.—Results of Experiments.—Before proceeding to the results of experiments, it is necessary to make several definitions and explanations of terms used in the tabulated results.

H ₂	= cubic feet of hydrogen per hour measured at 0° C. and 760 mm.
CO	= cubic feet carbon monoxide per hour measured at 0° C. and 760 mm.
Air	= cubic feet air per hour measured at 0° C. and 760 mm.
C.P.	= candle power in sperm candles.
$\frac{\text{C.P.}}{\text{Gas}}$	= candles per cubic foot of gas per hour = duty.

$\frac{\text{Air}}{\text{Gas.}}$ = cubic feet of air per cubic foot of gas.

$\frac{\text{CV} \times \text{Gas}}{\text{C.P.}}$ = calories per candle per hour.

All gas measurements are reduced to dry gas at 0° C. and 760 mm.

The first experiments were made with hydrogen, using a No. 2 mantle. It was soon found, however, that the burner-head, as originally designed, was not suitable to the combustion of a mixture of hydrogen with more than about one-fifth of the air necessary for complete combustion. As soon as the ratio of air to gas in the mixture issuing at the burner-head reached the limit of 0.52, back-firing occurred. The approach of this limit was always heralded by a peculiar singing noise in the burner-head; and in these conditions the addition of even a small amount of air caused the mixture to explode down the tube of the burner with considerable violence. Within the narrow limits of variation of the proportion of air to gas imposed by the construction of the burner, it was found:

- 1.—That the duty obtained with each particular rate of consumption of hydrogen increased with the amount of admixed air up to the point at which back-firing occurred.
- 2.—That the duty obtainable regularly decreased with the rate of hydrogen consumption.

This is clearly shown in Table I., as follows:—

TABLE I.

H ₂ .	C.P. No Air. H ₂	C.P. Most Air. H ₂ .	Air. H ₂
2.35	6.8	7.9	.52
2.87	5.64	7.02	.48
3.32	4.87	6.32	.45
3.62	4.72	6.19	.43
3.95	4.0	5.39	.39
4.80	—	4.94	.35
4.99	—	5.04	.26
5.13	2.91	4.5	.43
5.65	—	3.77	.37

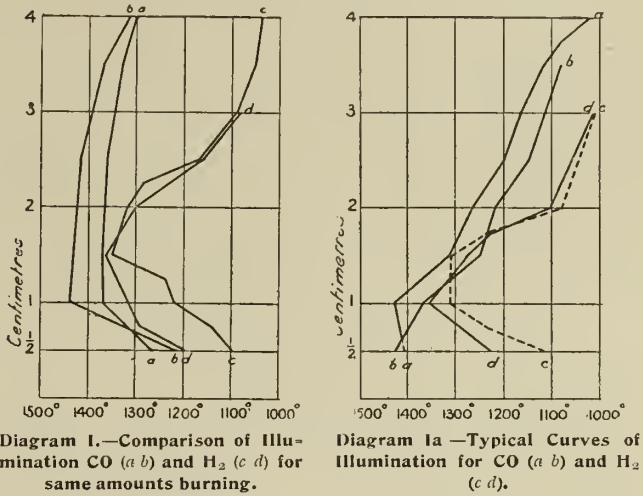
In further experiments on hydrogen with this burner, it was found that the best duty was obtained when the ascension-pipe was fixed as high as possible above the nipple—due, no doubt, to better admixing of the gas and air before it reached the burner-head. It was also remarked that whereas with low consumptions the mantle was brilliantly illuminated at its base but rather poorly on the higher portions of its surface, with high rates of consumption the illumination of the base fell off considerably, while that of the middle and upper portions was greatly increased. This circumstance is doubtless to be ascribed to the squat and bulky shape of a badly-aerated hydrogen flame, which is ill-adapted to any ordinary form or size of mantle. It was therefore decided to modify the construction of the head of the burner in order to allow of a much better aeration of the hydrogen flame without its striking-back. This entailed several months' experimental work.

At this stage of the investigation, it was becoming increasingly evident that the distribution of illumination over the surface of a mantle was vastly different in the case of the two gases when burnt under similar conditions with a badly-aerated flame. Arrangements were therefore made to compare the distributions of illumination over the mantle in the two cases. The method adopted was to estimate the intensity of the illumination of small areas over the whole of the mantle by means of a Féry optical pyrometer, which gives what is essentially a photometric measure of the luminous radiation in terms of an arbitrary temperature scale attached to the instrument.

With regard to the experiments under consideration, the illuminations of the various parts of the mantle are expressed in terms of the readings on the arbitrary temperature scale of the instrument; but it must be understood that these temperatures would only be approximately correct if a mantle corresponded to the ideal "black" body. For the purpose of this paper, their readings may be taken as relative measures of illumination according to a particularly arbitrary scale; and the various diagrams relating to these experiments must be interpreted accordingly. In carrying out the tests, portions of the mantle were screened off from the pyrometer by means of a sheet of metal having a rectangular hole 12.5 mm. wide by 5 mm. high. The screen was

placed about 2 inches in front of the mantle, and the optical pyrometer was fixed at a distance of about 6 feet on the other side of the screen, in correct alignment with the slit. The burner carrying the mantle was mounted on a carriage provided with a rack-and-pinion arrangement, whereby successive areas of the mantle could be brought opposite the slit, and the distribution of illumination over the whole surface of the mantle from top to bottom could be mapped out.

ILLUMINATION CURVES FOR CARBON MONOXIDE AND HYDROGEN.



The character of results obtained is shown in the curves in Diagrams I and Ia.

In these diagrams the vertical heights above the burner head of the centre of the small areas examined on the mantle surface are plotted as ordinates against readings on the arbitrary scale of illumination as abscissae.*

The actual figures for consumption of gas and air for these curves are shown in Tables II. and IIa., and were obtained with the small No. o size mantle.

TABLE II.

Curve.	Gas.	Air.	C.P.	C.P. Gas.	Air. Gas.
a	1.88 CO	Nil	9.48	5.03	..
b	1.88 CO	0.66	15.15	8.04	.35
c	1.86 H ₂	Nil	3.77	2.03	..
d	1.86 H ₂	0.74	5.18	2.78	.40

TABLE IIa.

Curve.	Gas.	Air.	C.P.	C.P. Gas.	Air. Gas.
a	1.22 CO	Nil	10.75	8.79	..
b	1.22 CO	0.52	7.45	6.09	.42
c	1.30 H ₂	Nil	2.9	2.23	..
d	1.30 H ₂	0.56	3.94	3.03	.43

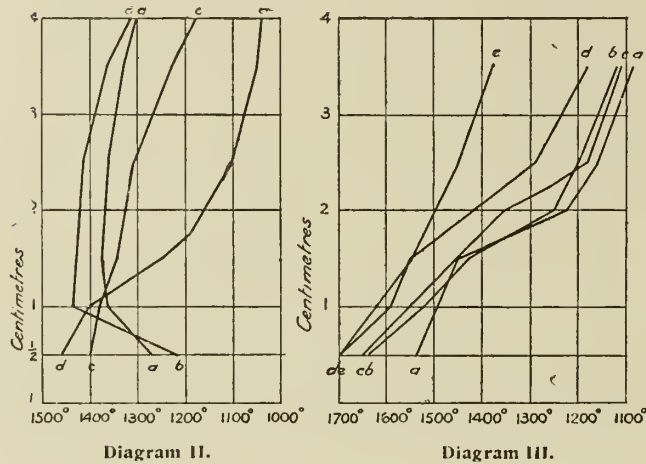
The figures in the above tables refer to similar rates of consumption of hydrogen and carbon monoxide, for the same mantle and burner, with flames almost equally aerated. The total light afforded is, however, very different in the two gases; nor is the reason far to seek. A glance at the curves shows that the distribution of illumination is quite different; for whereas the illumination caused by hydrogen is mainly at the bottom of the mantle and falls away very rapidly on the upper half, owing to the squat and bulky shape of the flame, in the case of carbon monoxide the illumination is very little different on the upper and lower halves of the mantle—the falling off being quite gradual, and pointing to an upright tapering flame for this gas.

With the addition of a small amount of air to the hydrogen flame, the illumination of the bottom of the mantle was immediately increased, while that of the upper portions faded. The flame is smaller and more concentrated. This is shown in Diagram I, curves c and d, and in Diagram Ia, curves c

* As far as the author is aware, diagrams have not before been used for this purpose. As indicators of the distribution of illumination over the mantle surface, they may be compared to the "indicator diagrams" which show the distribution of power over the stroke in an engine cylinder.

and *d*. In the case of the carbon monoxide flame, the addition of air increased the illumination all over the mantle surface (curves *a* and *b*, Diagram 1 and 1A). As the result of increased aëration, the flame shrank and fitted the mantle better. Evidently this was the best possible fit with this rate of consumption of carbon monoxide; for on adding more air the candle power dropped, and the illumination of the upper half of the mantle became less and less. This is shown graphically in Diagram II. Here, in curves *c* and *d*, the bottom of the mantle only is appreciably illuminated; the illumination of the top falling away in a very marked

ILLUMINATION CURVES FOR CARBON MONOXIDE.



- Diagram II.

 - a*. Too little air.
 - b*. Correct amount of air.
 - c*. Too much air.
 - d*. High excess of air.
- Diagram III.

 - a*. Too little air.
 - b*. Too much air.
 - c*. Correct amount of air.
 - d*. Effect of more gas and air on *b*.
 - e*. " " " "

degree. The rates of consumption corresponding to these curves are shown in Table III.

TABLE III.

Curve.	CO.	Air.	C.P.	C.P. CO.	Air. CO.
<i>a</i>	1'88	—	9'48	5'03	—
<i>b</i>	1'88	0'66	15'15	8'04	'35
<i>c</i>	1'88	0'94	14'7	7'80	'50
<i>d</i>	1'88	1'69	7'87	4'18	'90

It may be noted here that with these low rates of consumption the burner was not working at its best; and, consequently, the values for the duties are low as compared with those shown in the next table.

TABLE IV.

Curve.	CO.	Air.	C.P.	C.P. CO.	Air CO.
<i>a</i>	2'05	2'37	18'47	9'01	1'16
<i>b</i>	2'05	3'19	23'75	11'64	1'56
<i>c</i>	2'05	3'91	20'15	9'83	1'91
<i>d</i>	2'59	3'78	36'6	14'10	1'46
—	2'59	4'05	40'5	15'61	1'56
<i>e</i>	3'c9	5'00	60'0	19'41	1'62
—	3'c9	6'18	43'8	14'17	2'0

The illumination curves for this table are shown in Diagram III.

Curves *a*, *c*, and *b* in Diagram III. are interesting, as showing the greater illumination obtained on increasing the aëration up to a certain limit, and its subsequent falling off when too much air was added. Starting with too little air, curve *a* shows a considerably lower illumination both at the bottom and top of the mantle than curves *c* and *b*. The addition of a little air evidently caused the flame to shrink and fit the mantle better. At this consumption of carbon monoxide, this degree of aëration gave the best duty (curve *c*). The addition of more air apparently brought the flame inside the mantle, and there is a general lowering of the illumination over most of the surface—curve *b*. At this point, the consumption of carbon monoxide was increased; the flame became larger again; and curve *d* was obtained. Here the illumination was better all over the mantle. The ratio of

air to gas was now lower than that for the last maximum duty. Therefore, on increasing the air again, the candle power rose in accordance with expectation. The illumination curve for this experiment was not determined. On further increasing the consumption of gas and air, the illumination of the upper half of the mantle, which in curve *d* is not so good as that of the lower half, was increased, and curve *e* was obtained. The ratio of air to gas for curve *e* is higher than that for curve *d*. A further increase of added air lowers the duty as shown in the table. The illumination curve for this experiment was also not determined. The results in Tables III. and IV. are in entire accordance with M. Sainte-Claire Deville's conclusion that the ratio of air to gas required for the maximum duty increases with the actual consumption of the gas.

The consumptions of carbon monoxide shown in Table IV. were the highest that had been used up to this stage of the work. Comparable rates of consumption of hydrogen are shown in Table IVa.

TABLE IVa.

H ₂ .	Air.	C.P.	C.P. H ₂ .	Air. H ₂ .
2'4	0'94	9'47	3'94	0'39
2'92	nil	5'38	1'84	nil
3'44	1'22	9'0	2'62	0'36

The difference in "duty" afforded by hydrogen and carbon monoxide in all the experiments so far considered is striking. In Tables II. and 11A, the duty for carbon monoxide is considerably more than double that shown by hydrogen under similar conditions. In Tables IV. and IVa., the duty afforded by carbon monoxide was also very much superior to that afforded by hydrogen; but the comparison is, in this instance, perhaps not altogether a fair one. For whereas in the case of the carbon monoxide the flames were all well aërated, in the case of the hydrogen they were badly aërated, although as highly aërated as the construction of the burner would permit. It has nevertheless been shown that in all cases where hydrogen and carbon monoxide have been compared under similar conditions of aëration, the advantage has always been overwhelmingly in favour of carbon monoxide. Moreover, since with any ordinary atmospheric burner carbon monoxide may be burned with a much greater degree of aëration than is possible to obtain with hydrogen without the flame striking-back, it may be concluded that, under such conditions, carbon monoxide will give a higher maximum duty at every rate of consumption.

The problem of designing a form of burner which would permit of a thoroughly aërated hydrogen flame presented many difficulties; but after much experimenting it was successfully solved by the design of burner No. 3A, now to be described.

Burner 3a.—A sketch is shown of this in fig. 1A. The

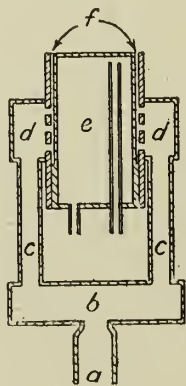


Fig. 1a.—Section of Burner Heads Nos. 3a and 3b.

sketch is shown of this in fig. 1A. The mixture of gas and air enters at *a* (which is made to fit the top of the tube *d* in fig. 1) into a horizontal tube *b*, from which two upright pipes *c* lead to a gallery *d*. This gallery completely encircles the burner-head. Holes drilled on the inside of the gallery allow the passage of the gas and air into the slit *f*, which also extends all round the burner-head, and from the top of which the mixture is burnt. The inside surface of the slit is the circular water-jacket *e*, which cools the gaseous mixture while the restricted width of the slit causes the mixture to move forward towards the flame at a high velocity.

It is obvious that such a burner as the above is very far removed from anything that is likely to be used in actual practice, and that therefore in some respects the remaining experiments may be said to have been carried out under quite artificial conditions. But since the object of the research was the comparison of the illuminating efficiencies of hydrogen and carbon monoxide both burning under the most favourable conditions, it seemed neither necessary nor desirable to impose any arbitrary limit as to the design of a burner. In the first experiments with the new burner, the width of the slit was only 0'074 inch, and while it was possible to maintain a fully aërated flame of hydrogen without



Fig. 2.—H₂ flame well aerated. Fig. 3.—CO flame well aerated.

any danger of it striking-back, the extremely narrow opening only permitted of comparatively low rates of consumption. In these circumstances, very poor results were obtained as regards maximum efficiency. On investigation, this seemed to be due primarily to the shape of the flame, which is shown in fig. 2. It assumed a long, tapering, pencil-like form; and though this is not necessarily an indication of its shape when the mantle was placed in position, it obviously did not particularly conform to the outline of the mantle. Nevertheless, even with this burner, under similar conditions as regards aëration, a 40 per cent. higher duty was obtained with carbonic oxide than with hydrogen. The slit of the burner was now widened to pass 50 per cent. more gas than in its original condition; and the final experiments were performed with the burner-head thus altered. Under the new conditions, it was at length possible to follow the maximum duty curve for hydrogen with increasing consumptions up to a point at which it ceased to rise.

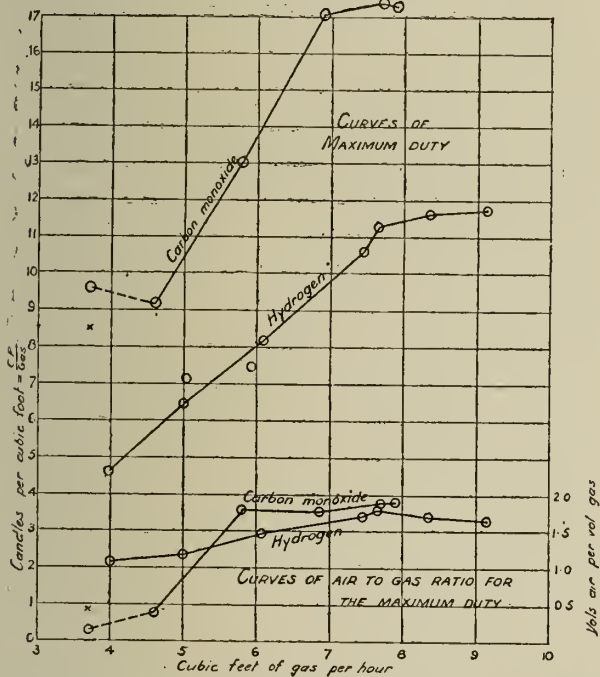


Diagram IV.—Curves of Maximum Duty and of Air-to-Gas Ratio.

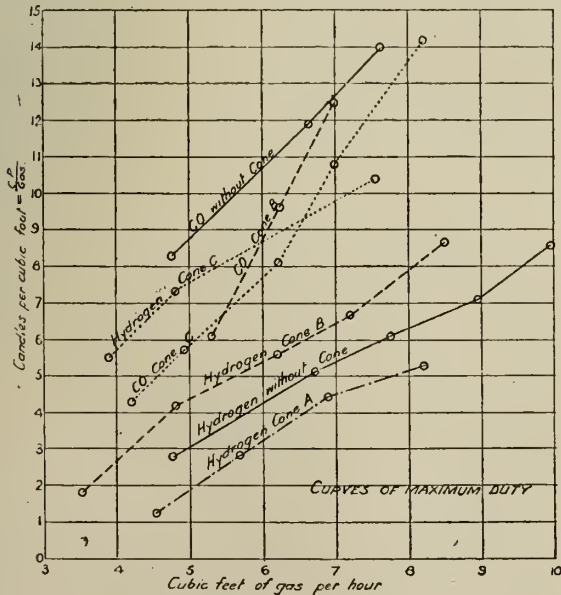


Diagram V.—Curves of Maximum Duty.

Such a slit burner, however, is not well adapted for the combustion of carbon monoxide, owing to the flame being partially blown away from the slit, as shown in fig. 3. So that if hydrogen and carbon monoxide are to be finally compared under the most favourable circumstances for each, the results obtained with the slit burner for hydrogen must be compared with those obtained by means of burner No. 2 for carbon monoxide. This comparison is shown in Tables V. and VI. The "duty" curves constructed from the figures in Tables V. and VI. are compared in Diagram IV.

TABLE V.

H ₂ .	Air.	C.P.	C.P. H ₂ .	Air. H ₂ .	C.V. × H ₂ . C.P.
3'98	4'31	18'4	4'62	1'08	16'0
5'01	5'92	32'2	6'43	1'18	11'5
5'04	6'68	36'2	7'18	1'32	10'3
5'92	8'65	44'6	7'53	1'46	9'8
6'07	9'24	49'5	8'16	1'52	9'06
7'46	12'76	78'7	10'55	1'71	7'00
7'65	13'67	86'5	11'31	1'78	6'54
8'35	14'25	96'5	11'56	1'71	6'39
9'13	15'13	108'0	11'76	1'65	6'3

TABLE VI.

Co.	Air.	C.P.	C.P. Co.	Air. Co.	C.V. × Co. C.P.
3'72	0'61	35'53	9'57	0'16	8'73
4'62	1'81	42'4	9'18	0'39	9'1
5'8	10'55	75'5	13'05	1'83	6'4
6'87	12'27	117'2	17'06	1'78	4'89
7'69	14'64	133'2	17'33	1'90	4'82
7'91	15'22	137'0	17'31	1'92	4'82

The maximum duty obtained for hydrogen at a consumption of 9'13 cubic feet per hour was 11'76 candles per cubic foot—a result which must be compared with the 17'33 candles per cubic foot obtained for carbon monoxide at a consumption of 7'69 cubic feet per hour. The ratio of the maximum efficiencies for carbon monoxide and hydrogen is therefore 1'47, as compared with a ratio of 1'13 for their net calorific values.

VARIAION OF SHAPE OF FLAME AND ITS INFLUENCE UPON THE "DUTIES" OBTAINABLE FROM THE GAS.

The experiments on hydrogen with the slit burner had suggested the desirability of endeavouring to alter the shape of the flame by the use of porcelain cones, so as to confine the combustion as far as possible to a hollow shell corresponding to the outline of the mantle. For this purpose, hollow cones of white porous porcelain of three different shapes, as shown in fig. 4, were prepared by Messrs. Doulton and Co., of Lambeth. The surface of cone A was so made as to be parallel to the surface of the mantle, while the outlines of the other two cones were designed for the purpose of deflecting the flame as much as possible, either towards the bottom or towards

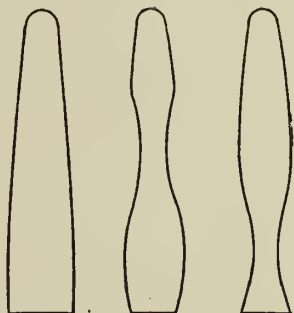
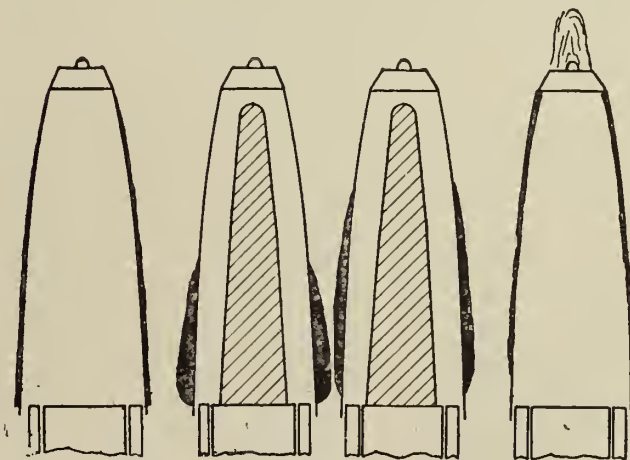


Fig. 4.



H₂ with and without Cone A. CO with and without Cone A. Fig. 5.

the top of the mantle as circumstances might seem to require. In comparing the cones as shown in fig. 4, it will be noticed that B and C are both derived from A, by reducing the diameter in certain places. As might be expected, the alterations thus caused in the contour of the flame affected the curve of maximum duty at different consumptions in a very marked manner. The effect of using the cones is shown in Tables VII. and VIII., from which the duty-curves in Diagram V. have been constructed.

TABLE VII.

Diagram and Curve.	H ₂	Air.	C.P.	C.P. H ₂	Air H ₂	C.V. × H ₂ C.P.
No Cone						
VI. a ₁	9'68	15'37	85'5	8'84	1'59	8'36
a ₂	9'94	14'64	85'5	8'60	1'47	8'59
b	8'95	13'02	63'5	7'10	1'45	10'41
c	7'77	10'94	47'5	6'11	1'41	12'10
d	6'69	8'14	34'5	5'16	1'22	14'33
e	4'75	4'29	13'05	2'75	0'90	26'88
Cone A						
VII. a	10'03	13'65	40'0	3'99	1'36	18'52*
b	8'22	13'10	43'8	5'33	1'59	13'87
c	6'87	10'93	30'7	4'47	1'59	16'53
d	5'65	7'96	16'2	2'87	1'39	25'76
e	4'52	5'06	5'7	1'26	1'12	58'57
Cone B						
VIII. a	8'5	15'63	73'4	8'63	1'85	8'56
b	7'21	12'66	48'0	6'66	1'76	11'10
c	6'19	10'26	34'55	5'58	1'66	13'24
d	4'81	7'17	20'15	4'19	1'48	17'62
e	3'51	4'62	6'35	1'81	1'31	40'87
Cone C						
IX. a	8'58	14'02	82'6	9'63	1'63	7'67*
b	7'52	12'54	78'3	10'42	1'67	7'09
c	6'73	8'76	45'02	6'69	1'30	11'05*
d	4'80	6'18	35'2	7'34	1'29	10'07
e	3'87	5'07	21'3	5'50	1'31	13'44

* Evidently short of air.

TABLE VIII.

Diagram and Curve.	CO.	Air.	C.P.	C.P. CO.	Air. CO.	C.V. + CO. C.P.
No cone						
X. a	7'61	13'32	106'5	13'99	1'75	5'97
b	6'62	12'77	79'5	12'01	1'93	6'95
c	6'03	9'33	57'5	9'54	1'55	8'75
d	4'76	1'11	39'3	8'26	0'23	10'11
Cone A						
XI. a	7'38	13'95	88'5	11'99	1'89	6'96
b	6'57	12'29	72'0	10'95	1'87	7'62
c	5'80	9'64	61'8	10'65	1'66	7'84
d	4'46	4'11	23'75	5'32	0'92	15'70
Cone B						
XII. a	8'14	14'6	108	13'26	1'79	6'3
b	6'98	11'40	87'8	12'7	1'63	6'63
c	6'24	8'28	60'0	9'62	1'33	8'68
d	5'31	6'70	32'6	6'14	1'26	13'59
Cone C						
XIII. a	8'2	14'4	116'2	14'19	1'76	5'89
b	6'98	10'24	75'5	10'81	1'47	7'72
c	6'23	9'30	50'5	8'11	1'49	10'3
d	4'93	3'82	27'4	5'68	0'77	14'7
e	4'18	2'09	18'05	4'31	0'5	19'36

One fact is made plain from a consideration of these tables and diagrams—namely, that both for hydrogen and carbon monoxide the curve of “maximum duties” is altered considerably by the cones as far as it has been possible to follow it, and that different shaped cones have different effects. Two reasons may be advanced in explanation of this alteration of the curves. They are:

1.—The “quickenings” or concentration of the flame

owing to increased surface combustion, or some such similar cause.

2.—The deflection of the flame according to the shape of the cone.

In considering the first, it is necessary to look at fig. 5. This consists of four sketches, showing the relative distribution of brightness of the illumination given by (a) carbon monoxide with cone as in sketch No. 1, and without a cone in sketch No. 2; (b) hydrogen with cone as sketch No. 3; and without a cone in sketch No. 4. The illumination is distributed in a very equal manner over the mantle surface when the cone is not in use. On the contrary, when the cone A is in use the illumination appears to be mostly on the bottom parts of the mantle, and is much more brilliant—a statement which is proved in the particular experiments illustrated by the fact that the duty afforded was higher in both cases with the cone than without it. [This is not, however, always the case. Concentration of the illumination invariably occurs when any cone is used; but increase in the total candle power is not always effected by concentration.]

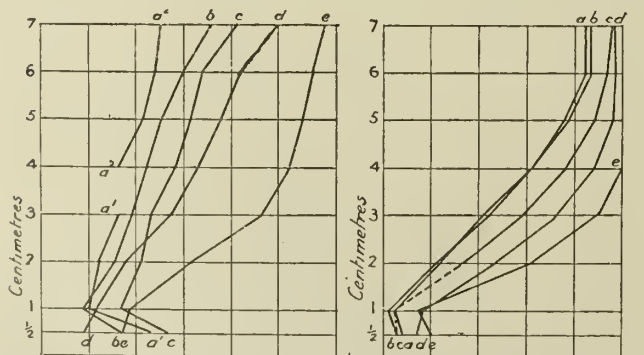
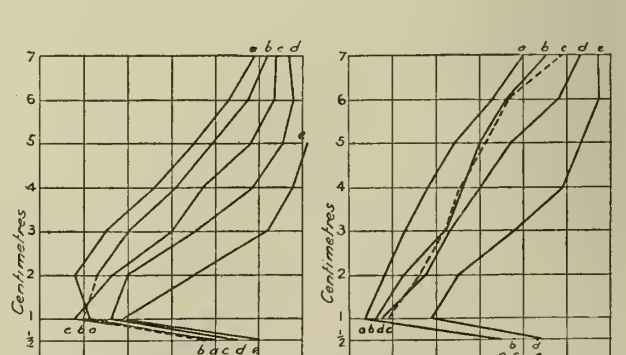
With regard to the second reason, the effect of deflection can be clearly observed on examining the illumination curves given in Diagrams VI., VII., VIII., and IX. for hydrogen, and X., XI., XII., and XIII. for carbon monoxide. [The lettering of the curves refers to the lettering in Tables VII. and VIII.]

Hydrogen.—In Diagram VII., it is seen that with cone A the illumination is principally at the bottom of the mantle, and falls away rapidly as the upper portions are approached; whereas in Diagram VI., without a cone, the falling away is not nearly so rapid, and the upper portions of the mantle are comparatively well illuminated. In Diagram VIII., the effect of cone B is shown to be in the same direction as cone A at the bottom of the mantle; but at the top it allows of better illumination. In Diagram IX., cone C, with its slender bottom and bulging top, causes the flame which has partially escaped the previously-mentioned quickening action of the wide bottomed cones A and B to be deflected on to the upper portions of the mantle, with a consequently improved illumination there.

Carbon Monoxide.—The effects are very similar. Without a cone (Diagram X.), there is a very even illumination over the mantle surface. Cones A and B (Diagrams XI. and XII.) cause quickening of combustion and better illumination at the bottom and less in the upper portions, while cone C (Diagram XIII.), causing less quickening and concentration of illumination at the bottom, gives better illumination at the top of the mantle than the other cones.

Returning to the effect of the cones on the duty curves (Diagram V.), it must be concluded that, as far as the curves go, they show that the duty afforded by hydrogen can be raised by the use of a suitably shaped cone. Whether or not the duty can be permanently raised can only be decided when the curves can be followed as far as the flat part. At low consumptions at any rate there is an actual improvement. In the case of carbon monoxide, no actual improvement is effected by the cones, though the direction of the duty curves when the cones are used indicates a quicker rise of duty for a given increase in the rate of consumption than without them. Could the curves be further extended, it is possible that the horizontal part of the steeper curves would be higher than that for the less steep curve for carbon monoxide without a cone. As this can only be settled by further experiment, the only definite conclusion so far established

ILLUMINATION CURVES FOR HYDROGEN.

Diagram VI.—H₂ without Cone.Diagram VII.—H₂ with Cone A.Diagram VIII.—H₂ with Cone B.Diagram IX.—H₂ with Cone C.

ILLUMINATION CURVES FOR CARBON MONOXIDE.

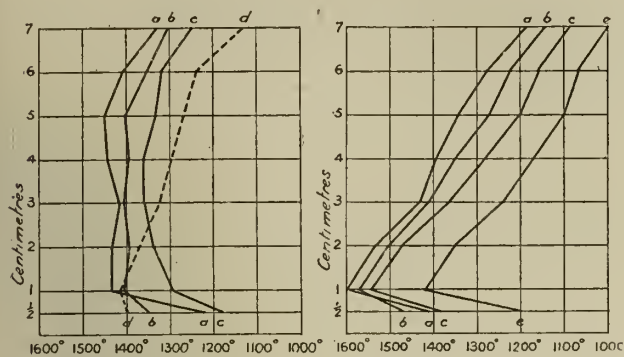


Diagram X.—CO without Cone.

Diagram XI.—CO with Cone A.

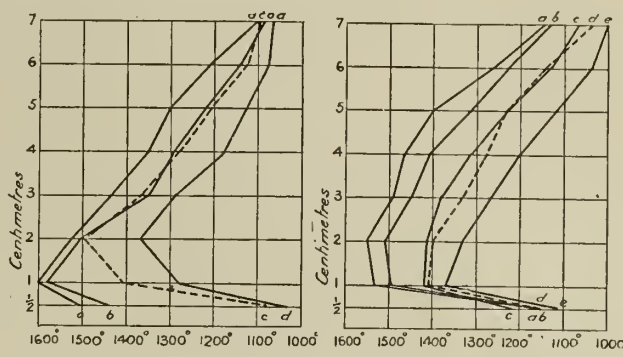


Diagram XII.—CO with Cone B. Diagram XIII.—CO with Cone C.

by the use of the cones is the fact that they cause quickened combustion, and therefore concentration of illumination.

CONCLUSIONS.

The principal conclusions arrived at during this investigation may be summarized as follows:

1.—When hydrogen is burnt in an ordinary atmospheric burner with a degree of aëration up to a ratio of $\frac{\text{Air}}{\text{H}_2} = 0.5$ —i.e., the highest possible with such a burner—the duty afforded steadily decreases with a rising rate of gas consumption.

2.—The distribution of luminosity over the mantle with such a burner is vastly different with hydrogen than with carbon monoxide under similar conditions.

3.—With an ordinary burner, carbon monoxide invariably gives a very much higher duty than hydrogen.

4.—When, by suitable manipulation, hydrogen was made to burn in a well-aërated condition, the highest duty obtained was 11.7 candles per cubic foot, with a ratio of $\frac{\text{Air}}{\text{H}_2} = \text{about } 1.7$. This, compared with the best result for carbon monoxide—viz., 17.3 candles per cubic foot with a ratio $\frac{\text{Air}}{\text{CO}} = 1.9$ —shows a 48 per cent.

margin in favour of carbon monoxide. A comparison of their calorific values as used in the test shows only a 13 per cent. advantage in favour of carbon monoxide.

5.—The use of cones inside the mantle causes a quickening of combustion and concentration of illumination.

In conclusion, the author desires to thank Professor Bone for his constant interest and advice during the course of the investigation, and his kind assistance in the compilation of this paper.

Discussion on Mr. Forshaw's Paper.

The PRESIDENT said it could not but be gratifying to the Institution to know that such careful experiments and such scientific work had been carried on, with the object of finding the conditions which existed in the incandescent mantle, which was now so favourite a form of gas lighting. It was a highly scientific problem. The investigation had dealt with two gases which, among others, they distributed; and for the purpose of the investigation it had been necessary to find the conditions which existed when pure hydrogen and carbon monoxide were used in burners of different descriptions. They all knew that different gases affected the shape of the flame and the intensity of the illumination in a mantle. A mixture of water gas and coal gas gave a different shaped flame, and required a burner of slightly different proportions, from that used for pure coal gas. They also knew that the intensity of combustion when there was a mixture of water gas and coal gas was greater than with pure coal gas. It was very important for the progress of incandescent lighting that they should recognize that the shape and the local intensity of the flame depended on the mixture of gases in relation to the design of the burner. Their friends in the trade who were developing the incandescent burner, both upright and inverted, were no doubt keeping this point in view; and, fortunately for them all, the construction of the inverted burner seemed to have been a comparatively easy matter for developing a higher candle power per cubic foot

than had been the case with the upright burner. There seemed to be fewer difficulties in the way of obtaining a higher duty. As many of them knew, it was not difficult to get 20 candles per foot, at an angle of about 80°, from an ordinary inverted burner which could be purchased on the market. This was very gratifying; but it was possible that by such investigations as these even better results might be obtained, and there was evidently room for further investigation and development. Before opening the discussion, he would ask the Honorary Secretary to read several letters which had been received bearing upon the subject.

Mr. SHOUBRIDGE read the several letters, as follows:—

[From M. SAINTE-CLAIRE DEVILLE—Translation.]

I have only a very rudimentary knowledge of the English language, and so it is not possible for me in a few hours to thoroughly fathom the sense and bearing of Mr. Forshaw's letter. . . . I should like to be excused if this letter reveals the fact that I have not entirely understood the communication.

My impression is that there is no contradiction between the conclusions of Mr. Forshaw and my own. Mr. Forshaw considers gases chemically pure, and asks himself whether the luminous value of these gases, in a state of incandescence, varies proportionately to their calorific power; He particularly compares carbon monoxide and hydrogen. and he finds that the maximum yield of the former is far higher than the maximum yield of the latter. This in no way astonished me; and I do not think I ever expressed a contrary opinion. It seems, in fact, that there is no necessary correlation between the heat of combustion of a gas and the amount of its luminosity in the mantles. The theoretical temperature of combustion of the gases seems, *à priori*, to be a more important factor of this yield. But it is not at all from this point of view that I started to study the question.

My first labours on this subject date from 1894. At that time incandescence was in its infancy; and in Paris, at any rate, there could be no question of distributing to consumers any other gas than coal gas. The only method of controlling the quality of the gas was the determination of the lighting power of the flames, as defined by Dumas and Regnault. It appeared thereupon that a coal gas giving, on the Dumas and Regnault photometer, a lighting power quite insufficient, might nevertheless be perfectly usable for lighting by incandescence. People might have asked themselves whether it would not be advisable to create another method of measuring light, to determine the lighting power of gas by incandescence, after having defined it with precision. It was then that I undertook the systematic comparison of the heats of combustion of coal gases with their lighting powers by incandescence. I adapted to an ordinary burner a feed of air capable of being regulated and measured. Then, keeping the gas pressure constant at the point of consumption, I regulated the air in such a manner as to realize the maximum luminous intensity for the gas used. This work shows—in fact, it is found—that the quantity of light obtained per 1000 calorific units used up under the mantle is about constant for all coal gases. I have since established a peculiarity which has the effect of making this probable enough—namely, coal gases, from the poorest to the richest, all have a theoretical temperature of combustion about equal, and in the neighbourhood of 1950°.

In 1901, I again took up this question—modifying the definition of the lighting power of a gas by incandescence.

I admitted that this characteristic lighting power would be, not the maximum luminous yield at a moderate expenditure, under normal pressure, but the absolute maximum luminous yield obtained by intensive combustion. The method of ascertaining this yield seems to me to be pretty correctly stated by Mr. Forshaw early in his paper. I also affirmed (confining myself in my remarks to coal gases only) that the proportion of lighting power by incandescence to the calorific power of the gas, may be considered as an experimental fact sufficiently established for there to be no necessity, in commercial practice, to directly control the lighting power by incandescence (which would be extremely difficult) in order that a gas manufacturer might consider himself to be acting fairly towards the consumers when he has furnished them with a gas of a higher calorific power than an agreed figure. The investigations of 1901 were published by the International Commission on Photometry at the close of the session of 1903.

In 1905 I again took up the question, for the purpose of inquiring within what limits a mixture of water gas with coal gas might modify my first conclusions. I recognized that water gas gives a little more light per 1000 heat units than coal gas, but that, taking it altogether, the trouble occasioned to the law of proportions is of slight importance, and may be neglected in practice. [See the researches published by the International Commission of Photometry at the close of its session of 1907.]

It is thoroughly understood, besides, that these conclusions are only applicable in the case of the supply of a gas on the basis of coal gas. Still, I think that if a company furnishes the public in a regular way with carburetted water gas, the accidental variations of yield of light by incandescence would be accompanied by variations in the same direction of the calorific power of the gas. But the average value of the luminous yield per 1000 units of heat would doubtless be a little higher than in the case of coal gas, whether mixed or not with water gas, and carburetted if necessary with benzol.

[From Professor A. G. VERNON HARCOURT.]

The total light sent forth from an incandescent mantle is obviously the sum of the different quantities of light from a number of equal areas into which its surface may be divided. The greatest light is given out from such of these unit areas—square centimetres, one might take it—as are in the hottest part of the flame. Other parts of the surface contribute in various less degrees, according to the temperature of the part of the flame with which they are in contact. The hottest part of a flame is its outside—a part scarcely visible—where the last of the gas, already highly heated, is finally burnt.

If a tongue of flame and a mantle could be so shaped to fit one another as that nearly all the mantle was just dipping into the outside of the flame, the result would be excellent with any ordinary gas. Still there would be differences between one gas or mixture of gases and another. If other conditions could be made alike, the flame temperature would vary with the calorific value of the gas; and it is interesting to see, from the measurements quoted by Mr. Forshaw, how nearly these two are proportional, judging by the necessarily rough test of the illumination produced by the application of the flame to a mantle.

Another property of gases, besides their calorific value, which affects flame temperature, is their rate of combustion. Mr. Forshaw writes: "The rate of combustion of hydrogen is known to be very much higher than that of carbon monoxide;" and he connects this most justly with the great difference between the diffusion rates—*i.e.*, rates of molecular movement—of the two gases.

Since the temperature of a flame depends upon the difference between the heat that is produced and the heat that is given off during each moment of time, it is clear that when the rate of combustion (which is the rate of heat production) is greater, the temperature of the flame will be higher.

Mr. Forshaw has attempted a most difficult estimation, owing to the great difference between the shapes of the flames of hydrogen and carbonic oxide burning from the same burner, and the different fitting of similar mantles to flames of different shapes; and if different burners are used for the two, there is an uncertainty, due to the influence of the burner.

I hope that Mr. Forshaw may be continuing his research; and I venture to prophesy that if he can succeed in produc-

ing really comparable flames of the two gases, better without previous admixture of air which complicates the case, he will obtain at least as good an incandescence from hydrogen as from carbonic oxide.

[From Professor WILLIAM A. BONE.]

I have much pleasure in testifying to the sustained industry and experimental skill displayed by Mr. Forshaw during his eighteen months' tenure of the Institution Research Fellowship; and although I must leave it to others to judge of the pertinence and value of the work he has accomplished, I perhaps may be allowed to express the opinion that, as regards devotion to his subject and conscientious desire to secure accuracy of his results, he has established a record which it will be difficult for any of his successors to surpass. It is equally gratifying to the Institution, the University, and myself that before the two years of his tenure of the Fellowship had been completed, an opening as Research Chemist to a large firm engaged in the manufacture of gas-heating appliances was found for him. In this respect, also, a happy precedent has been created.

With respect to the subject of the paper, there can be little question of the importance of the careful determination of the relative illuminating efficiencies of various gases when used in conjunction with the incandescent mantle. So far as can be judged at present, the future of "gas lighting" seems largely dependent upon the extended use of the mantle, and therefore the elucidation of the many scientific problems connected with its function as a "heat-light" engine cannot fail to be of ultimate value to the industry.

During recent years the opinion has been gaining ground that the illuminating efficiency of a combustible gas used in conjunction with an incandescent mantle is proportional to its net calorific value; and in consequence it has become the fashion to regard the calorimeter as the ultimate measure of the value of gas for both lighting and heating purposes. At first sight no doubt this belief may seem plausible enough, and there is a certain amount of experimental evidence in its favour; but on close examination this evidence is insufficient and lacking in cogency. Moreover, the belief ignores such chemical factors involved in gaseous combustion as the relative combustion "intensities" of different gases, and the influence of hot surfaces thereon, as well as the known complexity of even apparently simple cases of combustion. I venture to think that few chemists who have specially studied gaseous combustion would subscribe to the "calorimetric" doctrine, at least on the strength of the evidence so far advanced in its support.

Past investigators, no doubt with a view to the immediate practical value of their work, had chiefly busied themselves with complex mixtures of gases, with the result that it was impossible from their results to discriminate between the various factors operative in determining the "mantle efficiency" of a gas. Mr. Forshaw has attempted what has proved to be the much more difficult task of comparing the efficiencies of two single gases, having nearly the same calorific values, but different rates of diffusion and combustion intensities, and where rates of combustion were also differently affected by hot surfaces. The results obtained have borne out the anticipation that the efficiency depends upon other factors than mere calorific values; and from that point of view they might be commended to the careful attention of all illuminating engineers. The precise definition of these other factors must be left to further inquiry.

The original programme of work mapped out for Mr. Forshaw included the examination of methane; but partly owing to the great experimental difficulties encountered in the cases of hydrogen and carbon monoxide (difficulties which often entailed delays on account of reconstruction of the burners used), and partly to the fact that Mr. Forshaw had, by reason of his industrial appointment, to resign the Fellowship before completing his two years' tenure, the investigation of methane had to be left to his successor.

A novel feature of the paper are the "illumination curves" which indicate the distribution of illumination over the mantle surface. The ingenious optical pyrometer invented by M. Féry had provided an easy and convenient method of determining the distribution of luminosity, the importance of which would be evident to anyone who would study Mr. Forshaw's figures. The experiments on the use of cones were also valuable in suggesting lines of further work and progress.

Mr. Forshaw would probably be the last to claim any degree of finality for his work or conclusions, and the paper must not be considered as embodying anything more than a clear statement of experimental results from an unbiased standpoint. His conclusions would be extended and possibly modified by his successors in the Fellowship, and ultimately they might hope to get their feet planted on the bed-rock of truth in regard to this matter.

I should like to add that the paper embodies only a part of the results of Mr. Forshaw's industry; he has also co-operated with me in experiments on the important subject of "Surface Combustion," the results of which will appear in due course.

[From Mr. JOHN W. BRAY.]

I think the paper will give rise to some very interesting discussion, which I should like to have heard. To my mind, the construction of the burner is of prime importance in any comparison between the illuminating powers of various gases.

My own experience has been that a burner suitable for coal gas will require modification when used with water gas, acetylene, &c. Perhaps, therefore, if Mr. Forshaw had modified his burners even slightly, he might have found an explanation of the difference in the illuminating efficiencies of hydrogen and carbon monoxide.

The same burner used for these gases may not give comparable conditions. These may only be obtained when burners giving the maximum efficiency are employed.

However, I think the results embodied in the paper are most interesting; and I shall look forward to an extension of the experiments, when what I may term the ordinary commercial illuminating gases are used.

Mr. THOMAS HOLGATE (London) said that he had much pleasure in bearing his testimony to the excellent work Mr. Forshaw had done; and he thought perhaps its importance was not circumscribed by his references to the incandescent burner. If they found out the value in an incandescent mantle of the constituents of town gas, it would be one factor enabling them to value the gases they were getting from the older and newer methods of gas production. He had had the pleasure of some correspondence with M. Sainte-Claire Deville, upon the work which that scientist had so admirably performed during a series of years; and he believed that any apparent inconsistency which might appear between his published work and that as now brought forward was only apparent, and that further study would show an essential agreement. Perhaps the reason why M. Sainte-Claire Deville emphasized the question of calorific power as being the one factor was that in his early days he tested mixed gases which had on the average the same flame-temperature; and that being so, it was quite manifest that equal volumes of such a gas must have a value in an incandescent burner approximately determined by the calorific power. The flame-temperature continuing the same, there were no means of comparing the variation of any factor but that of calorific power. Had M. Deville taken gases with different flame-temperatures, he would have found out the influence of the two factors. He (the speaker) thought the French scientist's later work provided a means of testing this. In later years, he tested blue water gas; and if one was careful to dissect the data he provided, it was possible to form a scale of results which showed that the highest efficiency corresponded with the gas which gave the highest flame-temperature. The increase so observed proceeded according to the fourth or fifth power of the increase of flame-temperature. This led him to ask whether Mr. Forshaw had made any observation upon the temperatures of the flames. He noticed that the figures he gave of the temperature of the mantle showed that the mantle was at a higher temperature with a carbon monoxide flame than with hydrogen; and this would, of course, indicate a corresponding increase of luminosity. But had he made any observation on the actual temperature of the two flames—the hydrogen and the carbon monoxide? If he had not, could he suggest any other reason than the difference in flame-temperature for the relative efficiency he had found? If they took the ratio between the flame temperature of hydrogen and carbon monoxide, and took the fifth power of that, they would get a figure which along with the ratio of their calorific values entirely corresponded to his observed figures of 11.7 and 17.3.

Further, he would point out that, in the burner which Mr. Forshaw finally adopted for the hydrogen flame, he had an arrangement for cooling the gas on its way to the burner, in order to prevent back-firing; and he might ask if it was at all likely that any abstraction of the heat took place from the flame by the contiguity to it of that mass of water. They had in the paper one set of figures from carbon monoxide gas where no such disturbing element arose; and the question was whether they were to attach any importance to this dissimilarity. Lastly, he desired to emphasize the value of getting fundamental data relating to each gas.

Mr. LEON GASTER (London) said it was a great privilege to be present at that meeting. He congratulated the Institution on having had this investigation started, because it was of the greatest importance to them to really have correct information as to the relative merits of different illuminants, so that they might know what part each gas is playing in the incandescent method of lighting. Illumination, dealing with a physiological subject, naturally gave rise to a great deal of imagination and speculation. The paper had certainly presented in a very clear manner what these two gases under given conditions were capable of doing; and Professor Bone, in his letter, added that when they had dealt with the other gases used for illumination and their relative efficiencies, they would know more about the rôle played by those now under investigation. Nevertheless, an important piece of work had been done. He wished to express his own thanks particularly to the Institution for their co-operation with the Electro-Technical Commission on the question of the international candle. Only the day before, he had a letter from Washington expressing satisfaction at the co-operation of the Gas Institution with the Commission and the Gas Referees in this country, and which had led to the understanding with regard to an international unit of light. It was very gratifying to find that the unit of light adopted was that given by the 10-candle power Harcourt pentane lamp; and if this unit was generally adopted, everything would be expressed more clearly. For comparison purposes, it was essential to know whether the illumination measurements were taken horizontally, mean, spherically, or hemispherically, as illumination figures, without knowing what they really meant, were misleading. He did not blame gas engineers for taking the horizontal figure, because it suited them best; but it was not so good for proper comparisons. He believed there was room for every illuminant; and he only wanted to know where each should be placed according to its true merits. This investigation no doubt would contribute to settle a great many points with regard to gas; and it ought to be further continued, to the benefit of the gas industry in particular, and of illuminating engineering generally.

Mr. J. P. LEATHER (Burnley) said the paper was of great interest to him, not so much because of the conclusions set out at the end, but from the fact that a commencement had been made with a scientific investigation of illumination by the incandescent mantle. In ancient days, the alchemist worked with recipes containing a dozen different constituents to produce a simple thing, without knowing whether some of them were either necessary or useful; and the progress of chemistry in the Nineteenth Century was due to this old system having been abolished and a search being made to find the value of each constituent. Up to the present time, all the work on incandescent mantles had been on the old system of the alchemist, dealing with the complex mixture called coal gas—different observers using different mixtures, because they had gas produced in different localities. Now they were beginning to separate the gases, and to know what each gas meant; and when this was done, they would be in a better position to know what to aim at in their manufacture. Mr. Forshaw exercised a wise discretion, no doubt, from some points of view, in choosing hydrogen and carbon monoxide for his experiments, because they were the simplest gases that he could work with, and he could obtain them readily in a state of comparative purity. But he had got into certain difficulties through choosing these gases, largely due to the fact that they required so small a proportion of air for complete combustion—namely, only about 2.38 volumes of air as compared with $5\frac{1}{2}$ to 6 volumes in the case of ordinary coal gas, or $9\frac{1}{2}$ volumes in the case of marsh gas. This made a very considerable difference to the way in which the gas was to be burned, and to the burner; and it lent emphasis to the remarks of Dr. Colman on the importance of considering whether they were making marsh gas or hydrogen in their

retorts. While the results of the experiments of Mr. Forshaw were of great interest and value, and they were much indebted to the author for his researches and the diligence he had bestowed on them, he thought in his conclusion he had stated things perhaps not with very great definiteness, but which were hardly borne out by the facts. For instance, he had left the straight and narrow way for bye-path meadow when he talked about surface combustion. No doubt this was due to the hypnotic influence of those who thought there was something in surface combustion. As far as he knew, the argument in favour of it was this, that at high temperatures hot surfaces produced decomposition, and therefore, by the homeopathic law, might also be expected to cure it and promote combination. While dealing with the question of cones, he (Mr. Leather) would point out that there seemed to be a discrepancy between Tables VII. and V. In Table VII., hydrogen without a cone gave, with a consumption of about $7\frac{1}{2}$ cubic feet per hour, only 6 candles per foot, compared with 10 candles when cone C was used. But in Table V. hydrogen without a cone gave over $10\frac{1}{2}$ candles with the same consumption of hydrogen. So that although in one of the diagrams hydrogen was shown to give a better result with a cone than without, the tables, taken together, did not bear this out. M. Casaubon, of Brussels, and several other investigators, whose names he did not remember, had done work which tended to prove, and not only scientific investigation but general practice showed, that they got the best results in illumination when the full theoretical proportion of air was introduced into the mixture before it entered the burner. For instance, with a Kern burner, which drew in about 75 per cent. of the full theoretical quantity, they got 20 candles; but when, by means of higher pressure or specially constructed burners, a greater quantity was drawn in, they got 30 candles and upwards. It did not seem fair to compare the value of hydrogen and carbon monoxide, when in no case had the author succeeded in getting in more than about 70 per cent. of the theoretical quantity of air required. He told them that when he increased the quantity beyond a certain point the duty again diminished; but that was probably due to the fact that the burner was not suitable to the gas and the mantle. This was a very complicated question. In determining the illuminating value of gas in an incandescent burner, they had not only the gas, the air, and the burner to consider, but also the mantle. With an exceptional gas like hydrogen, they must not only construct the burner, but also the mantle for the purpose. Again, there was the question of burning the full theoretical quantity of air. Mr. Forshaw said he was not able to do it with the first burner he had. He (the speaker) would not like to say definitely he could have done it. But it did strike him, when he read the paper (which had been sent to him beforehand), that it ought to be capable of being done; and although he had only two days, he thought he would try to do it. He constructed a burner out of materials at hand—quite of the ordinary character. At first he started very much as Mr. Forshaw did, and got the same difficulty. He turned on the hydrogen and then turned on the air; and as he turned on the air beyond about the figure Mr. Forshaw had given, he got the burner lighting-back. He spent some little time on these experiments, because he thought he would check Mr. Forshaw's figures; and he got figures quite as good as, if not better than, any of his as regarded illuminating power. He could not give the figures, because he had not time to do a great deal of exact work; but taking one result which he corrected for temperature and pressure, with a consumption of hydrogen of 7.8 cubic feet and 3.6 feet of air, he got an illuminating power of 93 candles, or 11.9 candles per foot—fully equal to the best result Mr. Forshaw obtained with a specially constructed burner, and with a higher quantity of air. The mantle was a Welsbach No. 4. It was a bigger burner than Mr. Forshaw had been working with; and he (Mr. Leather) had to use a mantle to fit his burner-head. In some other experiments in which he did not determine the proportion of air accurately, but with a slightly higher consumption of hydrogen, he got an apparently higher result than that—somewhere about 12 or 13 candles, when corrected for temperature and pressure, per foot of hydrogen. But this did not suit him altogether. He felt that they ought to get the full theoretical quantity of air mixed with the hydrogen before the point of ignition if possible; and when thinking it over, he had previously calculated out that with this the burner ought not to light-back. If they were burning 8 cubic feet of hydrogen in a burner with a mixing-

tube $\frac{1}{4}$ inch in diameter, and 2.4 times its volume of air, they would have a velocity of 22 feet per second; and at this rate the burner ought not to light-back, because it was greater than the velocity of propagation of inflammation in a mixture of hydrogen and air. If they started with hydrogen and gradually introduced the air, they had not got that velocity; and when they got up to a much smaller quantity of air than this, they might have a velocity of only 10 feet per second, and a mixture which would light-back. But if they turned the air on first (say, 20 cubic feet), through the burner, and then turned the hydrogen on till they got the right proportion, the burner did not light-back. He simply got the velocity first. Unfortunately when he got to this his time was up, as he had to come to town. Further experiment should include a modification of the mantle as well as the burner; and this was very desirable. It should also include experiments on the lines referred to by Professor Bone in his experiments on marsh gas. It might be difficult to get marsh gas on a large scale in a fair degree of purity, but at any rate they could get a mixture of hydrogen and marsh gas. This work, if carried on still further, would help them considerably in deciding as to what they ought to aim at in carbonization, which, after all, was the foundation of their work as gas manufacturers.

Mr. JAMES PATERSON (Redhill) said it struck him in listening to the paper that to a very large extent Mr. Forshaw was rather testing the mantle than the gas he had had under observation. When he looked at the long pencil-like flame of hydrogen, it struck him very forcibly that in using an ordinary mantle on a burner with such a flame, he was not getting combustion of the gas on the mantle itself. Of course, they understood that with these conditions it was an artificial experiment conducted on scientific lines; and it was very possible that better results would be obtained in illuminating effect if a mantle were used which was more nearly the shape of the long flame. He would suggest this point for future investigation by Mr. Forshaw or his successor. With regard to the use of cones, he had always been under the impression that the effect of putting a cold body into a flame was to act as an impediment to combustion, rather than to improve it; and he failed to see in the paper any evidence of the quickening of combustion which was referred to. It seemed contrary to their ideas that putting a black body in the middle of a flame would improve combustion. Furthermore, there must be the cooling effect of the body. Perhaps different results might have been obtained if the cone had been made hollow, of a very thin substance, so as to prevent absorption of the heat of the flame as far as possible. The effect of the cone seemed to be to throw the flame out on to the mantle. They were not really testing the flame and its luminosity under comparable conditions, but were throwing the flame out—increasing the luminosity at a certain point, as was shown by the diagrams of the appearance of the flame. The flame was put on the mantle; but it came out at the top, and the illuminating effect was lost—showing that the end to be attained was combustion of the gas on the mantle, or just inside, throwing the highest heat zone on the surface of the mantle. He hoped further experiments would be carried out to elucidate some of these difficult points.

Mr. FORSHAW said that he did not know that he could reply in detail to all the criticisms; but he was extremely gratified to hear M. Sainte-Claire Deville's letter, because it was an honour to be noticed by anyone so distinguished in the profession. He indicated in his letter that the paper had not put forward anything contradictory to his conclusions; but he (the speaker) would point out that M. Sainte-Claire Deville's conclusion was simply that the illuminating power of a mantle was proportional to the calorific value of the gas used. The result of his experiments with hydrogen and carbon monoxide simply showed that, for an advantage of 13 per cent. in calorific value, carbon monoxide had an advantage of 48 per cent. in illuminating value in a mantle. He quite admitted M. Sainte-Claire's contention that the variation of the illuminating value of a mantle would be in the same direction as the calorific value; but he did not admit that it was proportional to it. With regard to the flame-temperature, he did not take observations. It was rather a difficult matter to do. If one used a thermojunction, it took a lot of time. The President had just informed him that he would be able to reply better to the criticisms which had been made if he cared to do so in writing; and he should take advantage of this opportunity.

A STUDY IN WORKING COSTS.

By HERBERT LEES, of Hexham.

A careful study of the published statistics relating to the accounts of gas undertakings can never fail to be interesting to the student of the economics of the gas industry; and it will always be instructive. It enables him to make comparison of his own working results with the best—if he does not happen to be so fortunate as to occupy that enviable position himself; and the introspection which this induces will generally lead to the strengthening of the weak places. To those engaged in the industry, it is well known that there is a commendable ambition on the part of engineers and managers of gas undertakings to sell gas as cheaply as possible. The outside critic would attribute this to stress of competition. But whatever may have been the sum-total of that influence, it cannot be gainsaid that, long before competition became serious, this ambition was very prevalent; and it was shown in the frequent reductions in the price of gas, as the outcome of improved working, and of the development of the consumption of gas for a variety of purposes.

Occasionally, some historic document comes to light, telling us of high prices for gas which are unknown to-day, even in remote and sparsely populated districts. We are, therefore, not justified in supposing, as is so often done, that the men responsible for the conduct of gas undertakings in the earlier stages of the industry's history were not imbued with a like spirit. We must not forget that when coal gas was introduced to the world as a means of illumination, it was in an age greatly affected by prejudice—if not by superstition. The "men of wisdom" had grave fears of what would happen if coal gas was stored in vessels such as we now know as gasholders. The ignorance which prompted these fears was not easily dissipated; and we cannot say that even now it has been entirely removed. This prejudice made their task very difficult; and that they were able to do so well says much for their energy and determination, as well as for the usefulness of the commodity they produced and sold.

The financial aspect of the gas engineer's work has received frequent reference in Presidential Addresses, and notably in recent years by Mr. D. Irving in his address to the Institution in 1905. If to any extent the author should trespass on ground previously covered either by that admirable address or by other writers, his excuse must be that only occasionally has the subject been presented as one for discussion, in which form it is likely to elicit a wider range of opinion which cannot be otherwise than advantageous; and if he should be guilty of any errors or false deductions, the subsequent discussion will no doubt correct them.

In a study of working costs, every phase of the conduct of a gas undertaking must be considered; for the ultimate result, as shown in the price of gas, depends upon the efficiency of the work of every department. Thus the engineer, in constructing works with due economy, and so that the processes of manufacture can be carried on in the most economical manner; the works manager in controlling these processes so that the most can be got out of the raw materials at a minimum cost; and the distribution superintendent, in exercising that vigilance which will ensure that no unnecessary loss by leakage from mains and service pipes, or from defective meters, will take place—each contributes to the economical working of the concern. Nor does the responsibility end here; for the success of a gas undertaking cannot be secured without wise administration, which will embrace the most efficient methods of dealing with, and educating, the public whose patronage it seeks.

It is good for the engineer not only to make comparison of his own with another's work, but also to carefully note the progress of his own undertaking from year to year; and what is good for the individual in this respect cannot be otherwise than beneficial if applied over a wider area. For that purpose, the author has had recourse to "Field's Analysis." In the earliest years of that useful publication, the accounts of the Metropolitan Gas Companies only were dealt with. Subsequently the Suburban Companies were added; and in 1883 it was further enlarged by the inclusion of representative Provincial undertakings under the administration of companies and corporations. Although there has been some change in the particular undertakings included, the average figures for each section have been taken.

It may be urged that there is danger in dealing with averages. That, of course, depends on how they are applied.

The first object contemplated by the author is to ascertain what progress has been made as the result of improved methods of manufacture during the last 25 or 30 years. It is sometimes said—with more imagination than truth—that the methods of manufacture and purification of gas have not changed. It would be more correct to say that the principles involved are the same, but great advances in the application of those principles have been made. The author is not in a position to affirm that all the undertakings whose accounts are dealt with in "Field's Analysis" have brought their works up to date; but they may be accepted as representative undertakings, and they serve as an index of the progress made.

Fuel Account.—Appended to this paper is a table (Appendix A) giving the analyses of the accounts of those undertakings for the years 1878, 1883, 1888, 1893, 1898, 1903, and 1907, being intervals of five years with the exception of the last-named, which is the latest issue at the time of writing. The Metropolitan Gas Companies only are included in the 1878 column; and this is interesting as showing the working costs before the introduction of gaseous firing. The figures indicate that, on the whole, the fuel account of the Metropolitan undertakings was not extravagant for that period; in fact, it was as good as that of the Provincial undertakings 25 years later. This item of fuel account is, perhaps, the most disappointing of any of the figures given; and it is at the same time the most difficult to state accurately. This is shown by a comparison of one of the undertakings under review, with the "Gas World Analysis" of the same accounts. "Field's Analysis" states the coke made at 12.03 cwt. per ton of coal carbonized, of which 1.53 cwt. was used for fuel—being 13 per cent. on the coke made; while the "Gas World Analysis" figures show 13.4 cwt. of coke and breeze available for sale. These differences are very conflicting, and make it difficult to formulate any reliable comparisons on this point. But assuming that the same method of calculation has been adopted throughout by the compilers of "Field's Analysis," there is shown the very satisfactory figures in individual cases of 13, 14, 15, 16, and 19 per cent. of coke made used for fuel. But it must be stated that in 1883 two undertakings were as low as 15 per cent., which results have not been consistently maintained by those undertakings in subsequent years. Two of the undertakings showing a fuel account of 55 and 41 per cent. of the coke made in 1883, have in 1907 reduced these figures to 24 and 27 per cent. respectively. There is evidence of progress in the direction of fuel economy, which must always be regarded as one of the essential features of good retort-house practice; and this will surely become more general.

Make per Ton.—The second advantage to be derived from gaseous firing is an increased yield of gas per ton of coal carbonized. The introduction of the manufacture of carburetted water gas seemed to disturb the calculation of this item for a time; and for some years it did not appear in "Field's Analysis." But it has recently reappeared in an appendix, and is based upon the coal gas made only. The figures of the accounts given in Appendix "A" are—

TABLE I.—Gas Made per Ton of Coal Carbonized.

	1883.	1907.
	Cubic Feet.	Cubic Feet.
Metropolitan Companies	10,275	10,885
Suburban "	10,213	11,169
Provincial "	10,113	10,457
" Corporations	9,758	10,827

These figures show substantial progress; and the best results of 1883 and the best of 1907 are about relatively comparable with them. There is, however, a marked advance in some individual cases—one undertaking showing 9141 cubic feet per ton in 1883 and 10,753 cubic feet in 1907; another 9120 and 11,043 cubic feet per ton respectively. Some of the progress made under this heading must be attributed to other causes than that of carbonizing temperatures—such as retort-house governors, light liquor seals, "dry" mains, and better knowledge of carbonizing principles; and perhaps the advantage of a carburetted water gas plant, or some other enriching medium, makes it practicable to extract an abnormal amount of gas from the coal in some instances. Be that as it may, several undertakings can now show a "make per ton" of upwards of 12,000 cubic feet; and no one cares to speak of his results if the figure does not materially exceed 11,000 cubic feet.

These higher figures are not yet general, and the advantage to be gained thereby may be counted among the "reserve forces" of the industry.

Coal and Residuals.—The cost of raw materials, and the prices of residual products will always be subject to market fluctuations and influenced by local circumstances; but the income from these products is dependent, in some measure, upon the working results. Economy in fuel is reflected in the coke sales; while the extraction of a maximum amount of ammonia from the gas—and subsequently from the liquor—and its conversion into sulphate of ammonia, is a determining factor and one over which there is some control. Coke usually follows coal in its fluctuations in price; and to some extent makes good the loss sustained by an undertaking as a result of higher coal prices. This same effect is noticeable in those undertakings near to, and distant from, the coal-fields respectively, with the result that the difference in prices is partly corrected thereby. This, however, has its limitations; and undertakings at a great distance from the source of supply (especially those dependent upon the railways for carriage) are at a great disadvantage. This is shown in Appendix A in the case of Suburban Companies; and the Provincial undertakings far removed from the coal-fields are likewise disadvantageously placed.

Working Expenses.—The working expenses have not on the whole shown any appreciable reduction; and in some cases there is an increase. The following figures taken from Appendix A show the position in 1883 and 1907 respectively per 1000 cubic feet of gas sold:—

TABLE II.—Total Working Expenses per 1000 Cubic Feet of Gas Sold.

—	1883.	1907.	Increase or Decrease.
	d.	d.	d.
Metropolitan Companies . . .	14'79	16'24	+1'45
Suburban " . . .	17'52	17'37	—0'15
Provincial " . . .	13'48	12'35	—1'13
" Corporations. . . .	12'00	12'50	+0'50

The rate of wages is an important factor in these costs. The advances made in the period under review have probably been not less than 30 per cent. in the aggregate; and the economies effected by the introduction of machinery have been largely counteracted thereby. But this is not the only disturbing factor. There has been a change in the incidence of the charges. The cost of manufacture (apart from coal) shows an almost continuous decline; and in the final result the figures per 1000 cubic feet of gas sold are substantially less than in the earliest year taken, as the following statement shows:—

TABLE III.—Manufacturing Charges (Exclusive of Coal) per 1000 Cubic Feet of Gas Sold.

—	1883.	1907.	Reduction.
	d.	d.	d.
Metropolitan Companies . . .	9'47	7'12	2'35
Suburban " . . .	10'42	7'31	3'11
Provincial " . . .	8'28	6'52	1'76
" Corporations	7'74	7'02	0'72

The reduction of these charges in the case of the Metropolitan and Suburban Companies forms a substantial proportion of the total; and although the Provincial undertakings show smaller reductions, they have a slight advantage in the total costs in 1907. There were, of course, fluctuations from year to year; and it will be noticed that, between 1888 and 1893, there was a marked increase in these costs, which however had almost disappeared by 1898. The cause of this increase will, doubtless, be found in the disturbed state of the labour market of that period. Being followed, as it was, by the introduction of machinery, the increased cost of manufacture was practically overtaken in the latter year. Since then the reduction of manufacturing charges appears to have assumed a permanent character. That this is very largely due to the use of machinery and new methods of carbonization is evident from the fact that carbonizing wages show a substantial proportion of the reduced costs. It is very gratifying that the introduction of additional machinery has not added to the cost of "wear and tear." Even this item is less than formerly. Purification, in the last year dealt with, shows a lessened cost in the Metropol-

itan and Suburban gas undertakings; the Provincial Companies exhibit great regularity; while the Provincial Corporations show more fluctuation in these figures. The abolition of the sulphur clauses is not likely to have any substantial effect upon the Provincial undertakings, as many of the Companies and all the Corporations were previously exempt. Moreover, freedom from legal restrictions should not, and probably will not, lead to a lax policy in regard to purification. There is so little to be gained, and there is much to be lost, if the public should form a prejudice against the use of gas on account of any increase, or supposed increase, in the quantity of sulphur remaining in the gas.

Distribution Charges.—When the great changes that have been effected in the distribution department of a gas undertaking are taken into account, it will not be surprising to find that the economies gained in other directions are cancelled by increased expenditure in this department. In each section of the accounts under review, the increase is considerable; but in the Metropolitan and Suburban Companies—especially the latter—it reaches a very high figure. The method of dealing with slot installations will materially affect this figure in particular accounts, and will probably in some measure explain the discrepancies which appear between different undertakings.

Rates and Taxes.—This item shows an increase of nearly 50 per cent. for the Metropolitan Companies; the Suburban and Provincial Companies have maintained a very regular figure throughout; and the Provincial Corporations exhibit an upward tendency which amounts to an increase of 40 per cent. in a comparison of 1907 with 1883. This is somewhat surprising, inasmuch as it is supposed that, when a Corporation owns the gas undertaking and receives substantial sums therefrom in aid of the rates, the rates are less than in other towns where this does not obtain. These figures suggest that this is not the case.

Management, Etc.—The costs under this head do not greatly vary from year to year; but there is a tendency to a reduction. Law, bad debts, and other charges are not such as to seriously affect the total working costs.

Net Cost in Holder.—The net cost of gas in holder per 1000 cubic feet sold (including the net cost of coal for manufacturing charges) is shown in the following statement:—

TABLE IV.—Net Cost of Gas in Holder per 1000 Cubic Feet of Gas Sold.

—	1883.	1907.	Increase or Decrease.
	d.	d.	d.
Metropolitan Companies . . .	15'57	12'57	—3'00
Suburban " . . .	18'98	16'04	—2'94
Provincial " . . .	15'04	11'32	—3'72
" Corporations	11'13	11'89	+0'76

The total economies effected up to the point of delivery into the holder are here shown; and it will be seen in the next table that other charges—principally for distribution—have nullified the advantage thus gained. The total cost for net coal and working expenses per 1000 cubic feet of gas sold is as follows:—

TABLE V.—Net Coal and Working Expenses per 1000 Cubic Feet of Gas Sold.

—	1883.	1907.	Increase or Decrease.
	d.	d.	d.
Metropolitan Companies . . .	20'89	21'69	+0'80
Suburban " . . .	26'08	26'70	+0'02
Provincial " . . .	20'24	17'15	—3'09
" Corporations	15'39	17'37	+1'98

The final result of 24 years' development shows that there is a slight increase in the cost of gas per 1000 cubic feet sold by the Metropolitan and Suburban Companies; the Provincial Companies show the substantial reduction of 3'09d., and the Corporations an increase of 1'98d. It must not be overlooked, however, that the earlier year was in the period when tar and sulphate of ammonia realized very high prices, which for the four sections amounted to 2'15d., 2'76d., 2'35d., and 3'61d. respectively, in excess of the latter year. While this is a disturbing factor in the comparison of total costs and of net cost of gas in holder, it does not influence the other figures; and as the prices of those days are not

likely to recur, it must be ignored in any considerations and deductions as to the future.

Capital Charges.—The possibilities of reduced prices for gas are not exhausted in the figures shown in the revenue account; and although the net result of the comparisons may from that standpoint be somewhat disappointing, there remains a further field for exploitation—namely, that of capital charges. There has been substantial progress made in the reduction of these charges during the period covered by this survey, as the following figures indicate:—

TABLE VI.—*Capital Charges per 1000 Cubic Feet of Gas Sold.*

—	1883.	1907.	Reduction.
	d.	d.	d.
Metropolitan Companies . . .	15'07	10'40	4'67
Suburban " . . .	15'18	9'00	6'18
Provincial " . . .	10'79	7'79	3'00
" Corporations . . .	10'16	6'29	3'87

In a paper read before the North of England Gas Managers' Association in 1907, the author dealt with this aspect of the question as it affected a particular undertaking; and the factors which in that instance operated in bringing about a great reduction of these charges are such as obtain in other undertakings—viz., (a) the development of the use of gas for a variety of purposes in addition to lighting, thus inducing day consumption, which is specially valuable during the summer months, and (b) the lower rates at which capital can now be obtained by gas companies.

To complete the comparison, a further table is necessary, showing the net gas rental per 1000 cubic feet sold, which is as follows:—

TABLE VII.—*Net Gas Rental per 1000 Cubic Feet of Gas Sold.*

—	1883.	1907.	Reduction.
	d.	d.	d.
Metropolitan Companies . . .	36'75	30'34	6'43
Suburban " . . .	41'66	31'83	9'83
Provincial " . . .	30'39	22'77	7'62
" Corporations . . .	29'30	26'16	3'14

There is, therefore, as a final result, a substantial reduction in the prices charged for gas in each of the sections; and so far as these undertakings are representative of the bulk throughout the country, there has been real progress. If this is least marked in the case of the Corporation undertakings, it must not be overlooked that they occupied a somewhat better position in 1883 than any of the other sections. When this has been said, however, something still remains to be explained. In the raising of capital, they have occupied a very advantageous position; but the difference is becoming less, and while the Provincial Companies show a steady reduction, the Corporations' charges appear to be on the increase. One of the undertakings included in the statistics increased its capital charges from 4'47d. to 7'41d. per 1000 cubic feet of gas sold between 1900 and 1907. The cause of this was fully dealt with in the Presidential Address of Mr. Charles Wood in 1906; and it serves to show—what the author endeavoured to demonstrate in the paper that he read before the Gas Institute in 1897—that the advantages of municipalization do not apply now as they did in the years when gas companies paid heavily for their capital.

Every movement has its pioneers, and average success is not the maximum of achievement. It is desirable, therefore, to look at this question from the standpoint of those who have gained greatest success. Especially should this point of view be taken in forming ideals for the future. Only the best are good enough for "models," and in a search for examples a wider range of gas undertakings has been taken. For this purpose, the "Gas World Analyses of Accounts" has been consulted. It is, perhaps, assuming a serious responsibility to make choice of examples for this purpose; but it must be understood that there are many excellent records which could not be conveniently included in the list.

Appendix B gives the analyses of the accounts of ten undertakings in different parts of England, each being, in many respects, a model in its own district, and some will be recognized as being in the very forefront of economical working.

The cost of coal is in some measure an indication of the

distance of the works from the coal supply; and in any comparison this should be taken into account. The returns from residual products are not unsatisfactory in any instance, and in some they are exceptionally good. The proportions from ammonia are high in two or three undertakings—"F" undertaking showing the highest yield from this source of any of the English undertakings whose accounts are included in the "Gas World Analyses."

Purification costs in six cases are under one-tenth of a penny, and in two are as low as one-fiftieth of a penny per 1000 cubic feet of gas sold. There are several explanations to be given for this low cost of purification, not the least important of which is in having purifiers of ample capacity. It would be very instructive if, in the subsequent discussion, information was given by engineers who are in a favourable position in regard to this item. There are many who could speak from the opposite standpoint, and who would be attentive listeners to hints on cheap purification.

The item of salaries under manufacturing is somewhat irregularly dealt with; and in the case of "F" undertaking no charge is made in the published accounts, but it is included in management charges. The author has taken the liberty of estimating this at 0'5d. per 1000 cubic feet of gas sold. He has transferred that amount from management charges to salaries under manufacturing charges; and having regard to the excellent record of the undertaking no one could say that the estimate of the value of the engineer and his staff is over-stated. This transference affects the cost of gas in holder.

Carbonizing wages vary considerably; but some of the undertakings do not use stoking machinery, and others do so in part only. The lowest figure of 1'07d. per 1000 cubic feet of gas sold is that of an undertaking with a "make" of about 200 million cubic feet per annum; and the result is so exceptionally good that the author felt it would add great interest to his paper if the reasons for this could be given. He therefore entered into communication with the engineer, who very kindly replied as follows:

We attribute our low cost of carbonizing to the adoption of the De Brouwer charging and discharging machinery, a coke conveyor, and eight-hour charges. The cost in 1907-8 was 1'07d., and in 1908-9 1'10d. per 1000 cubic feet of gas sold. The carbonizing wages include stokers and enginemmen. We do not employ separate men for furnaces and pipe-jumping; in fact, we have not had any trouble with stopped pipes since we commenced to fill our retorts and work eight-hour charges. We have worked in this way over two years, and certainly would not go back to six-hour charges. We should much prefer to lengthen the duration, if the size of the retorts permitted.

This statement is interesting, as showing the trend of modern carbonizing practice as well as for its value in regard to the results obtained; and the author acknowledges his indebtedness to the engineer of the works for the information.

By the courtesy of an engineer of a works not included in the list in Appendix B, the author is enabled to give some further figures which are interesting as showing the progress made in the reduction in carbonizing charges. Before the introduction of inclined retorts at the station in question, "firemen's wages" amounted to 3'583d. per 1000 cubic feet of gas made. The erection of inclined benches extended over a few years with a gradually decreasing wages bill, as shown in the following statement:—

With one inclined bench, the cost per 1000 feet made was 3'418d.	
" two " benches, " " " "	2'448
" three " " " " "	2'010
" four " " " " "	1'825

Showing a saving of 1'758d. per 1000 cubic feet of gas made as a result of the introduction of "inclines" throughout, and amounting to £3612 on the gas made per annum at the station.

The extra cost over the provision of hand-fired benches amounted to £14,000; and the saving effected provides 5 per cent. for repairs *plus* 20 per cent. as a return for the outlay. At another station of the same undertaking, where stoking machinery has been installed, on a make of 1½ millions per day, the cost of all carbonizing wages—from coal into the breaker to coke out of retorts, including power-house and motor man, machine man, lid man on machine side, lid man on discharge side, cellar man, hopper man, and foreman—is 1d. per 1000 cubic feet of gas made, or 11d. per ton of coal carbonized. At a third station, with the same type of machine with a full installation on a daily make of 2½ millions, the cost will be down to 8d. per ton of coal

APPENDIX A.—ANALYSES OF ACCOUNTS EXTRACTED FROM "FIELD'S ANALYSIS."

	METROPOLITAN COMPANIES.													
	1878.		1883.		1888.		1893.		1898.		1903.		1907.	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coal	—	19'58	—	17'59	—	14'70	—	15'51	—	14'03	—	14'71	—	15'27
Less residuals:—														
Coke and breeze	6'65	—	6'18	—	6'16	—	6'54	—	5'87	—	6'88	—	6'66	—
Tar	1'95	—	2'55	—	1'59	—	1'65	—	1'05	—	1'57	—	1'12	—
Ammonia	2'37	10'97	2'76	11'49	2'04	9'79	1'90	10'09	1'53	8'45	1'96	10'41	2'04	9'82
Net coal	—	8'61	—	6'10	—	4'91	—	5'42	—	5'58	—	4'30	—	5'45
Manufacturing charges:—														
Purification	1'03	—	'87	—	'71	—	'79	—	'80	—	1'06	—	'45	—
Salaries	'45	—	'39	—	'32	—	'34	—	'35	—	'40	—	'40	—
Wages (carbonizing)	3'83	—	3'49	—	3'34	—	4'13	—	3'67	—	3'01	—	2'27	—
Wear and tear	5'59	10'90	4'72	9'47	3'16	7'53	4'24	9'50	3'64	8'46	4'35	8'82	4'00	7'12
Net cost of gas in holder	—	19'51	—	15'57	—	12'44	—	14'92	—	14'04	—	13'12	—	12'57
Distribution charges	—	2'39	—	1'85	—	1'75	—	2'39	—	2'80	—	3'53	—	4'50
Rates and taxes	—	1'56	—	1'70	—	1'95	—	2'12	—	2'23	—	2'64	—	2'52
Management	—	1'44	—	1'19	—	'93	—	'90	—	'98	—	1'08	—	1'12
Law, bad debts, and other charges	—	'60	—	'58	—	'55	—	'86	—	'61	—	'90	—	'98
Net coal and working expenses	—	25'50	—	20'89	—	17'62	—	21'19	—	20'66	—	21'27	—	21'69
Net gas rental	41'44	'22	36'75	'13	31'61	'87	34'04	'09	31'92	'91	31'88	'35	30'34	'25
Meter and stove rentals and other receipts		41'66		36'62		32'48		35'13		32'83		33'23		32'88
Gross profit	—	16'16	—	15'73	—	14'86	—	13'94	—	12'17	—	11'96	—	11'19
Capital charges	—	15'24	—	15'07	—	13'70	—	13'15	—	11'59	—	10'82	—	10'40
Surplus or deficit	S	'92	S	'66	S	1'16	S	'79	S	'58	S	1'14	S	'79
<i>Some Working Results.</i>														
Gas made per ton of coal carbonized cub. ft.	10,181		10,275		10,356		10,191		10,178,000		10,051,000		10,885	
Gas sold per mile of main	—		—		8,664,000		8,976,000		4'92		4'35		4'83	
Gas unaccounted for—per cent. on make .	5'56		5'99		5'63		5'24		22		23		24	
Coke used for fuel—per cent. on make .	27		24		22		25		22		23		24	

	SUBURBAN COMPANIES.													
	1883.		1888.		1893.		1898.		1903.		1907.			
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coal	—	20'36	—	17'91	—	18'48	—	16'08	—	17'01	—	16'95	—	16'95
Less residuals:—														
Coke and breeze	6'95	—	6'96	—	7'17	—	5'82	—	6'28	—	6'04	—	6'04	—
Tar	2'61	—	1'08	—	1'07	—	1'06	—	1'27	—	'94	—	'94	—
Ammonia	2'24	11'80	1'43	9'47	1'74	9'98	1'15	8'03	1'34	8'89	1'24	8'22	1'24	8'22
Net Coal	—	8'56	—	8'44	—	8'50	—	8'05	—	8'12	—	8'73	—	8'73
Manufacturing charges:—														
Purification	'77	—	'65	—	'79	—	'80	—	'80	—	'38	—	'38	—
Salaries	'74	—	'61	—	'57	—	'44	—	'48	—	'46	—	'46	—
Wages (carbonizing)	4'03	—	3'53	—	4'34	—	3'44	—	2'84	—	2'25	—	2'25	—
Wear and tear	4'88	10'42	3'74	8'53	4'06	9'76	4'04	8'72	4'36	8'48	4'22	7'31	4'22	7'31
Net cost of gas in holder	—	18'98	—	16'97	—	18'26	—	16'77	—	16'60	—	16'04	—	16'04
Distribution charges	—	1'80	—	2'17	—	2'46	—	3'95	—	5'18	—	6'16	—	6'16
Rates and taxes	—	1'97	—	1'84	—	1'76	—	1'83	—	1'83	—	1'74	—	1'74
Management	—	2'88	—	2'34	—	2'08	—	1'85	—	1'75	—	1'70	—	1'70
Law, bad debts, and other charges	—	'45	—	'60	—	'45	—	'39	—	'60	—	'46	—	'46
Net coal and working expenses	—	26'08	—	23'92	—	25'01	—	24'79	—	25'96	—	26'10	—	26'10
Net gas rental	41'66	'41	36'75	'18	36'50	'33	33'91	'02	33'81	'76	31'83	'61	31'83	'61
Meter and stove rentals and other receipts		42'07		37'93		37'83		35'93		36'57		35'44		35'44
Gross profit	—	15'99	—	14'01	—	12'82	—	11'14	—	10'61	—	9'34	—	9'34
Capital charges	—	15'18	—	12'94	—	12'21	—	10'55	—	9'57	—	9'00	—	9'00
Surplus or deficit	S	'81	S	1'07	S	'61	S	'59	S	1'04	S	'34	S	'34
<i>Some Working Results.</i>														
Gas made per ton of coal carbonized cub. ft.	10,213		10,407		10,220		—		—		11,169			
Gas sold per mile of main	—		3,507,000		3,982,000		4,691,000		5,470,000		5,977,000			
Gas unaccounted for—per cent. on make .	5'67		5'23		5'95		5'24		5'58		5'60			
Coke used for fuel—per cent. on make .	24		23		26		25		24		21			

carbonized, or 0·7d. per 1000 cubic feet of gas made. These are excellent results, and promise well for the possibilities of further economy in gas manufacture to undertakings able to take advantage of the latest methods of carbonizing. It will be remembered that Mr. A. F. P. Hayman, in his paper on "Dessau Vertical Retorts" read at last year's meeting, stated the cost of carbonizing wages for that system at 5d. per ton, as against 9·4d. for "inclines" at Berlin.

It is probably on the works that further economies will be effected; and as carbonizing methods are at present in a state of transition, it is not desirable to make any prophecy of the extent of these economies. The present, however, is

not an inopportune time for marking progress; and this paper is an attempt in that direction. The result is not at all discouraging, and the prospects are distinctly hopeful. It is not possible for each works to be adapted to new conditions as soon as new methods of manufacture are available. Capital already invested cannot be disposed of by the stroke of a pen; but as opportunity for renewal arises, the changes will be made, and eventually the lower costs named will become the rule rather than the exception.

Distribution charges do not seem to offer any immediate promise of substantial reduction. The increase consequent on the introduction of slot meter installations has in many

APPENDIX A (continued).—ANALYSES OF ACCOUNTS EXTRACTED FROM "FIELD'S ANALYSIS."

	PROVINCIAL COMPANIES.											
	1883.		1888.		1893.		1898.		1903.		1907.	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coal	—	15'88	—	13'25	—	17'05	—	12'24	—	13'34	—	13'78
Less residuals :—												
Coke and breeze	3'73	—	3'42	—	4'27	—	4'60	—	5'60	—	5'94	—
Tar	3'04	—	1'38	—	1'67	—	1'27	—	1'55	—	1'14	—
Ammonia	2'35	9'12	1'97	6'77	2'08	8'02	1'36	7'23	1'98	9'13	1'90	8'98
Net coal	—	6'76	—	6'48	—	9'03	—	5'01	—	4'21	—	4'80
Manufacturing charges :—												
Purification	'52	—	'61	—	'68	—	'63	—	'64	—	'65	—
Salaries	'54	—	'45	—	'48	—	'41	—	'35	—	'37	—
Wages (carbonizing)	3'64	—	3'32	—	4'12	—	3'74	—	3'15	—	2'63	—
Wear and tear	3'58	8'28	3'03	7'41	3'28	8'56	3'17	7'95	3'37	7'51	2'87	6'52
Net cost of gas in holder	—	15'04	—	13'89	—	17'59	—	12'96	—	11'72	—	11'32
Distribution charges	—	1'98	—	1'99	—	1'92	—	2'31	—	3'14	—	3'22
Rates and taxes	—	1'24	—	1'21	—	1'26	—	1'30	—	1'38	—	1'25
Management	—	1'72	—	1'45	—	1'41	—	1'23	—	1'20	—	1'20
Law, bad debts, and other charges	—	'26	—	'14	—	'16	—	'16	—	'24	—	'16
Net coal and working expenses	—	20'24	—	18'68	—	22'34	—	17'96	—	17'68	—	17'15
Net gas rental	30'39	—	28'46	—	29'80	—	24'67	—	25'32	—	22'77	—
Meter and stove rentals and other receipts	'65	31'04	1'15	29'61	1'24	31'04	1'40	26'07	1'82	27'14	22'01	24'78
Gross profit	—	10'80	—	10'93	—	8'70	—	8'11	—	9'46	—	7'63
Capital charges	—	10'79	—	9'62	—	9'41	—	8'32	—	7'76	—	7'77
Surplus or deficit	S	'01	S	1'31	D	'71	D	'21	S	1'70	D	'14
Some Working Results.												
Gas made per ton of coal carbonized cub. ft.	10,113		10,579		10,294		—		—		10,457	
Gas sold per mile of main	—		3,632,000		4,706,000		5,444,000		5,629,000		5,667,000	
Gas unaccounted for—per cent. on make	7'71		6'88		6'78		6'46		6'87		6'34	
Coal used for fuel—per cent. on make	35		35		33		26		27		25	

	PROVINCIAL CORPORATIONS.											
	1883.		1888.		1893.		1898.		1903.		1907.	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coal	—	13'59	—	12'29	—	15'78	—	12'60	—	14'36	—	12'54
Less residuals :—												
Coke and breeze	3'05	—	2'55	—	3'48	—	2'70	—	4'29	—	4'13	—
Tar	3'32	—	1'43	—	1'45	—	1'54	—	1'80	—	1'55	—
Ammonia	3'83	10'20	1'84	5'82	2'09	7'02	1'45	5'69	2'04	8'13	1'99	7'67
Net coal	—	3'39	—	6'47	—	8'76	—	6'91	—	6'23	—	4'87
Manufacturing charges :—												
Purification	'20	—	'33	—	'55	—	'45	—	'61	—	'49	—
Salaries	'36	—	'27	—	'26	—	'25	—	'27	—	'29	—
Wages (carbonizing)	3'39	—	3'08	—	3'67	—	3'12	—	2'94	—	2'72	—
Wear and tear	3'79	7'74	3'38	7'06	3'76	8'24	4'07	7'89	4'22	8'04	3'52	7'02
Net cost of gas in holder	—	11'13	—	13'53	—	17'00	—	14'80	—	14'27	—	11'89
Distribution charges	—	1'82	—	2'07	—	1'97	—	2'31	—	2'87	—	2'68
Rates and taxes	—	1'83	—	1'29	—	1'43	—	1'58	—	1'91	—	1'94
Management	—	'83	—	'76	—	'76	—	'74	—	'73	—	'73
Law, bad debts, and other charges	—	'23	—	'13	—	'10	—	'12	—	'12	—	'13
Net coal and working expenses	—	15'39	—	17'78	—	21'26	—	19'55	—	19'90	—	17'37
Net gas rental	29'30	—	28'13	—	29'04	—	27'17	—	29'35	—	26'16	—
Meter and stove rentals and other receipts	'70	30'00	1'00	29'13	'84	29'88	'54	27'71	'54	29'89	'44	26'60
Gross profit	—	14'61	—	11'35	—	8'62	—	8'16	—	9'99	—	9'23
Capital charges	—	10'16	—	8'07	—	6'02	—	5'26	—	6'96	—	6'29
Surplus or deficit	S	4'45	S	3'28	S	2'60	S	2'90	S	3'03	S	2'94
Some Working Results.												
Gas made per ton of coal carbonized cub. ft.	9,758		10,165		9,946		—		—		10,827	
Gas sold per mile of main	—		4,395,000		5,309,000		5,795,000		6,023,000		5,465,000	
Gas unaccounted for, per cent. on make	7'03		7'07		5'32		5'71		5'40		5'74	
Coke used for fuel, per cent. on make	33		35		31		31		29		26	

cases reached its maximum ; and some relief is, therefore, possible in that direction. But the adoption of high-pressure distribution will probably tend to increase rather than decrease these charges. On the other hand, capital charges on mains should be less ; and the use of gas for special purposes and for high-pressure lighting without the use of pressure-raising machinery on the consumer's premises, is an advantage of considerable value. The prospects of extending mains into outlying districts is enhanced by the possibilities of this system.

It will be observed that the most successful undertakings are not those with the highest "make per ton." This

remark must not be interpreted as depreciating a high "make per ton ;" but it will be seen that it is not the only element which makes for success. The quality and price of coal must be considered conjointly ; and if the one with a low yield of gas per ton works out the most economical, it should be chosen. That this is not always done may to some extent be attributed to the fact that members of Gas Committees and Boards of Directors read of what is being done at works other than their own, and cannot always understand why their engineer does not do as well with the coal at his disposal. Consequently, there is a temptation to recommend the use of the better quality of coal,

APPENDIX B.—ANALYSES OF ACCOUNTS OF UNDERTAKINGS EXTRACTED FROM THE "GAS WORLD ANALYSES" FOR 1907-8.

	A.		B.		C.		D.		E.		F.		G.		H.		I.		J.	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coal	—	9'96	—	12'79	15'63	—	15'01	—	11'36	—	12'54	—	—	11'21	—	11'23	—	14'16	—	15'71
Less residuals—																				
Coke and breeze	6'26	—	6'90	—	7'23	—	7'38	—	—	—	—	—	6'15	—	6'27	—	6'24	—	7'11	—
Tar	1'43	—	1'95	—	1'33	—	—	—	1'52	—	1'13	—	1'70	—	1'61	—	'95	—	1'06	—
Ammonia	2'68	10'37	1'80	9'65	10'96	—	11'67	—	1'87	9'44	3'09	10'64	1'51	9'36	2'08	9'96	1'84	9'03	1'45	9'62
Net coal	—	cr. '41	—	3'14	4'67	—	3'34	—	1'92	—	1'90	—	—	1'85	—	1'27	—	5'13	—	6'09
Manufacturing charges—																				
Purification	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Salaries	31	—	'98	—	'48	—	'08	—	'02	—	'02	—	'08	—	'06	—	'07	—	'43	—
Waxes (carbonizing)	27	—	'41	—	'54	—	'48	—	'82	—	'50	—	'35	—	'57	—	'49	—	'13	—
Wear and tear	2'47	—	2'94	—	2'27	—	1'07	—	1'72	—	2'99	—	2'12	—	1'83	—	2'02	—	2'43	—
Law, bad debts, and other charges	2'91	5'96	6'70	6'70	6'80	—	2'60	4'23	2'95	5'51	1'75	5'26	3'97	6'52	3'29	5'75	3'17	5'75	4'13	7'12
Net cost of gas in holder	—	5'55	—	9'84	11'47	—	7'57	—	7'43	—	7'16	—	8'37	—	—	7'02	—	10'88	—	13'21
Distribution charges	—	1'86	—	1'90	2'48	—	1'59	—	1'97	—	2'07	—	5'64	—	—	2'12	—	3'47	—	3'71
Rates and taxes	—	1'35	—	'99	1'60	—	2'28	—	2'47	—	1'20	—	2'93	—	—	2'74	—	1'13	—	1'07
Management	—	'88	—	1'27	1'25	—	'41	—	'81	—	1'37	—	1'06	—	—	'70	—	1'35	—	1'48
Law, bad debts, and other charges	—	'50	—	'61	2'66	—	'03	—	'79	—	—	—	'69	—	—	1'75	—	1'60	—	1'92
Net coal and working expenses	—	10'14	—	14'61	19'46	—	11'88	—	13'47	—	11'80	—	18'69	—	—	14'33	—	18'43	—	21'39
Net gas rental	15'26	—	20'72	—	24'91	—	25'53	—	35'05	—	14'76	—	31'90	—	31'21	—	23'92	—	23'83	—
Meter and stove rental and other receipts	1'52	16'78	2'67	23'39	27'43	—	1'00	26'53	'08	35'13	2'33	17'09	1'96	33'86	'79	32'00	3'39	27'31	4'45	28'28
Gross profit	—	6'61	—	8'78	7'97	—	—	—	21'66	—	5'29	—	—	15'17	—	17'67	—	8'88	—	6'89
Capital charges	—	6'29	—	8'75	7'96	—	6'34	—	10'77	—	2'48	—	—	8'51	—	8'81	—	8'33	—	6'38
Surplus or deficit	S	'35	S	'03	'01	S	S	S	S	S	S	S	S	S	S	S	S	S	S	'51
Some Working Results.																				
Gas made per ton of coal	—	10,579	—	11,055	10,762	—	10,306	—	12,328	—	9,792	—	12,129	—	11,149	—	10,212	—	10,809	—
Gas sold per mile of main	—	5,804,000	—	4,253,000	10,361,000	—	4,483,000	—	4,553,000	—	7,286,000	—	4,462,000	—	5,995,000	—	4,844,000	—	10,302,000	—
Gas unaccounted for—per cent. on make	—	3'0	—	10'4	2'9	—	2'7	—	4'5	—	2'9	—	8'3	—	2'1	—	3'4	—	5'0	—
Coke and breeze saleable per ton of coal	—	9	—	10	10'4	—	11'3	—	11'4	—	10'9	—	8'6	—	9'5	—	10'6	—	11'2	—

though this may result in less economical working. The high yield is obtained, and everybody concerned is satisfied—not least the engineer, who has enhanced his reputation as a carbonizer, and taken a step forward towards a more lucrative appointment. It requires some courage on the part of an engineer to continue the use of a coal which does not show up well in the published carbonizing statistics, even though it is economical to do so.

The method of ascertaining the "make per ton" varies. The practice of correcting for temperature and pressure obtains in some works, and for temperature only in others; while it is probably correct to say that in the majority of works no corrections are made. To be scientifically accurate, the corrections should be made, and care should be exercised to maintain the water-line of the station-meter at its proper level. Attention to these matters would probably disturb the item of "unaccounted-for gas." But it is surely an advantage to have accurate knowledge of what is being done in each department.

There is another point of comparison that may perhaps be permitted—especially so, having regard to what has been happening in the Parliamentary Committee Rooms recently. It has frequently been stated that gas undertakings owned by local authorities sell gas much cheaper than do gas companies. Such a statement is based on figures that are not properly comparable. The Provincial Companies whose accounts appear in "Field's Analysis" are for the most part far removed from the coal-fields, while the Corporation undertakings are, with one exception, in close proximity thereto. Notwithstanding this advantage, however, the average net gas-rental of the Companies' undertakings was in 1907 less than those of the Corporations, by 3'39d. per 1000 cubic feet, while in 1903 the difference was 4'03d. in favour of the Companies. The surplus profits were higher in the case of the Corporations; and thus they were in a position to contribute something in aid of the rates. In 1907, the amount was 2'58d., and in 1903 it was 2'68d. per 1000 cubic feet sold, which sums do not make up

the difference in the charge for gas. It is obvious, therefore, that these contributions from the gas profits to the rates are placing the Municipal consumer at a distinct disadvantage as compared with the Companies' customer; and it has already been pointed out that the rates do not appear to be lower in those towns.

This paper would not be complete without a further reference to the advantages the consumer of gas has derived as the result of the progress made during the past generation. The reduced price of gas is but a small proportion of his gains. Each cubic foot of gas consumed under modern conditions is, for power purposes, about three times its former value; for heating purposes, something approaching this may be claimed; while for lighting it is possible to get results varying from eight to twenty times that which was previously obtainable. These are great achievements; and if succeeding generations do equally well, or anything approaching thereto, there is little fear that gas will suffer in popularity.

RELATIVE CAPITAL ACCOUNTS OF GAS UNDERTAKINGS OWNED BY COMPANIES AND LOCAL AUTHORITIES.

By ARTHUR VALON, of London.

Comparisons are frequently made between company and local authority management of gas undertakings in regard to their capital expenditure, usually with reference to the difference between the capital raised per million cubic feet of gas sold as it appears in the Board of Trade returns. The bare figures as given in these returns are certainly startling; for the total capital raised per million cubic feet of gas sold by statutory gas companies is £822, while the total money borrowed by local authorities, after deducting sinking fund and loan repayments, amounts but to £457.

A very short examination of the details will, however, reveal that the figures are not strictly comparable, because the capital raised by the companies includes a large nominal increment due to the conversion of stock from a higher to a lower rate of dividend; while in the case of undertakings owned by local authorities the total amount of the loans borrowed includes the amount paid, upon transfer, for the goodwill of the undertaking. In principle, these additions are similar, as in both cases they arise from turning nominal capital into something more nearly approaching its value upon the market. Therefore, in making a comparison of the capital of companies and local authorities, the amount paid for goodwill by the local authorities should be a set-off as against the nominal increment by conversion of the companies.

The details of the nominal increments are scattered as notes throughout the Board of Trade returns; and they can, with time and trouble, be collected and stated. On the other hand, unfortunately, the amounts paid for the undertakings upon transfer are not contained in the returns; and, consequently, the figures for these must be obtained from outside sources, which it is almost impossible to do for the whole of the undertakings. A table is given at the end of this paper showing the total figures abstracted and arranged for the whole of the statutory undertakings in the United Kingdom, giving the nominal increments upon conversion in the case of the companies but without any adjustment for goodwill in the case of the local authorities. This latter figure, however, has been taken out for 16 of the largest undertakings; and it amounts altogether to £137 per million cubic feet of gas sold upon the existing consumption of those undertakings. It is not suggested that this would be an accurate measure of the deduction to be allowed over the whole; but it gives some idea of the effect upon the capital of the payment for goodwill at the time of transfer.

The table (p. 882) covers a period from 1886 to 1906, which is the last available return, and is subdivided into five-yearly periods in order, as far as possible, to eliminate small annual fluctuations. It will be observed that in the case of the companies the net capital outlay has steadily fallen from £675 until it now stands at £610 per million cubic feet sold; while in the case of the local authorities, the total amount of money borrowed per million cubic feet fell until 1897, when it stood at £616. It has since risen to £639. But if allowance were made for the increase at the time of transfer, the figure would be lower than the net capital outlay of the companies. Although the net amount of capital employed by the companies has steadily fallen, the rate of reduction during the last ten years has been much slower than previously; while in the case of the local authorities, the amount of money borrowed per million cubic feet has actually risen. This is no doubt due to the heavy expenditure now required on matters outside the works proper.

The capital cost involved by increase in the output of gas has also been shown; and this makes still clearer the effect of modern conditions. After 1891, the capital cost per million of increase rose, in the case of the companies, to £648, but has since fallen to £603; while in the case of the local authorities, the cost has risen steadily from £337 in 1892 to £723. The difference probably arises from the companies placing a larger proportion of the expenditure upon slot supplies to revenue, which is a wise precaution, as in their case money carried to capital is permanent; whereas in the case of the local authorities it will be paid off within a given period.

The main difference between the capital accounts of companies and local authorities is furnished by the operation of the sinking fund, which has reduced the loans out-

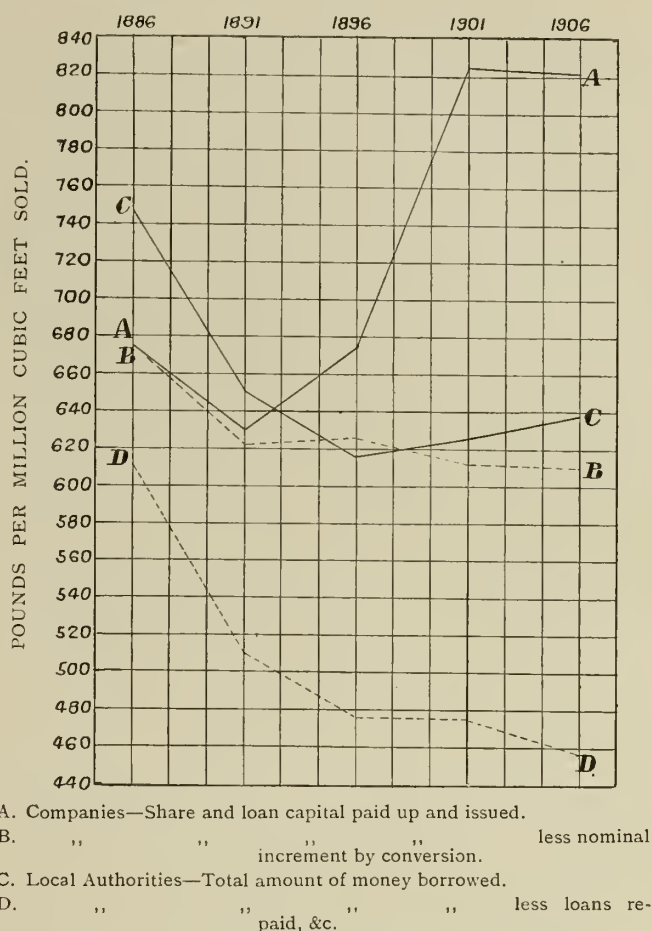
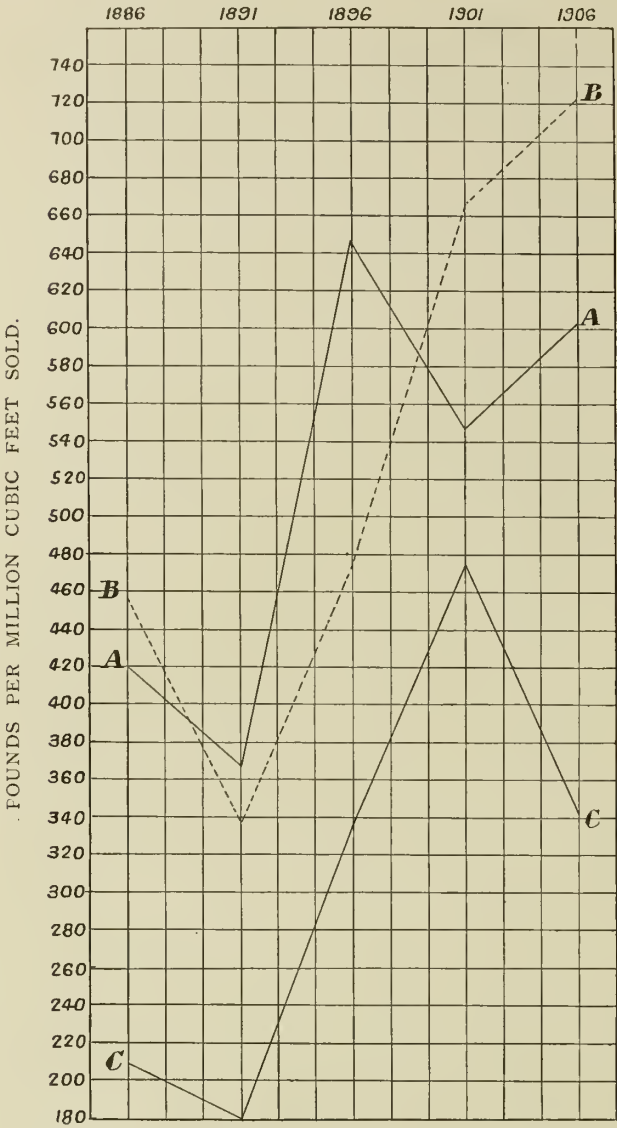


Diagram A.—Total Capital per Million Cubic Feet Sold.

standing from £612 per million in 1887 to £457 per million in 1907; so that, in spite of the increased expenditure upon capital account now necessary, the outstanding loan per million cubic feet of gas sold is steadily falling. There is now a difference of £153 per million in the net capital of the local authorities and the companies, and a difference of £309 per million between the outstanding loans of the local authorities and the capital of the companies upon which dividend or interest has to be paid. As time goes on, this difference is bound to increase. There is no prospect of a decrease in the rate of capital expenditure for a given output; and the question presents itself as to whether the time has not arrived when an effort should be made to enable the companies to reduce their capital.

This is not without precedent. In the year 1903, the Gaslight and Coke Company were restricted from paying any increase of dividend above the standard unless they first placed a definite sum to a fund for the redemption of capital—the sum varying according to the amount of the increased dividend. The fund was to be formed from money which the Company might otherwise have divided as increased dividend; and the total amount of capital to be redeemed was limited to £1,000,000. It is true that this sum is small compared with the total capital of the Gaslight and Coke Company; but if the principle is sound, it is purely a matter of detail as to what proportion of capital should be subject to redemption. Original capital ought in any case to be exempt from the operations of such a fund; so that under no possible circumstances could the whole of the capital be repaid.

If the annual repayments are to be sufficient to effect a material reduction in the capital, it is hardly practicable for the redemption fund to be accumulated from profits which might otherwise have been divided, unless the increment under the sliding-scale is considerably increased. But there would seem to be no advantage in this as against definitely stating the increment payable in dividend and the amount to be placed to the redemption fund—keeping them entirely separate. That is to say, for every penny reduction in the price of gas below the standard price a certain percentage upon the capital would be placed to a redemption fund before the increased dividend due upon the decrease of price was payable. These payments should be compulsory in respect of dividend above the standard rate; but there seems no reason why companies should not have the option of placing to a redemption fund any proportion of the money which



A. Companies—Share and loan capital paid up and issued, less nominal increment by conversion.
B. Local Authorities—Money borrowed.
C. " " " " less loans repaid, &c.
Diagram B.—Increase in Capital per Million of Increase in Gas Sold.

they might otherwise have divided, even although the full standard dividend was not being paid.
It might possibly be a still better arrangement that a definite percentage upon the capital should be paid into a

fund before any increase of dividend was made under the sliding-scale—the exact amount being calculated according to the rate at which it was thought desirable to make the redemption. After this amount had been found, the sliding-scale and increased dividend would work in the ordinary way without further compulsory payments for the extinction of capital. In the case of maximum companies, the compulsory payments would have to be made out of moneys in excess of the maximum dividends; but these payments should be precedent to any sums being placed to reserve. The option as to using any proportion of divisible profits for repayment of capital should apply to maximum companies as well as to sliding-scale companies.
The sums set apart for redemption should be applied as soon as available, in order to extinguish the interest. The capital would have to be bought upon the open market, and the amount purchased then cancelled. But if shares were not available, as might very well be the case with smaller companies, the money set apart for redemption might be used for purchasing new shares when an increase of capital was necessary. As the payments might be interrupted, a sinking fund in which the payments must be made regularly would not be applicable unless the sinking fund instalments were made precedent to the payment of any dividend—a proposal which most companies would probably consider far too drastic for adoption.
It is not possible to settle a detailed scheme which could be applied without modification to every undertaking in the United Kingdom. The adoption of any scheme might possibly involve alterations to the existing standard price and sliding-scale, and would have to be suited to the conditions of the particular company. It may be objected that the proposal is bound to increase the price of gas, or reduce the dividend; and this might occasionally happen in the early years. But if the capital were paid off by equal annual instalments, the total payment for instalments, with interest on the capital at (say) 5 per cent., would be a constantly reducing amount; and after twenty years the interest on the balance of the capital, and the annual repayments, would come to less than the bare interest on the original capital outlay—the total payment for instalment and dividend decreasing annually until the whole of the capital had been redeemed. A low capital account is so obvious an advantage in the struggle with our competitors—a struggle which is likely to be even keener in the future than in the past—that some present sacrifice would assuredly be justified in order to obtain it.

Discussion on Mr. Lees' and Mr. Valon's Papers.

The PRESIDENT said the name of Mr. Valon was an honoured one in the Institution; and he was glad to find that Mr. Arthur Valon had kept up the reputation of the family.

Companies.

Year Ended December.	Authorized Undertakings.		Sale of Gas. Million Cubic Feet.	Share Capital Paid Up (including Premium) and Loan Capital Issued.						Increase in						
	Num-ber.	Inc.		Gross Amount.	Per Mil-lion.	Nominal In-crement by Conversion.	Per Mil-lion.	Net Amount.	Per Mil-lion.	Sale of Gas. Million Cubic Feet.	Gross Amount of Capital.	Per Mil-lion of In-crease	Nominal Increment.	Per Mil-lion of In-crease.	Net Amount of Capital.	Per Mil-lion of In-crease.
1886	377	..	54,310	£ 36,639,856	£ 675	£ nil	£ nil	£ 36,639,856	£ 675	£ 8,825*	£ 3,704,921	£ 420	£ nil	£ nil	£ 3,704,921	£ 420
1891	422	45	65,338	41,144,281	630	451,130	7	40,693,151	623	11,028	4,504,425	408	451,130	41	4,053,295	367
1896	433	11	73,751	49,619,035	673	3,471,921	47	46,147,114	626	8,413	8,474,754	1,007	3,020,791	359	5,453,963	648
1901	454	21	89,685	73,977,378	825	19,125,707	213	54,851,671	612	15,934	24,358,343	1,529	15,653,786	982	8,704,557	547
1906	491	37	105,219	86,476,293	822	22,265,347	212	64,210,946	610	15,534	12,498,915	805	3,139,640	202	9,359,275	603

Local Authorities.

Year Ended March.	Authorized Undertakings		Sale of Gas, Million Cubic Feet.	Total Amount of Money Borrowed.	Per Mil- lion.	Total Amount of Loans Repaid, Annuities Redeemed, and Amounts Placed to Sinking Fund.	Per Mil- lion.	Total Amount of Money Borrowed, less Sums Repaid.	Per Mil- lion.	Increase in						
	Num- ber.	Inc.								Sale of Gas, Million Cubic Feet.	Total Amount of Money Borrowed.	Per Mil- lion of In- crease.	Loans Repaid, &c.	Per Mil- lion of In- crease.	Money Borrowed, less Loans Repaid, &c.	Per Mil- lion of In- crease.
1887	162	..	26,371	£ 19,723,046	£ 748	£ 3,583,355	£ 136	£ 16,139,691	£ 612	5,242*	£ 2,396,863	£ 457	£ 1,300,350	£ 248	£ 1,096,513	£ 209
1892	182	20	34,532	22,476,180	651	4,866,325	141	17,609,855	510	8,161	2,753,134	337	1,282,970	157	1,470,164	180
1897	208	26	43,133	26,561,689	616	6,057,445	140	20,504,244	476	8,601	4,085,509	475	1,191,120	138	2,894,389	337
1902	251	43	54,373	34,045,442	626	8,215,717	151	25,829,725	475	11,240	7,483,753	666	2,158,272	192	5,325,481	474
1907	272	21	62,727	40,089,107	639	11,403,670	182	28,685,497	457	8,354	6,043,725	723	3,187,953	381	2,855,772	342

* Four years only

Mr. EDWARD ALLEN (Liverpool) said, unfortunately, he had not heard Mr. Valon's paper read; but he had perused it beforehand, and fully appreciated its value. He had taken more personal interest in the paper by Mr. Lees; and he was sure that the Institution greatly benefited by having contributions of this nature. While, no doubt, many of the problems which confronted them had to be dealt with from an engineering or chemical point of view, after all the question was: Did it pay? And it was only by having careful and accurate accounts kept of the working of processes, plant, and machines, that they could settle this question. Therefore, after all, the working costs were of importance to every engineer and gas manager. It had been said that it was good for every man to have a wholesome measure of discontent. Nothing gave one this feeling so much as for a man to get hold of working costs of some other undertaking which showed his own position to be unsatisfactory. The beneficial result was that he at once endeavoured to remedy any defects he could discover; and he was sure Mr. Lees would be quite satisfied if this was the effect of his paper. The spirit of emulation was an excellent one. This matter was even of more importance in the case of engineers having charge of more than one works. He did not mean to say they could expect to see costs exactly the same in each works, because there were circumstances and conditions which were sure to vary; but when they found considerable differences between results of certain works, they wanted to know the reason why. They could not be at each works every day; but when they looked up the periodical returns, and found certain differences, they went to the man in charge and asked for an explanation. And very often great advantage to the undertaking resulted.

Mr. D. IRVING (Bristol) thought he should best serve the interests of the members if he wrote the few remarks he had to make, instead of detaining the meeting. They were indebted to both gentlemen for the very laborious and able contributions put before them. Personally, he should like to thank his old friend Mr. Lees for his kindly reference to his own contribution; and he was delighted to hear that nearly all the conclusions which were arrived at in 1905 were fully confirmed by the past four years' working. As Mr. Lees had said, it was very useful to have these comparisons brought up to date. The only thing that he would venture to express any regret about was that these valuable analyses, which had afforded them so much assistance and guidance for years past, did not include the works of their esteemed friend Mr. Allan. For some reason, they had dropped out; but, after the warm expression of approval of the analyses published by his colleagues and friends, they might hope in the future to have the advantage and benefit of statistics from their great Northern port.

Mr. DAVID VASS (Airdrie) said he would deal more particularly with Mr. Valon's paper. The *crux* of the whole paper lay in the question it formulated, whether the time had not arrived when an effort should be made to enable companies to reduce their capital. This took quite the opposite view to that expressed in the closing paragraph of Mr. Lees' paper. It took the view almost that they were, as it were, a dying industry, and must keep down their capital, just as if they were like an undertaking, such as a coal mine, which was eating up the property in which the capital was invested. This seemed to be the trend of the proposal made. But, how would the suggested remedy affect the parties concerned. It seemed to him it would be against them all. First, it would be against the shareholders, because the sum proposed to be set aside as a sinking or redemption fund would be taken out of that which would be applicable for dividend. He was not forgetting that it would also be applicable in a sense for reducing the gas-rate in the following year in the case of a sliding-scale company, because if they gave increased dividends, they must reduce the price. So that the two parties the most interested—the shareholders and the gas consumers—would be immediate sufferers from the introduction of a redemption fund. The third point was the business of the undertaking. It was said that if they could reduce the selling price of gas to-day, it would increase their business. If they could make their business popular to-day, twenty years hence could look after itself; and if they could increase their business year by year, they would have such a fund of capital invested as would amply repay anything which might be called for in the way of sacrifice. He suggested that no one would be benefited by this at all. The coming generation would be handicapped. They would only be relieved to the extent of a percentage from the sum

set aside for the redemption fund; whereas the working cost would be materially decreased as the quantity was increased, and this would more than compensate for anything in the shape of the sum set aside for redemption of capital.

Mr. JOHN CARTER (Lincoln) agreed with the previous speakers as to the value of the communications; and said that anyone who gave them a paper useful to discuss, and particularly useful to think over afterwards, was entitled to recognition. He had followed Mr. Lees' contribution very closely; but he was not quite sure that, if they could get the full, amplified, and complete statement of comparison as to the actual condition of affairs as between gas companies and municipal authorities, certain of his friends would be exactly satisfied with the result. He did not think the claim that municipalities might well set up to sell gas on the average cheaper than companies was one which could for a single moment be successfully contested. Mr. Lees mentioned two or three factors, which no doubt affected municipalities more than gas companies. For instance, he pointed to the fact that they made larger surplus profits; but he forgot to mention another very heavy charge which municipalities had to carry—a charge which Mr. Valon particularly dealt with, and which they knew very well as the sinking fund. This had to be set aside before arriving at the surplus profits. He turned with great interest to Mr. Valon's paper; and he thought it was about time that any spirit of rivalry or controversy between gas companies and gas undertakings conducted by municipalities should come to an end. It was high time that each of them recognized that there was a great amount of devotion of skill and intelligence displayed in conducting gas companies' undertakings. They rejoiced in their success. But, without being charged with immodesty, the same claim might be fairly made for the large and the medium-sized, and even small, gas undertakings which were the property of the various local authorities. He was often tempted to think that, in the discussion of gas matters, local authorities did not get that fair and impartial treatment from men of authority that they were entitled to. With regard to the capital generally invested in the gas industry, judging by the market prices neither gas companies nor corporations had the slightest cause for misgiving or doubt as to its standing in the country or its value as a personal investment. The importance of the part played by municipalities in the gas industry generally was very marked. When they remembered that, outside the Metropolitan area, approximately 50 per cent. of the capital embarked in the manufacture and supply of gas was raised by the various local authorities, this was a very sensible proportion, and showed how largely the principle of municipalization had been adopted with regard to gas matters. Those who were responsible for this approximate 50 per cent. of Provincial capital had too often in recent years been subjected to the charge that they were guilty of wild, reckless, and even riotous extravagance in the expenditure of public money, as particularly applied to their trading concerns. The main purpose for which he rose was to point out what a significant suggestion was contained in the paper Mr. Valon had read—viz., that, after all the financial criticisms which had been offered by men who, he supposed, in some quarters were regarded as men of authority, and capable of speaking on matters they professed to enlighten the public upon, after all they had heard from adverse critics of this class, principally City men, they had listened to-day to a suggestion that if the capital affairs of gas companies in this country were to be put into as sound a position as were those of municipalities, then some drastic change was immediately necessary.

Mr. J. P. LEATHER (Burnley) said that, speaking some few years ago at an Institution meeting, on the question which Mr. Valon had just brought up he suggested, though he was not connected with gas companies, that it would really be advisable for them to have some such thing as a redemption fund—not necessarily because they thought, as Mr. Vass had suggested, that the gas industry was a dying one, but because it was the general principle adopted in most industrial undertakings. It was quite true that gas was in a rather exceptional position, because all the companies which were worth talking about operating at the present day, were statutory undertakings; but, at the same time, in ordinary industrial undertakings it was usual to put something aside, even though the business might be on an exceedingly good foundation. At that time; he referred to an undertaking in which he had a small amount of interest (and he wished it were larger), which paid a good dividend, in the same way as a gas undertaking, but which put aside a very considerable

proportion of the profits towards redemption of capital. The way in which this was done in the case he referred to, and in common with many industrial undertakings familiar to members, was by raising a considerable portion of the capital by mortgage—only part being share capital. To an extent this was true of some gas companies, who had a certain amount of borrowed capital, though usually it was mostly share capital. If a portion were borrowed, the redemption Mr. Valon spoke of could take place more readily, not with the idea of paying off the whole of the capital, but to prevent it growing quite as fast as the capacity of the undertakings for making gas was growing. It was only an ordinary, sound, business procedure that the capital should be kept fairly low, because, eventually, it tended towards a reduced cost; and, although they might not at present see any reason to doubt that the gas industry would be for very many years to come in a sound position, no one could tell what would happen in the next fifty years—especially if they looked back at the last half-century. They might have to meet much more severe competition in the next fifty years; and therefore Mr. Valon's suggestion to take some steps to prevent capital increasing so fast as appeared usually the case seemed to be a wise one.

Mr. D. T. LIVESEY (East Grinstead), after thanking Mr. Lees for the useful figures he had given them, said he rose chiefly with regard to Mr. Valon's paper, because it seemed to him that the suggestion made was absurd. To his mind, there was no reason why any gas manager should not be able to keep the capital down by using the facilities they all had, in extending and improving their works, of raising some portion of the cost from the revenue account. He wanted to ask Mr. Valon who was to find the money which was to reduce the capital? Were they to tax the present consumers for the benefit of the future, or rob the present shareholders for the benefit of future shareholders? It seemed to him they must do one of these two. To find money at present to reduce capital, meant taking it either from the shareholders or the consumers. The gas business was in such a prosperous condition—the market value of the shares was so good—that there seemed to be no necessity whatever for the suggestion now made. They all knew that electricians, when they wanted to renew a piece of apparatus, simply said that extensions were needful, and therefore they wanted more capital. But this would find them out in due time. They themselves could do just the opposite. They could carry out their extensions and improve their works largely from revenue; and, if this were done judiciously, and not too quickly, it would prove far better than any attempt to reduce capital, when they could pay a reasonable interest on it, and also treat consumers with due consideration.

Mr. A. YUILL (Dundee) said he should not have trespassed on the time of the meeting simply to support his friend Mr. Lees; but he wished to explain that the statements Mr. Vass had made were not consistent with the facts. He did not wish it to be assumed that the gas industry was a dying one. He could not speak for the position of matters south of the Tweed; but he could speak for the other side of the Border, and more particularly for the town he represented. In Dundee, they had every reason to be satisfied with the progress the gas industry had made, despite the great opposition some of them experienced from their friendly rival, electricity. Both had gone on prospering. There was a field for both; and no doubt they would continue to prosper. But he wished to emphasize, as a point on which he had practical experience, that mentioned in Mr. Valon's paper—capital expenditure. Anyone who took an interest in the commercial management of a works soon realized that if he overloaded his ship greater difficulties were experienced in navigating it; and, if they overloaded their works with capital unnecessarily, they increased the fixed charges, and were not in a position to sell gas economically. This had to be considered at the present time when they had canvassers going not hand in hand, one for gas and the other for electricity. The consumers naturally listened to both; but the influence of the "almighty dollar" dominated their actions. To show how corporations benefited by the reduction of capital expenditure on gas-works, he might say that when his undertaking was acquired by the Corporation about forty years ago, the capital stood in relation to the make at over £1200 per million cubic feet, which was rather a high figure, and was a great handicap in the proper working of the concern. He was pleased to say that to-day it stood at a little over £430 per million, which placed them in such a position

that they were able to compete in a friendly way with their competitors.

Mr. J. H. BREARLEY (Longwood) said there was one point which he thought was not realized by previous speakers, and that was that the repayment of capital by a sinking fund or otherwise by a gas company would be exceedingly difficult to carry out in practice. If an Act such as Mr. Valon indicated were passed, it would weigh most heavily on the very undertakings which could least afford to set aside a sum for the repayment of capital in addition to meeting their ordinary charges. The companies with the highest capital were those which were most keenly hit by competition. How, then, were they going to meet this competition if, in addition to other things, they had also to set aside a certain sum for the repayment of capital, such as was indicated? Of course, the answer was that possibly those companies would fall on evil days by not reducing their capital. But his conviction was that this day would be hastened if they had to set aside such a sum, instead of reducing the price of gas. He congratulated both gentlemen on the papers they had read, and particularly Mr. Lees for pointing out one matter—namely, the danger of following too hypnotically the idea of getting the highest amount of gas from a ton of coal, and selecting coal, altogether regardless of its economical value, with a view to getting a large yield. They had had high makes bandied about pretty freely that morning; but he hoped this would not tempt any man to forget for a single moment the relative value of small coal as against (say) coal from the best seams. Some of them prided themselves on the fact that they had not a great yield of gas per ton. They might get higher yields possibly by improved methods of carbonization; but he was quite sure that, with the coals they used, they would never attain anything like the high yields put forward in some of the papers. Reverting for a moment to the question of gas companies repaying capital, when he referred to this some eleven years ago, in his maiden paper read before the Manchester District Institution, one of their old members got on his track, and said that a gas company would become a financial bubble if some such means of repayment was evolved. But Mr. Valon had put forward a suggestion which was worthy of consideration. If they got larger powers for renewal and reserve funds, the case might be amply met, rather than by definitely repaying a certain amount of capital. They wanted some go-between, between piling up capital and trying to wipe it out altogether; and the go-between which commended itself to him was that of having greater power to set aside reserves.

Mr. LEES said he appreciated some of the kind remarks which had been made; but Mr. Carter seemed to be delivering a speech, not so much in reply to what appeared in his paper, as to what he had read or heard in the City. He quite appreciated the good feeling that ought to—and he believed did—exist among all those engaged in the gas industry. Some of his most intimate friends were managers of corporation undertakings, while others were in company concerns; and he would not knowingly say a word which would appear to reflect upon their work. He did not think Mr. Carter really suggested that he did. He need not discuss the question as to how far the same results would be obtained if the investigation was carried farther, though he had his own views on this matter, and he thought probably he was about right. They could not, of course, eliminate any particular item. For instance, they could not eliminate sinking-fund charges. The consumer had to pay this item in the case of a corporation; so that it became part of the capital charge. The one point he wanted to make clear was that it was a tax on the gas consumer under a corporation to have to pay this additional charge for gas, over what he would pay if a company owned the undertaking; and his investigation went to prove clearly that he did pay more than he ought to do. He thought Parliament was coming to the same conclusion, and was doing what it could to rectify the matter. This was about the only matter of controversy in the paper. There was one other point which he might have taken up, though it had not been mentioned. It had been suggested to him that the reason why the rates appearing in corporation accounts were higher than in companies' accounts was that corporations frequently would not appeal against the assessment of their undertakings. He was not in a position to say how far this was correct; but it was not quite fair to the consumer to assume that, because the corporation collected the rates, the undertakings should not be properly assessed. The rates were paid outside a borough in many cases, as well as inside; and the consumers of the borough

were being over-rated if the gas undertaking was over-assessed. These were points which did not seriously affect them, but affected the consumers of a corporation undertaking; and the corporation would be well advised in such cases to overhaul their assessments.

Mr. VALON said the first point made with regard to his paper was by Mr. Vass, who suggested that he (Mr. Valon) looked upon the gas industry as a dying interest. Personally, he should be very sorry if he thought the gas industry was dying; but he did not think so at all, and did not believe anything in his paper ought to lead one to this conclusion. Mr. Vass gave as an instance of a dying interest a coal mine. Of course, to a certain extent, in this sense, they were a dying interest—that was to say that, if the coal was worked out, and when the coal was worked out, he presumed there would be—he would not say no gas companies, but no coal-gas companies. Then Mr. Vass said the shareholders and consumers would both be sufferers if any proposal for the repayment of capital were adopted, because it would be an extra charge on the gas, and this would be either an extra price or a reduced dividend, or both. Of course, if they were going to repay capital, they must obtain the money to do so from the consumer in the first instance; and, as he said in the paper, for a time the consumer might have to pay a somewhat higher price for his gas than would otherwise be the case. What, however, he endeavoured to show was that, in spite of this, it was desirable that they should charge the extra price at present, so that in future they might be able, not only to charge a correspondingly lower price, but a price even lower in proportion. If they increased the price now by (say) 1d. or 2d., in twenty or thirty years they might be able to reduce it by 3d. or 4d. Again, he did not think it was at all desirable that there should be a very considerable difference between the capital charges in the case of corporations and companies. The consumer supplied by a corporation had to find the charge for the sinking fund; and if consumers under companies had also to find this charge, they would only be doing the same thing. There was £157 per million difference between the amount of capital outstanding now, and a difference of over £300 in the capital upon which interest or dividends had to be paid. If this was going on increasing, he thought gas companies would find that the argument would be a very potent one in favour of the further transfer of undertakings from companies to corporations. Mr. Livesey suggested that the capital could be kept down by undertaking extensions out of revenue. Of course, if they did this, they would be doing exactly what he suggested, except that they would be doing it irregularly—he would not say illegally—instead of doing it in a regular and proper fashion. Mr. Livesey might find, when he had to go to Parliament for further powers, and had been doing a large amount of extension work out of revenue, that the Committee would not look at his operations quite so sympathetically as perhaps he hoped, and probably deserved. As to the charge for repayment being a charge on the present consumer in favour of the future consumer, it ought to be pointed out that the works were being worn out by the present consumer; and therefore the charge for replacing capital ought to be borne by him, and not by the future consumer. Mr. Yuill mentioned that in his case the capital had been reduced from £1200 to £430 per million; and, of course, this must have been done out of the pockets of the consumers, but apparently it had been accomplished to the advantage of everybody concerned. Mr. Brearley had suggested that it was just in those cases where there was heavy capital that it was most desirable that capital should be reduced, and at the same time it would be most difficult to do it, because they did not want to do anything to increase the price of gas. But Mr. Yuill's example perhaps would counterbalance this. If in the case of a company with very heavy capital it was found impossible to reduce it quite as fast as was desirable, at all events some arrangement could be made so that eventually it would be reduced to something in proportion to other undertakings of the kingdom. Mr. Brearley also suggested that it could be done by allowing the companies to have a much larger reserve, or in some other way. But this came to exactly the same thing; it was only a different way of doing it. It did not matter how it was done, so long as the capital was kept within bounds. He might point out that to provide a larger reserve would be just as great a burden on companies with a heavy capital and high price as the suggestion he had already made.

This closed the discussions.

THE BENEVOLENT FUND.

The Annual Meeting of Donors and Subscribers to the Benevolent Fund was held on Wednesday morning—the chair being taken by the PRESIDENT.

The minutes of the previous meeting having been read and confirmed, the report of the Committee of Management was taken as read.

The PRESIDENT, in moving its adoption, said the Committee inquired very carefully into each case before voting money; and though they had been able to make a grant in every case of real need, there were instances in which they would have liked to give more. In future they might be obliged to refuse aid in some cases unless the fund was well maintained and new subscriptions came in. The fund had received a great impetus from the action of the Midland Association through Mr. Meiklejohn. Other Associations had followed the good example; and a great deal more interest had been stirred up in the important work of helping unfortunate members and their families. He therefore hoped that, not only would the present subscriptions be kept up, but that others who had hitherto held aloof would see it was their duty to assist the fund.

The motion was duly seconded and carried unanimously.

The PRESIDENT announced that, as the result of the ballot, Messrs. Thomas Bower (West Hartlepool) and Hubert Pooley (Stafford) were elected members of the Committee.

Alteration of Rules.

The PRESIDENT then moved the adoption of a set of amended rules which had been printed and circulated, subject to a further alteration in Rule 12 which had been made that morning by the Committee, the effect of which was to place the Honorary Secretaries of the Affiliated Associations on the Committee, instead of the District Members of Council, as originally proposed.

Mr. J. T. JOLLIFFE (Ipswich) seconded the motion.

A short discussion ensued on certain matters of detail; but after some further explanation from the President, the amended rules were unanimously adopted, and the proceedings terminated.

STANDARDIZATION OF PIPE-THREADS.

REPORT by Mr. JAMES W. HELPS.

(See p. 819.)

I beg to report that, accompanied by Mr. Leslie Robertson, the Secretary of the Engineering Standards Committee, and Mr. Krause, a member of the same body (Mr. Thos. Glover, the President, being unfortunately unable to be present owing to pressure of Institution and other business), I attended the second session of the International Commission appointed to deal with the "Unification of Pipe Threads," which was held in Paris on June 8, 9, and 10.

It will be remembered that at the first session, held in the same city in June, 1908, certain decisions were arrived at, as set forth in your Council's report for the past year. These decisions were brought to the notice of the Engineering Standards Committee, who, as they did not approve of them, drew up a memorandum of their objections, which was submitted to, and accepted by, your Council, and accordingly included in their report. The principal points of difference were as under:

- (1) The angle of the thread, which was fixed by the Commission at 60°, as against the 55° of the Engineering Standards Committee.
- (2) The method of fixing the gauge diameter of the pipe.
- (3) The shape of the thread with regard to the amount of truncation.
- (4) The pitches of the threads of certain sizes.

At the commencement of the meeting, it was pointed out that, inasmuch as several important and interested countries were not represented, it would not be advisable to take any definite vote by countries. It was, therefore, agreed to confine deliberations to a consideration of the opinions of those present, with the object of ascertaining the extent to which agreement would be possible with a view to a future conference.

Angle of Thread.—With regard to the angle of the thread, the general opinion was in favour of 60°; but your repre-

sentatives (and those of Switzerland) strongly upheld the advantages of the Whitworth angle of 55°.

Gauge Diameter.—The gauge diameter was next considered; and, after a lengthy discussion, the definition suggested by your representatives met with the most approval. It was to the effect that the gauge diameter should be taken as the diameter of the pipe at that point of the conical thread (1 in 32) at which the parallel coupler or socket made a hand-tight joint, or, in other words, the inside diameter of the coupler itself.

Shape of Thread.—With regard to the shape of the thread, the suggestion that truncation at the root and crest should be so effected as to make the height 8-10ths of the pitch, was most generally approved.

Pitch.—The most important matter—viz., the pitches of the threads—was then discussed. There was very little difficulty in agreeing as to those pitches for pipes under 2 inches in diameter, as most countries seemed fairly in accord, and but slight concessions were necessary to arrive at a general agreement. The principal points of difference arose when the consideration of pipes over 2-inch diameter was reached. These were fixed at the conference of 1908 at 7·9 threads per inch, or 3·20 mm. pitch, as against the 11 threads, or 2·30 mm. pitch, in use in Great Britain and most Continental countries. It was pointed out that the coarser thread as used in America was designed to meet conditions which arise under the somewhat special circumstances at times met with in American practice; and after some considerable discussion, the finer pitch of 11 threads to the inch met with general acceptance. It will be seen that the gauge diameter and pitches which were provisionally approved as given in the table below very closely follow British and Continental practice.

Pitch.	Outside Diameter.
1·00 mm.	10 mm.
1·40 mm.	11 "
	13 "
	16·5 "
1·80 mm.	21 "
	26·5 "
	33 "
	42 "
	48 "
	59·5 "
	66 "
	70 "
2·30 mm.	73 "
	75·5 "
	81·5 "
	88·5 "
	94 "
	101 "
	106·5 "
	114 "

Before the close of the conference, it was arranged that the Société Technique de l'Industrie du Gaz en France should appoint a Sub-Committee of that body charged with the duty of obtaining the opinions of the various countries interested, with a view to laying the information when obtained before a further meeting to which the countries concerned should be formally invited to send representatives.

Your representatives desire to acknowledge the courtesy and hospitality shown them by the President and Council of the Société Technique, and the efforts which the Society is making in the direction of a general agreement on the important subject under discussion.

May I, in conclusion, express the opinion that this Institution is greatly indebted to the Engineering Standards Committee for permitting their representatives to attend the conference, and to Mr. Leslie Robertson and Mr. Krause for the valuable assistance they rendered thereat.

(Signed) J. W. HELPS.

Death of Mrs. Forbes Carpenter.—We regret to learn that Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Works Act, has just sustained a severe bereavement by the death of his wife. This heavy blow has come upon him not long after his recovery from an illness which delayed the preparation of his report, noticed in the last issue of the "JOURNAL" and again to-day.

The Gas Engineering Endowment at Leeds.—At a meeting of the Court of the University of Leeds last Wednesday, Professor Smithells submitted a resolution to amend an ordinance so as to include "Gas Engineering" and "Fuel" among the subjects enumerated therein. In doing so, he said he had been asked whether the gas engineering endowment involved the appointment of another professor; and he might reply that it would not. It simply meant the endowment of the professorship that already existed.

JOINT CONFERENCE OF COMMERCIAL SECTIONS OF THE UNITED KINGDOM.

Last Tuesday afternoon (the opening day of the annual meeting of the Institution of Gas Engineers), there was held, at the Institution of Mechanical Engineers, Storey's Gate, S.W., a joint conference of the Commercial Sections of the United Kingdom, which was called to consider various resolutions. In the notice summoning the conference which was issued by the Hon. Secretary *pro tem.* (Mr. H. Kendrick, of Stretford), the hope was expressed that every member of a Commercial Section would be present; and it was stated that all gas engineers interested in the work would be heartily welcomed. The suggestion was also made that every member should invite his Chairman or a representative of his Committee or Board to be present. The result of this notice was a very satisfactory attendance. At the outset, on the proposition of Mr. Kendrick, Mr. S. MEUNIER, of Stockport, was voted to the chair. Mr. Thomas Glover, of Norwich, the President of the Institution of Gas Engineers, also occupied a seat on the platform.

There were present about 80, including 48 members of the Lancashire, Yorkshire, Eastern Counties (East and West), Cornish, Southern, South-Western, and North British (West and North-West) sections.

THE QUESTION OF REPORTING THE PROCEEDINGS.

The CHAIRMAN remarked that the first thing to be decided was whether the meeting should be absolutely private, or whether the Press should be admitted.

After a short discussion a resolution throwing open the meeting to the Press was carried unanimously.

MINUTES OF SHEFFIELD AND LEEDS MEETINGS.

The HON. SECRETARY said it had been suggested that the minutes of the Sheffield and Leeds meetings should be read, in order to put the conference in full possession of what had already transpired. Four sections were represented on these occasions; but he was happy to say that considerably more than this number were represented that day.

The minutes were then read and confirmed.

A VOTE OF THANKS.

The CHAIRMAN pointed out that the next item on the agenda was a vote of thanks for the use of the meeting hall—a vote which was thoroughly well deserved. The conference was a new departure, and a step outside the regular procedure of the Institution meetings. It was exceedingly kind of Mr. W. T. Dunn, the Secretary of the Institution, to take the trouble he had to act upon the suggestion made at the Leeds meeting that the present was a proper time to hold a joint conference. Mr. Dunn had approached the Committee of the Institution of Mechanical Engineers; and they very kindly fell in with the idea. He therefore had much pleasure in proposing a vote of thanks to them.

This was heartily accorded.

STATEMENT BY THE CHAIRMAN.

The CHAIRMAN remarked that as this subject of Commercial Sections was rather an old one with them in Lancashire and Yorkshire, and especially in the Manchester district, perhaps he might be allowed to give a short *résumé* of the why and the whereof of these sections. He did not want to take up too much of their time; but he rather thought that many among the junior branches at any rate did not quite follow what had been done in the past by the older ones. The original inception of the Commercial Sections came about by a meeting of perhaps six, or seven, or eight engineers in Manchester, who had to deal with a number of little questions which rather bothered them; and they decided that it would not be at all a bad idea if they interchanged information between one and the other. From this seven or eight, the number increased perhaps to about twenty. Then the aid of the name of the Manchester District Institution was invoked, and granted. They had gone on from this until they had reached the stage at present occupied; but he ventured to assert that they had only just touched the fringe of what the Commercial Sections could be made to effect. Perhaps he might be excused if he gave them a short outline of the reports of the Lancashire Commercial Section—which also included Yorkshire, although they had taken up questions which Lancashire had not. He had in his hand the reports since 1905; and he would venture to trespass on their time while he gave them some idea of the contents. These reports spoke for themselves as to the work which had been done originally. The section was started for the purpose of preventing cutting between one another in the matter of residuals. From this it got to interchange of information with regard to contract prices for coal, tar, sulphate of ammonia, and other things—including sulphuric acid, and all the rest of it. Now it had grown to many other interesting features. From the report for 1905, he quoted the following:

During the past year, in addition to the question of coke, the various contracts appertaining to gas manufacture and distribution have been considered from time to time, including coal, tar, liquor, lime, benzol,

oil, tubes and fittings, &c. . . . The tabulation of labour queries, which occupied the attention of your Committee during the greater part of last year, was completed, and a copy issued to each of the members who supplied the necessary information. The tabulation is a valuable standard of reference for all classes of labour in gas-works, but will require to be corrected from time to time as alterations take place in the respective works.

He might tell them that in Lancashire and Yorkshire they had a complete set of tabulations, showing the wages paid for every kind and every different class of work which could be found; and when he said that it took them nearly two years to compile this, they would easily understand the difficulty of the task. But they possessed it now; and they kept it up to date. The report continued:

Reference was made in the last annual report to Mr. Pye's "Notes on Rating;" and during the present year copies have been printed and circulated to the members of both the Lancashire and Yorkshire Sections. A short paper was read by the Secretary on the "Maintenance of Incandescent Burners at Heywood," in which he claimed that it was to the interest of gas authorities to take up this question. . . . The important question of "Gas Producers for Power Purposes" was introduced by Mr. Braddock, of Radcliffe, a summarized report of which, together with the discussion at the subsequent meetings, has been forwarded to each member of the section. Mr. Isaac Carr, of Widnes, read a short paper on "High v. Low Grade Gas, and the Effect of the Gas-Testing Decisions of the Departmental Committee of the Board of Trade on Gas Authorities and Gas Consumers." . . . The question of relative value of candle power and calorific value was also discussed. . . . Mr. Ball introduced the subject of "Various Methods of Increasing Gas Sales;" the most important point advocated being the reduction of price. . . . This subject gave rise to a long and interesting discussion; and statistics were given by several members showing the progress of their respective undertakings by judicious advertising, and the adoption of special conditions for large users of the day-load, cooking-stoves, grillers, &c. The question of "Arrangements with Plumbers" was introduced by the Chairman at another meeting. He referred to the difficulty of corporations dealing with this question as compared with companies, but was of opinion that special terms and facilities should be offered to plumbers in connection with sales of goods and the carrying out of work for gas authorities. The Committee have also taken into consideration the anomalies which exist in reference to railway rates for carriage of coke and other materials, but have not concluded their investigations. The action of the Anti-Vibrator Incandescent Lighting Company, with reference to the infringement of patent and the effect on mill-lighting and other works received the attention of the Committee. The returns for ammoniacal liquor, sulphate of ammonia, and tar have been tabulated and issued to the members. The Committee have under consideration the question of standard rules and regulations for authorized plumbers, and conditions of gas supply.

From the report for 1906, he took the following:—

The question of ordinary gas-works contracts for coke, tar, liquor, &c., has been considered each month. The following subjects have also been introduced, and interesting discussions have ensued: "Free Cookers," introduced by Mr. Andrew; "Differential Rates for Cooking, &c.," by Mr. Ginman; and "Grouping of Accounts for Discounting," by Mr. Potts. The question of suction gas, naphthalene, and the periods fixed by the Local Government Board for the repayment of loans, have also been considered; and much valuable information was elicited by the discussion of these subjects. The members have also under further consideration the question of railway rates. The returns for ammoniacal liquor, sulphate of ammonia, and tar have again been tabulated. The Committee are preparing a list of rules and regulations for authorized gas-fitters, and conditions of gas supply, which, it is suggested, might be adopted as a standard. The Committee are also tabulating returns from the members of the section, showing the average price realized for coke per ton during the last three years.

The following extracts were from the report for 1907:—

Weekly statements of coke stocks and prices have been issued to the members, and reports exchanged with the Yorkshire Section. The total stocks are reported at the monthly meetings, when the condition of the market and ruling prices are discussed. . . . The shipping trade has been brisk; but many of the members have experienced difficulty in securing waggons. Returns, showing the average price realized at the various works, and other particulars respecting the sale of coke, have been tabulated and issued. . . . It has been decided to subscribe to the Mansion House Association on Railway and Canal Traffic, the principal objects of which are to advise its members on all matters affecting railway and canal traffic, and also watch legislation in the interest of traders. Members will get the benefit of expert advice in cases of dispute with Railway and Canal Companies.

This meant that the members of both the Lancashire and Yorkshire Sections were entitled to bring forward any question that might affect them in connection with railway rates, siding rates, or any other thing appertaining to this particular branch, and through their Secretary obtain the expert advice of the Mansion House Association and their officers. This was secured at an inclusive fee, which they had thought it advisable to pay. The fee did not amount to much; but the advice was extremely useful. The report continued:—

As to the residual market, tabulations of returns showing particulars of production and prices realized by the various works in the section have been issued to the members, which ought to prove of considerable value for reference. The markets for benzol, pitch, oil, carbon, oxide—new and spent, &c.—have also been dealt with. The labour statistics issued two years ago have been revised; and a supplementary return has been issued giving details of alterations in wages and conditions of labour. Various phases of the labour question have been dis-

cussed at several of the meetings. The new Workmen's Compensation Act has evoked considerable discussion during the year, particularly the clauses which affected the gas industry. Details of revised rates and other information have been obtained by the Committee, and circulated among the members. Mr. Pye, of Chester, submitted notes on the subject of "Summer Advertising." He advocated novel and genuine advertising, especially in districts where there is practically no expansion. . . . The question of the adoption of "Old Age Pensions" was introduced by Mr. Andrew, of Oldham. Details of schemes in operation in several towns were submitted; and the discussion on the subject was well sustained. . . . Mr. Carr, of Widnes, introduced the subject of "Gas Consumption per Head of the Population," and gave some most interesting statistics respecting the consumption of gas at Widnes. . . . The following subjects have also been discussed: Tarring of roads, hiring of gas heating apparatus, recent experiences with suction-gas plants, reinstatement of trenches, the use of lead and compo. pipe, sizes of meters and pipes, the use of water-slide pendants, oscillation caused by gas-engines, responsibility for escapes, &c., and many other matters connected with gas management. The necessity for revising the Gas-Works Clauses Act, 1871, has been advocated at several of the meetings. . . . Reports have been exchanged with other Commercial Sections. . . . During the year, several of the members, when unable to attend the meetings, have sent written communications to the Secretary, giving experiences and particulars relating to their works and district, bearing on the subject announced for discussion.

He did not think he need go further, because the report of 1908 was practically an enlargement of the same business. But what he did want to point out was that these Commercial Sections were not built up as they were originally—simply for talking over tar, coke, or coal. They were of benefit in many respects outside these matters. Every question which arose in any engineer's experience he brought forward, with great advantage, not only to himself, but to the other members. ("Hear, hear.") The points were set forth and discussed, and the general consensus of opinion tended to show, at any rate, the line of procedure which it was safest to follow. This was what was intended; and it was what he hoped would accrue from interchange of opinions between them, because they had many questions in common. If they could only get this interchange of information with regard to circumstances which applied to every district, then they could form themselves into a body which would be useful, not only to themselves and their departments, but to each individual section.

The special resolutions submitted to the meeting were discussed at length; and the main object of the meeting was endorsed, which will result in placing the Commercial Sections of the United Kingdom in a stronger position, by the exchange of ideas and information throughout the country on all matters of commercial interest. Several items of the *agenda*, including the most debatable, were left over to the delegates and sections for further consideration during the next twelve months.

APPOINTMENT OF OFFICERS.

As the hour was very late, instead of electing officers and a committee,

Mr. R. G. SHADBOLT (Grantham) proposed, Mr. CARTER (Lincoln) seconded, and it was agreed, that Mr. Meunier and Mr. Kendrick be asked to act as Convener and Secretary of the Joint Conference for the space of another year.

The proceedings concluded with a vote of thanks to the Chairman, on the proposition of Mr. C. WOOD (Bradford), seconded by Mr. E. ALLEN (Liverpool).

Society of Engineers.—Last Wednesday, on the invitation of Messrs. Ellington and Woodall, M.M.Inst.C.E., the Engineers to the London Hydraulic Power Company, a number of the members of the Society of Engineers visited the Company's new power-station, in course of construction at Grosvenor Road, Westminster, about 300 yards west of Vauxhall Bridge. When completed, the building will be the largest of the Company's pumping-stations, and will replace the existing station in Millbank Street. At the time of the visit the works were not in a sufficiently advanced state for the reception of machinery, and interest centred principally in the ferro-concrete construction (the Hennebique system). The station when completed will comprise engine and boiler houses, accumulator tower, chimney shaft, coal-store, filter-house, workshop, store-room, men's room, and foreman's house, with water-tanks over the boiler-house and filter-house. The settling reservoirs in the rear cover an area of 2550 square yards, with a total capacity of about 2½ million gallons. The station is designed to supply 200,000 gallons of power water per hour, at a pressure of 800 lbs. per square inch. River water is to be conducted into the settling reservoirs at the rear through two lines of 20-inch pipes, laid at about half-tide level. The reservoirs can be emptied to the river at low tide through 14-inch drains. The water, after settling, is to be pumped from these reservoirs through the condensers into an overhead tank above the filter floor. It is then filtered; and from the filters it will flow into another tank, at a lower level, over the boiler-house, whence it will be conducted to the main engines with a gravity head, and pumped into the power mains. There are at present about 165 miles of hydraulic power mains laid in London, and served by five central stations from two to three miles apart. The supply is over 20 million gallons per week, with about 6000 machines at work.

THE LIVESEY MEMORIAL FUND.

WE have received from Mr. Walter T. Dunn the following list of further contributions to the fund :—

1909.		£	s.	d.
June 14	Previously acknowledged	9945	2	1
„ 15	John Aird and Sons, London	52	10	0
„ 17	Bridgwater Gaslight Company	5	5	0
	J. S. Dougall, Boston	1	1	0
	Timothy Duxbury, Oldham	1	1	0
	Eastern Counties Gas Managers' Association	21	0	0
	Charles Hawksley, London	52	10	0
	D. H. Helps, Reading	2	2	0
	William Hill, Stalybridge	1	1	0
	R. Hesketh Jones, London	10	10	0
	Lambton Collieries, Limited, Newcastle-on-Tyne	25	0	0
	Dr. Rudolf Lessing, London	2	2	0
	New Zealand Express Company, New Zealand, per Mr. F. M'Leod (South Metropolitan Gas Company)	3	3	0
	J. Wylie Nisbet, London	5	5	0
	Oriental Gas Company, London	15	15	0
	Oughtibridge Silica Company	5	0	0
	H. J. Randall, Tottenham	0	10	6
	J. W. Randell, Fulham	1	1	0
	J. J. Runtou, Hull	1	1	0
	W. J. Smith, Carlisle	2	2	0
	J. H. Troughton, Newmarket	1	1	0
„ 21	W. Chaney, Birmingham	1	1	0
	Total	£10,155	3	7

PERSONAL.

PRESENTATION TO Mr. T. C. FULLER.

We offer our congratulations to a gentleman well known to a large circle in the gas profession—Mr. T. C. FULLER, the Secretary of the Isle of Thanet Gaslight and Coke Company, who, on the 3rd of May last, completed his fortieth year of service. He was appointed as the Clerk to the Ramsgate and Margate undertakings on May 3, 1869, and took an active part in the stirring period of 1874 to 1877, when the Ramsgate Local Board sought to acquire the Ramsgate works by compulsory purchase, but were defeated; terms afterwards being agreed to. Again, in 1880 and 1881, he took part in opposing the promotion of the Westgate and Birchington Gas Company. The district and charges being defined, an agreement was entered into, and the Bill was allowed to pass. In 1898, he was again engaged in Parliament; and though the site then selected was withdrawn, the monetary portion of the Bill was granted. Being well known as a hard worker, it is pleasing to have to record that his long service has met with the appreciation of his Board, to which a resolution placed on the minutes of the Company fully testifies. The Chairman of the Company (Alderman L. Hart, J.P.), in speaking of Mr. Fuller, said: "As Chairman of the Company, I feel I should be more than remiss if I did not move that there be placed upon record the high appreciation we have of Mr. Fuller, our Secretary, and his work. For forty years he has devoted himself to the interests of the Company; and, not only to us, but to our predecessors, he has given the highest possible satisfaction in every way. We know that he has ever had but one object, and that has been to advance to the fullest the interests of the Company; and his whole career has been one of continual and continued prosperity for all concerned with him in his work." A very handsome salver was presented to Mr. Fuller at the close of the Directors' meeting last Friday. It bore the following inscription :—

Presented by the Chairman and Directors of the Isle of Thanet Gas Company to Thomas Christopher Fuller, Secretary of the Company, in recognition of his services—May 3, 1869, to May 3, 1909.

Mr. J. F. BEDFORD, of the Leeds Corporation Water Department, has been appointed, out of 114 applicants, Water Manager to the Colne Corporation.

Mr. ARTHUR M. FORSHAW, M.Sc., who read at the meeting of the Institution last week the paper on "A Comparison between the Illuminating Efficiencies of Carbon Monoxide and Hydrogen when used in Conjunction with the Incandescent Mantle," has been appointed Chief of the research and chemical staff of Messrs. John Wright and Co., of Birmingham.

Mr. W. BROWN, Manager of the Lasswade and Bonnyrigg Gaslight Company, Limited, has been appointed Manager of the Gas Company which has been formed for the supply of gas in the Cardenden district of Fifeshire. The Company is the outcome of the increased activity in the coal output of the county of Fife. Mr. Brown, who is a protégé of the late Mr. W. Young, of Peebles, has been eight years at Lasswade. He has been President of the Waverley Association of Gas Managers, and is at present Hon. Secretary of that body. He has also held the office of President of the Scottish Junior Gas Association, Eastern District.

On the evening of Friday, the 11th inst., Provost Torry, as the Chairman of the Stonehaven Gas Company, along with the past

Chairman and the Secretary, waited upon Mr. W.M'LEAN ROSS, the retiring Manager of the Company, and presented him with a gold Albert and pendant, and Mrs. Ross with a gold brooch, set with diamonds, rubies, and pearls, as tokens of the appreciation and esteem the Directors and shareholders of the Company have of Mr. Ross. In handing the gifts over, Provost Torry expressed the heartfelt wish of the Directors that Mr. Ross and his family circle might be as prosperous under the Southern Cross as they had been in the old country. Mr. Ross thanked the Directors on behalf of himself and his wife.

Mr. HAROLD DAVIES, of Blackburn, has been selected to fill the position of Gas Engineer and Manager to the Brighouse Corporation—an appointment for which applications were invited in our advertisement columns some weeks ago. The successful candidate was educated at the Liverpool College, and subsequently at the Liverpool University College (where he studied scientific subjects, engineering, and laboratory work) and at the College of Chemistry. He also made special researches in organic chemistry as applied to gas-works residuals, under Dr. Pickard, the Consulting Chemist and Gas Examiner to the Blackburn Corporation. He holds thirteen certificates for science and art, including one in the Honours grade in "Gas Manufacture." He has had considerable experience in all branches of constructional work, first at Runcorn, where he was a pupil of Mr. J. R. Frith, and afterwards his assistant, and subsequently at Darwen and Colne, where he was the Assistant Engineer and Manager. In November, 1899, he obtained the position of Chief Assistant Gas Engineer at Blackburn, where he was associated with Mr. S. R. Ogden in the designing and erection of the present works, which are equal to an output of 2½ million cubic feet daily. It will thus be seen that the Brighouse Corporation have secured the services of a thoroughly well-trained man for their Engineer and Manager; and we trust the choice they have made will every year be more fully justified.

OBITUARY.

JOHN TINDALL.

ANOTHER name has been erased from the roll of gas engineers who were in active work in the early part of the second half of last century. There passed away on the 2nd of June, in his 79th year (after a paralytic stroke which he had the previous Saturday), Mr. John Tindall, whose connection with the Walsall Corporation Gas-Works up to 1900 brought him prominently before the gas industry; and he was buried in the old cemetery, close by the old gas-works, on the following Saturday. The funeral was attended by the Chairman of the Gas Committee, who is the Mayor of the town, and other local friends, including his successor at the gas-works, Mr. B. W. Smith, together with some twenty or thirty of the employees at the gas-works. Among the many beautiful wreaths sent, one was by the Midland Association, another by Mr. Charles Meiklejohn, another by Mr. A. C. Scrivener, and others from friends in the industry. Deceased was interred in the same grave as his wife, who had predeceased him about ten years. Mr. Tindall went to Walsall in 1874, and resigned early in 1900, when Mr. Smith took up the position; the final severance with the works taking place on the 18th of June. When Mr. Tindall entered upon his duties, the gas-works were situated in Wolverhampton Street. The demand for gas in the town necessitated the extension, in 1896, of the works now known as the Pleck Station; and ultimately the enlargement of the plant there led to the closing down of the works in Wolverhampton Street. Mr. Tindall was highly respected in the profession; and equally in Walsall was he held in very high esteem right up to the closing days of his long life.

The death of Mr. Tindall removes from our midst one of the five gas engineers who, on the 20th of September, 1877, met at the Windsor Street Gas-Works, Birmingham (with Mr. Charles Hunt in the chair), to consider the desirability of forming a District Association of Gas Managers for the Midland area. The first ordinary meeting was called on Oct. 11, 1877, when Mr. Tindall was elected Honorary Secretary, to which office he was re-elected the following year. He was then appointed Honorary Treasurer to the Association. Having filled this office for five years, he was elected President on Sept. 25, 1884, and until his retirement from the management of the Walsall Gas-Works in 1900, through ill-health, he continued to take an active interest in the work of the Association.

GEORGE FREDERICK DEACON.

WE regret to record the sudden death last Thursday of Dr. George Frederick Deacon, whose name is well known to most of our readers in connection with the Liverpool and other schemes of water supply, as well as with the waste-recording meter invented by him.

Deceased was born at Bridgwater on July 26, 1843, and at an early age displayed a taste for science and mathematics which marked him out for the engineering profession. After receiving his early training, he studied engineering science at Glasgow University, where he came in contact with Sir William Thomson (afterwards Lord Kelvin), who was then Scientific Referee to the Atlantic Telegraph Company; and through his recommendation,

Mr. Deacon at the age of twenty-one obtained an appointment with the Company. He subsequently commenced practice in Liverpool as a consulting and mechanical engineer, and made a special study of the estuary of the Mersey. At the age of twenty-eight, he secured the dual position of Borough and Water Engineer of Liverpool. Soon after his appointment, the deficiency in the water supply of the city became a very urgent question. Mr. Deacon determined to ascertain whether an economical use was being made of the supply at command; and he subsequently invented and brought into use the waste-meter to which reference has already been made. A great saving was thus effected; and in 1875 the supply of water, which for ten years had been intermittent, was made constant and sent out under higher pressure than before.

In 1881, Mr. Deacon resigned the position of Borough Engineer, in order that he might devote his energies to the duties of the other office. A better water supply for the city had become a generally recognized necessity. He investigated projects for bringing water from Westmorland and Wales; and about the year 1876 he projected the great Vyrnwy scheme. The project had been approved by Mr. J. F. Bateman and Mr. Thomas Hawksley, who were then regarded as the chief British hydraulic engineers. The Water Committee of the Corporation engaged the latter, together with Mr. Deacon, to take charge of the scheme; and they were associated from 1879 until 1885. They agreed that the dam of Lake Vyrnwy should be constructed of masonry; but they were not agreed as to the mode of its construction. This and other points of difference led to Mr. Hawksley's resignation in 1885. Later on the whole question was referred to several eminent engineers, who reported entirely in favour of the method employed by Mr. Deacon, and stated with respect to the dam generally that "nothing short of an earthquake could possibly disturb it." From that date to its completion, Mr. Deacon had entire responsibility of the work. The most serious and difficult part of the undertaking proved to be the aqueduct tunnel under the River Mersey.

This was driven through gravel and sand at a great depth, under free pressure of water from the river above. It was abandoned in turn by two contractors; and in this way, though only 182 feet were completed, a great deal of time was lost. Mr. Deacon thereupon assumed the responsibility of the contractor; and he finished the remaining 620 feet in a few months. As Engineer-in-Chief, Mr. Deacon completed the first instalment of the Vyrnwy scheme in 1882; but since then a second pipe-line has been laid to the city. On the completion of the scheme, Mr. Deacon removed to London, where he practised as a Consulting Engineer. He projected the new water scheme for the Birkenhead Corporation; and up to Monday last week he was constantly in communication with officials of the Corporation, discussing details. He was full of affairs, and had several large projects on hand besides the Birkenhead scheme, for which he was the Consulting Engineer; and his death will be a great loss.

Besides his waste-meter, Mr. Deacon invented apparatus for smoke prevention, mechanical stoking, and grain drying, other differentiating meters, reducing-valves, and heat-engines, for all of which he obtained patents. Among other medals received by him were the Telford, Watt, and Stephenson Medals of the Institution of Civil Engineers, to which body he was admitted as an associate in 1872; and was transferred to the membership list in 1874. He was author of many scientific and engineering papers, including the article on "Water Supply" in the supplement to the ninth edition of the "Encyclopædia Britannica." He was a member of the Institution of Mechanical Engineers, of the Iron and Steel Institute, and other scientific societies, and had been President of the Association of Municipal and County Engineers. He was an LL.D. of Glasgow.

We regret to learn that Mr. D. Hunter Anderson, the Engineer and Local Manager of the Bastia (Corsica) Gas-Works, has sustained a great bereavement by the death of his wife, which occurred on the 1st inst. at Bastia, in her 53rd year.

We much regret to have to record the death, under very tragic circumstances, of Mr. ALFRED RICHARDS, of No. 18 Finsbury Circus, E.C. It appears that for the last few weeks, in consequence of unsatisfactory health, he had been travelling in Wales and Scotland, whence he returned to town on Tuesday evening last. On Thursday, without giving the slightest indication that the nerve trouble was deep-seated, he took his own life by shooting. It is, of course, well known that Mr. Richards, who was a keen sportsman, had for some time slackened his business energies—spending long periods (extending to six months at a stretch) in shooting and fishing—leaving the carrying out of business matters almost entirely in the hands of his partner, Mr. William Richards; and the announcement made early last year that the name of the firm had been changed to A. & W. Richards was doubtless construed by their clients as indicating what was an actual fact—viz., that the entire conduct of the business had devolved upon Mr. W. Richards. The sad event, therefore, will make no difference in the administration of the gas and water auctions to which Messrs. Richards, during their partnership of the last twenty years, have devoted their chief energies. It may be remarked that the deceased gentleman was for many years a member of the Evening Star Lodge, with which his brother is still connected.

THE DESIGN OF ATMOSPHERIC BURNERS.

By ALFRED MANSFIELD, of Liverpool.

AMONG the many problems connected with the design of atmospheric burners of all kinds is the relationship of one orifice to another. I know of no tables which give this information in a manner which is of service to a busy man. I have been obliged to work them out for use in our laboratory; and I publish them in the hope that they will be of service to others. I give the diameter of orifices in inches and their discharging powers, commencing from 1-100th of an inch and ending at 1 inch.

Diameter of Tube, Inch.	Discharging Power.	Diameter of Tube, Inch.	Discharging Power.	Diameter of Tube, Inch.	Discharging Power.
·01	·000003927	·35	·028459006	·68	·149737384
·02	·000022030	·36	·03053749	·69	·155321824
·03	·0000612495	·37	·032701083	·70	·160992736
·04	·000125701	·38	·034955617	·71	·1668047450
·05	·00021945	·39	·037301373	·72	·17274081
·06	·0003462	·40	·039739037	·73	·17879855
·07	·00050895	·41	·04328975	·74	·184985262
·08	·00071099	·42	·044892819	·75	·191298624
·09	·00095439	·43	·047613274	·76	·197740142
·10	·0012417	·44	·050430274	·77	·204310018
·11	·0015758	·45	·053344937	·78	·211008430
·12	·0019589	·46	·056358364	·79	·217833146
·13	·002392824	·47	·059471646	·80	·224793031
·14	·002880047	·48	·062684304	·81	·231884666
·15	·00342788	·49	·066000462	·82	·239108236
·16	·00402140	·50	·069420208	·83	·246466096
·17	·00467918	·51	·072716956	·84	·253957638
·18	·00539807	·52	·076572534	·85	·261584117
·19	·00617942	·53	·080307165	·86	·269341352
·20	·00702494	·54	·084171856	·87	·277246719
·21	·00793630	·55	·088163192	·88	·285270714
·22	·00912483	·56	·092157208	·89	·293451529
·23	·0099626805	·57	·096327063	·90	·301765246
·24	·01108112	·58	·100607694	·91	·310217927
·25	·01227163	·59	·105001214	·92	·31880625
·26	·0135362396	·60	·109504537	·93	·32754123
·27	·01487587	·61	·11412532	·94	·33641819
·28	·01629161	·62	·118860511	·95	·34543790
·29	·01778467	·63	·123732063	·96	·354601110
·30	·01934692	·64	·128677199	·97	·36390858
·31	·0208862225	·65	·13376656	·98	·37335499
·32	·02280796	·66	·138971019	·99	·38295387
·33	·0245669	·67	·144292267	1·00	·39269850
·34	·02686858				

The method of using these tables is as follows: In a ring or bar burner, it is well known that the total discharging power of the drilled holes must bear a definite relationship to the discharging power of the mixing-tube. Take for example an ordinary ring boiling-burner. It is decided to drill 70 holes ·11 inch diameter. What will be the diameter of the mixing-tube? If we refer to the above table, we find the discharging power of an orifice ·11 inch diameter is ·0015758. The total discharging power for 70 orifices will therefore be ·1103060. Glancing down the column of discharging powers, we find a single tube between ·60 and ·61 in diameter will have a similar discharging power.

It must be remembered that the discharging power of a mixing-tube varies according to its length. Also that mixing-tubes are not usually circular or smooth. It would be safe to make the diameter of the mixing-tube ·75 inch; but it must not be less than ·60 inch. Suppose this burner is found to work well, and will boil water with an efficiency of 60 per cent., and for some reason it is desired to use holes $\frac{1}{4}$ inch, or ·25 inch, instead of ·11 inch in diameter, and still retain the same mixing-tube and nipple. How many holes ·25 inch diameter should be drilled? The method is as follows: We have found the total discharging power of the 70 holes each ·11 inch diameter to be ·1103060. A reference to the table will show that the discharging power of an orifice $\frac{1}{4}$ inch, or ·25 inch, diameter is ·01227163. If we divide this into ·1103060, we find the result to be between 8 and 9. If eight holes are drilled ·25 inch diameter instead of 70 holes ·11 inch diameter, it will be found that identically the same structure of flame is the result. Or if a single tube is desired, it will be between ·60 and ·61 inch diameter.

Perhaps it will be found that this burner (which works so well) consumes 10 cubic feet of gas per hour. Its discharging power is ·1103060. If we divide 10 by ·1103060, we obtain a constant which is 9·06. Now, if we take any other size of burner, calculate its discharging power, and multiply by this constant, it will give the exact consumption of gas per hour in cubic feet for the same kind of flame, with the same quality of gas.

For the measurements of orifices, I use a steel tapered gauge made by Messrs. Chestermans, of Sheffield, which costs about 9s. It is marked on one side in 64ths and on the other in 100ths, and reads up to 1 inch. With this handy instrument, orifices can be measured to 1-100th of an inch with the greatest ease.

It will be seen that the table is of the greatest service for the following:—

- 1.—The correct calculation of the relationship between the issuing orifices and the mixing-tube.
- 2.—Having once designed a satisfactory burner, a smaller or

larger burner can be readily designed which will give exactly the same efficiency.

- 3.—If the gas consumption of one burner is found, with a certain quality of gas, the consumption for any other size of burner can be calculated with the greatest exactitude for the same quality of gas.

BELTON'S PATENT "FACILE" SYPHON.

IN the entrance hall of the Institution of Mechanical Engineers last week, many gas engineers were interested in a model of this new form of syphon for gas-mains. It is the invention of Mr. J. C. Belton, of Chester, and is designed with the objects of minimizing the cost and trouble attendant upon the fixing of syphons, of more completely effecting the removal of the liquid deposited, and of decreasing the liability to leakage and to fracture of the casting by superficial pressure.

These objects are attained by making the syphon in the form of a "fish-bellied" pipe, having the usual sockets, or socket and spigot, at the ends. The body of the syphon is no wider than the diameter of the pipes to which it is connected. The depth at the centre is about three diameters of the pipe, and the length about 4 feet, so as to give ample capacity in the containing portion. The dip-pipe for emptying is fixed in the centre, and is of sufficient length to remove almost the entire contents; the curved shape of the bottom portion enabling this to be done more effectually than is possible with syphons having a flat bottom.

The only excavation required for fixing the "Facile" syphon is a curved depression in the bottom of the pipe-trench sufficiently deep to accommodate the segment-shaped casting; the ends being levelled to receive the adjacent pipes by rocking the casting in the required direction. A spade or two of earth thrown in the trench holds it in position while it is being "jointed up" and tested for soundness. When the trench is filled up, the soil readily conforms to the curves of the bottom, and makes a firm support, so preventing the fracture of the adjacent pipes by the weight of a syphon inadequately supported—a mishap not unknown to users of flat-bottomed syphons.

The economy of time and labour in fixing is a considerable item in the advantages claimed for the "Facile" syphon; the difficulties often met with in the fixing of flat-bottomed cylindrical or rectangular syphons being entirely obviated. The vertical cross section offers the maximum resistance to fracture by heavy traffic. The section is slightly modified for syphons above 10-inch size, so as to avoid unwieldiness. Length, depth, and terminal connections can be varied to suit special requirements; but standard patterns have been prepared for all sizes under 12 inches. Many expressions of appreciation of the obvious advantages of the syphon were heard from engineers who examined the model during the week, but not a word of adverse criticism.

Electric Lighting and Fire Risks.

At the congress of the Fire Brigade Officers held at the Guildhall, Westminster, last Thursday, Mr. Arthur Pordage, the Fire-Master in Edinburgh, read a paper on "Electric Lighting and Fire Risks." Reviewing the origin of fires caused by electric currents, the author said it was found that the majority resulted from the fusion of gas-pipes by a short-circuit being formed from charged electric wire tubing, metal beams or columns, and gas-tubing. The principal cause of these defects was, in his opinion, due to the metallic conduit system. It was his experience that not more than 2 per cent. of fires caused by defective electric circuits had been due to defects developed in wooden conduits. He accordingly advocated the use of wooden casing as against metallic conduits. Electric lighting and gas heating for domestic purposes were both now so absolutely indispensable to every-day life, that the safest means of wiring buildings were essential for the proper safeguarding of life and property against methods which tended to menace alike the success of electric domestic supplies and the buildings in which they were installed. As to the fire risks caused by electricity, he gave the following figures for London and Edinburgh during the past three years: London, total fires caused by electricity, 294, of which number 279 were returned as being due to defective electric circuits, seven to the overheating of electric lamps, and the remainder to minor causes. For Edinburgh, the total electric fires were 46, of which 35 were due to shorting of tubing on to gas-pipes, five to faulty flexible wires, and six to overheating and minor causes. The averages in other large towns were generally similar, proving that the diminution of electric causes of fires could only be attained by the adoption of really safe methods of distributing electric energy in buildings.

The Council of the London Chamber of Commerce, at their meeting on the 10th inst., elected Mr. Henry Adams, M.Inst.C.E., F.S.I., &c., as a member of the Arbitration Committee of the Chamber in addition to the Engineering Committee of which he has been a member for some years.

AMERICA AND THE NEW UNIT OF LIGHT.

WE have received from the Acting-Director of the Bureau of Standards of the Department of Commerce and Labour at Washington (Mr. E. P. Rosa) an announcement which is being issued by the department relative to the adoption by the United States, in conjunction with Great Britain and France, of the new unit of light. The first portion of the circular consists of the memorandum by Dr. R. T. Glazebrook, F.R.S., the Director of the National Physical Laboratory, Teddington, which was reproduced in the "JOURNAL" for the 18th ult. (p. 439); and the following comments are made upon it.

The above announcement marks an important step forward in the history of photometric measurements. For many years the British parliamentary candle was the unit recognized in this country [America]; but the lack of precision in practical photometry did not permit its value to be very accurately expressed or reproduced. In recent years, the gas industry has employed the one-candle power sperm candle, the ten-candle power Harcourt pentane lamp, the Hefner lamp, and various secondary standards; the electrical industry has employed incandescent electric lamps, either certified by the Bureau of Standards or rated in terms of standards that are consistent with those of the Bureau. The unit of the Bureau has been maintained very constant, as shown by frequent comparisons with the standards of France, Germany, and Great Britain, but differed appreciably from the British unit, and hence from the unit employed by most of the gas companies in America.

The Bureau of Standards took the initiative several years ago in bringing about international uniformity in the unit of light, by sending its representatives abroad, with copies of its standards, to determine more accurately the relative values of the units of the several European countries, and to urge the adoption of an international unit. In this country, the American Institute of Electrical Engineers, the American Gas Institute, and the Illuminating Engineering Society have acted together in support of the movement, and have voted in advance to recognize the new unit of candle power. In England, the National Physical Laboratory has secured the endorsement of the London Gas Referees and the Institution of Gas Engineers. The union of the three national standardizing institutions of America, France, and Great Britain in maintaining a common unit of candle power, and the co-operation of the German Reichsanstalt in redetermining from time to time the ratio of the Hefner unit to the common international candle, assures the highest attainable constancy for the new unit of light.

Unfortunately there is no primary photometric standard that is sufficiently constant and reproducible to be generally accepted as an international standard. France, Germany, and Great Britain each has its own primary flame standard; and a great deal of effort has been expended in attempting to determine accurately the relations between them. Until the flame standards themselves are better understood, however, and the atmospheric and other conditions more perfectly controlled, the unit of light cannot be preserved as accurately by primary flame standards as by incandescent electric secondary standards. The latter, when well made, properly seasoned, and carefully measured, permit comparisons to be made (using the means of many settings on several lamps) with excellent precision; the lamps themselves being constant enough, and the precision of measurement high enough, to fix the final values to about one or two tenths of 1 per cent. There is good reason to believe that in this way the international unit of light can be preserved so nearly constant that any inevitable drift occurring one way or the other would be too small to detect with certainty by any of our present flame standards in many years. The Bureau of Standards will continue to standardize flame standards by the electric standards, and will also carefully investigate the more important flame standards. Similar tests and investigations will also be made in Europe; and, if any appreciable drift does occur, it will sooner or later be detected.

Careful distinction should be made, in this connection, between a unit and a standard. An international unit maintained by the co-operative effort of several national standardizing institutions, and checked from time to time by means of all the best primary standards in use, is more likely to be maintained constant than if it were defined to be represented by any single primary standard, unless such a primary standard were reproducible to a very high degree of precision. Such a unit can be continued permanently, even though all present primary standards are ultimately superseded by better ones. The Hefner lamp as a convenient flame standard will not be displaced in America or any other country which adopts the international candle as its unit of light. Uniformity among different countries and continuity of value are prime necessities with respect to the unit. But the particular standard by which the unit is realized in practice is largely a matter of convenience and circumstance. In the photometry of electric lamps, electric standards are most suitable. In gas photometry, one form of flame standard or another will be employed according to circumstances. It is not expected that all countries of the world will at once adopt the proposed international candle as their unit of light. Those countries which already have the Hefner unit in general use may prefer to continue it. But if all

countries which have a unit differing appreciably from the Hefner will adopt the international candle as their unit, there will then be only two units in use throughout the world, and they will have the ratio 9 : 10. This would result in a distinct gain, both in the practice of photometry and in definitions and nomenclature.

The effect of this change of 1·6 per cent. in the unit of the Bureau, which is in general use for electric lighting throughout the country, is to raise the candle power rating and decrease slightly the watts per candle of electric lamps. A 16-candle power lamp will give 16·26 candles in the new unit, or a 16-candle carbon filament lamp burning at 110 volts will give 16 candles on the new basis at 109·69 volts. The change, though small, is important in the photometry and rating of lamps.

The new unit of candle power being in agreement with the present English unit as represented by a ten-candle power standard pentane lamp, there will be no change in the unit of light now employed by those gas companies who use pentane lamps, provided they are in agreement with the English standard. But as pentane lamps may differ slightly from one another, even when burned under the same conditions, it is desirable, for the sake of greater uniformity, to have them standardized in terms of the standard candle of the Bureau. These variations, amounting to from 1 to 5 per cent., are generally in the same direction—that is, the lamps if not correct usually give less than 10 international candles under standard conditions when burning in a pure atmosphere at a normal barometric pressure of 76 centimetres of mercury and an atmospheric humidity of 8 litres of water vapour per cubic metre. In anticipation of this change, some of the largest gas companies in the United States have already had their pentane and Hefner standard lamps standardized by the Bureau in terms of the new unit.

Gas standards will hereafter be certified in terms of the international candle. Electric standards will be certified in terms of the old unit until July 1, 1909, unless otherwise requested. On July 1, the new unit will be adopted by the Bureau of Standards in the certification of electric standards; and it is hoped that manufacturers of electric lamps will adopt the new unit as soon thereafter as possible. The Bureau recommends that all gas and electric companies, all photometric laboratories, and manufacturers of electric lamps in the United States should adopt the new unit of candle power, if possible, not later than Jan. 1, 1910.

Determination of Thorium in Monazite Sand.

In an article in an Italian chemical publication, Signor V. Borelli dealt with the above subject. According to an abstract in the "Journal of the Society of Chemical Industry," about 2 grammes of finely-powdered monazite are treated in a platinum crucible with 5 c.c. of sulphuric acid of sp. gr. 1·84 and a little hydrofluoric acid. The crucible is fixed in a larger porcelain crucible by means of a ring of asbestos, and is heated gradually, so that the hydrofluoric acid is evaporated in from one to two hours, and the sulphuric acid in from four to five hours. When fumes are no longer evolved, the platinum crucible is allowed to cool, the greater part of the contents detached with a spatula, and dissolved in about 10 c.c. of hydrochloric acid. After diluting with water to 50 c.c. to 60 c.c., the solution is decanted through a filter. The crucible is now half filled with concentrated hydrochloric acid (2 : 1), heated for a few minutes on the water-bath, the contents poured into a basin, the residue again digested with hydrochloric acid, and then the crucible carefully washed out—the whole of the contents being received in the basin. The contents of the latter are heated for 15 minutes on a boiling water-bath, diluted with water, the solution decanted through the same filter as was used previously, the residue digested with concentrated hydrochloric acid, and the sequence of operations repeated three or four times, until only a small quantity of a greyish-white sandy residue, insoluble in dilute acid, is left. The solution (about 300 c.c.) is heated to boiling, treated with ammonia until the greater part of the acid is neutralized—i.e., until the precipitate formed re-dissolves only with difficulty—and then to the boiling solution crystallized ammonium oxalate is added in small quantities at a time, until the precipitation of the rare earth oxalates is complete. After a few hours, the solution is decanted through a filter, and the precipitate washed by decantation and on the filter with a dilute solution of ammonium nitrate. The precipitate is taken up with 15 c.c. to 20 c.c. of nitric acid, heated to boiling, and potassium permanganate solution added till a pink colour persists. The solution is boiled to destroy the excess of permanganate, ammonia is added until the solution is neutral or just faintly acid to litmus, and then 10 c.c. of a 3 per cent. solution of pure hydrogen peroxide added, and the whole heated for a few minutes at from 60° to 80°C. The precipitate of thorium peroxide, coloured a more or less intense orange by cerium peroxide, is filtered off, and washed with a dilute solution of ammonium nitrate. The thorium peroxide is freed from the impurities it contains by re-dissolving in nitric acid and precipitating again with hydrogen peroxide. It is again washed with ammonium nitrate solution, ignited in a platinum crucible, and weighed.

Those among the many friends of Mr. John Bond, the Engineer and Manager of the Southport Gas-Works, who were present at the meeting of the Institution last week, were pleased to be able to congratulate him upon his engagement, which was then announced, to Miss Margaret Hankinson, of Alvechurch.

COMPRESSED-AIR DRILLING OF A LIVE GAS-MAIN

And Attaching a 24-Inch T-Piece, while under Pressure.

IN executing his constructional work, it is the duty of the engineer to do it with economy, combined with dispatch and safety to those employed on the work. To attach a T-piece and drill a large main while under pressure, without loss of gas, and with safety to the men, is at any time an interesting piece of work; and an instance that recently came under our notice—where the work was done with unusual expedition, in connection with the Eastbourne Gas-Works—appealing to us as being especially interesting, we asked Mr. John Hammond, the Resident Engineer and Manager, to allow us to describe and illustrate the operation.

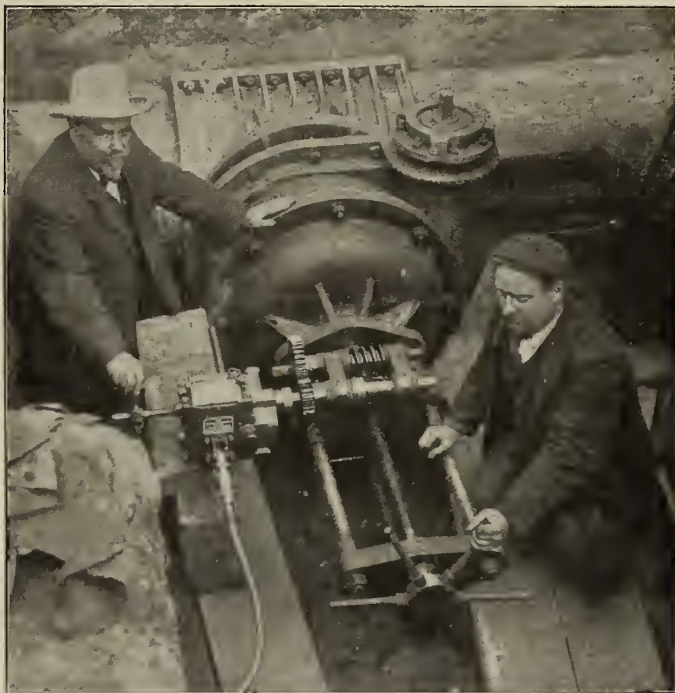


Fig. 1.—The Drill attached to the Valve.

The trunk main concerned is a 24-inch one supplying the town; and upon it a junction of equal diameter was required. A new governor has been put down at the works, through which it was necessary to supply the town; and to connect up to the trunk main a 24-inch T-piece had to be inserted, and the main bored



Fig. 2.—The Valve and Clip being attached to the Trunk Main.

under pressure. This was successfully carried out by the special drilling machine (seen in fig. 1) by Mr. A. O. Ruscoe, of Messrs. Ruscoe and Co., Queen Anne's Chambers, Westminster, S.W.

Here we have illustrated a method whereby this class of work can be mechanically accomplished in about one-third the time ordinarily occupied by the old method of drilling by hand labour, as shown in fig. 2. In carrying out the work, Mr. Hammond introduced a small compressed-air motor (seen in fig. 1), in place of hand labour, to operate the drill.

In fig. 2, it will be observed how the valve and the clip were attached to the trunk main; and in fig. 1 how the drill was attached to the valve. In fig. 3 is shown the core that was extracted by the drill on the completion of the work. The valve was closed before the drill cover was removed; and the whole work was accomplished without even the smell of gas being once noticed in the trench.



Fig. 3.—The Core extracted by the Drill.

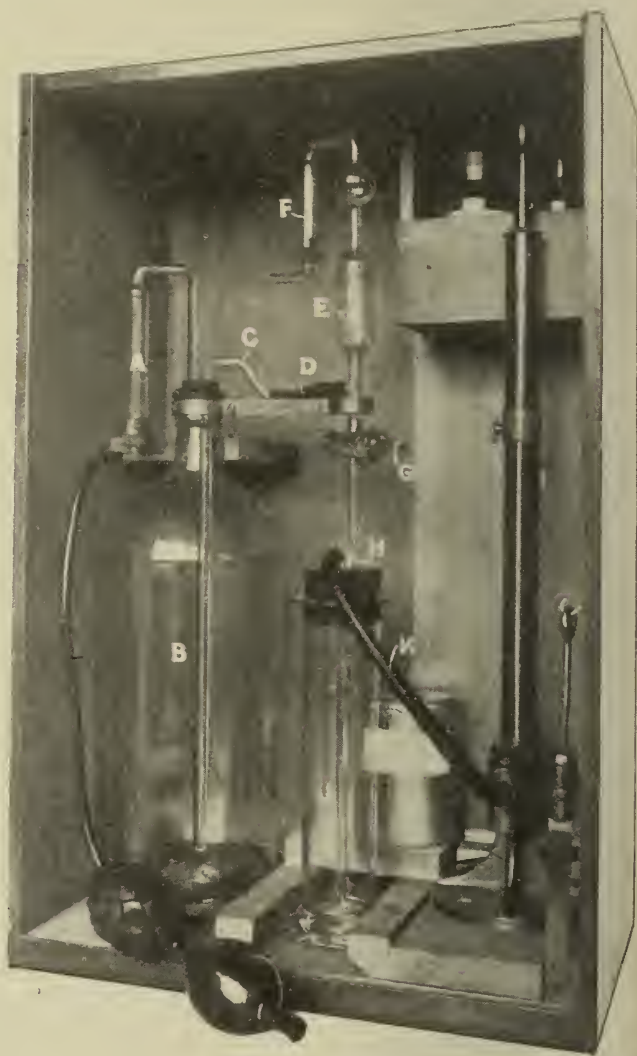
The application of the compressed-air motor for the working of the drill has more than one advantage to recommend it. It considerably shortens the time required for the whole operation; and on the score of safety in going up to a live main, this method of doing the work leaves nothing to be desired, as there is no possibility of escape of gas. This is an important point in these days, when it has become essential to work gas at higher pressures, and with the demand for gas going on throughout the twenty-four hours. There are Compensation Acts in operation now; and in pre-Compensation Act days, gas was distributed at lower pressures. Workmen need greater protection in these times of higher pressures; and when dealing with a live main, compressed-air drilling from this point of view, as well as from all others, is something to be commended. In many gas-works there are air-compressors now installed; and if not a portable air-compressor is always serviceable on a works. This illustration of how this 24-inch connection was made with the 24-inch live main at Eastbourne will, we think, be suggestive to other gas engineers when engaged on similar operations, which demand expedition without loss of gas.

We thank Mr. Hammond for permission to publish these particulars and the photographs.

Brussels International and Universal Exhibition, 1910.—Our readers may remember that a Royal Commission has been appointed to take charge of exhibitions to be held in Brussels from May to October next year, and at Rome and Turin in 1911. H.R.H. the Prince of Wales is President, and the Commission have permanent offices in Queen Anne's Chambers, Westminster, where the superintending official is Mr. U. F. Wintour, the Secretary and Commissioner-General and Director of the Exhibitions Branch of the Board of Trade. We learn from particulars which have been published by the Board that the British Government have secured for its section what is considered to be the most prominent position in the Brussels Exhibition. It amounts to 203,140 square feet, of which 150,540 square feet are in the Industrial Hall and 52,500 square feet in the Machinery Hall. The main gallery running through the British Section is 510 feet long and 98 feet wide; and there are four other parallel galleries 56 feet wide which lend themselves to the formation of attractive courts for the display of different classes of manufactures. The officials of the Royal Commission will undertake the entire handling of the exhibitors' goods within the Exhibition, and provide show-cases, stands, &c., without charge beyond the cost of the space.

ESTIMATION OF CARBON DIOXIDE IN AIR.

THE dangers associated with the presence of a large proportion of carbon dioxide in air have long been recognized by scientifically trained minds; but up to the present day the strictly physiological limit has never been actively enforced. While factory and other regulations have led to the apportioning of so many cubic feet of air-space to an employee in a workshop, the purity or impurity of the air which is being breathed is left almost unconsidered. Of late years, the principle of "change of air per worker," compared with "air space per worker," has been more and more recognized; and one of the factors which have somewhat delayed improvements has been the absence of a quick, but at the same time simple and accurate, method for estimating the carbon dioxide present in the air from any part of a room. It is claimed that the three essential conditions of rapidity, simplicity, and accuracy are satisfied in the "York" air-tester, which has been patented and is being manufactured by Messrs. J. J. Griffin and Sons, Limited, of Kingsway. This, as will be seen from the accompanying illustration, consists of a wash-bottle containing a definite quantity of a reagent which reacts with carbon dioxide, and a pump by means of which a measured volume of air is passed through the reagent in the wash-bottle.



The method of manipulating the tester is as follows: Before making the solution required for the test, the protecting tubes A and F must be filled with soda-lime. These tubes serve to prevent access of atmospheric carbon dioxide to the solution. The solutions required are (a) a strong or stock solution of baryta, from which is made (b) a weak solution used for the test. The operator should take 25 grammes of the pure crystallized barium hydroxide (powdered) and place in a litre bottle; add a litre of distilled water; cork up, and shake well until the crystalline baryta is completely dissolved, or only the merest trace of barium carbonate is left in suspension. It is very important that the rubber stopper should fit tightly, so that no air can gain access to the solution. This bottle contains the laboratory stock solution, and need not be carried about with the apparatus. To prepare the weak solution, it is necessary to first remove the fittings from the bottle marked B, and then place in it 2 litres of distilled water and about 1 c.c. of a solution of phenol-phthalein (containing 1 gramme of phenol-phthalein per 100 c.c. of alcohol). By means of the 5 c.c. graduated pipette, small quantities of the strong baryta solution are run into the 2 litres of water in the bottle B until, after thorough shaking, the solution just assumes a permanent pink tint. The carbon dioxide which was originally

present in the distilled water has now precipitated. As soon as this pink tint is permanent, the operator adds a further 3.3 c.c. of the strong baryta solution, inserts a cork, and shakes thoroughly. He removes the cork, and immediately fits the rubber stoppered protecting tubes and pipette (A, C, E, F), in position.

The solution now requires calibrating against atmospheric air. The apparatus is placed in front of an open window on the windward side of the room, in such a position that a current of fresh air is passing over it. The outlet-tube of the pump is connected to the absorption vessel J by means of the rubber tube K, and the inlet-valve to a long glass tube, the open end of which projects several feet out of the window, and is supported by passing through a ring supplied ready for attachment to the body of the pump. In this way a sample of pure air can be procured. The pump is worked several times up and down, so as to clear the apparatus of any impure air. Then 25 c.c. of the solution in the bottle B (conveniently raised into the pipette by means of the small blower attached at A) are placed in the absorption vessel, and a drop or two of phenol-phthalein solution added through the tube H. The vessel J and its contents are then thoroughly shaken (the tube H being closed by the thumb) for a quarter of a minute, after which one volume of air from the pump is discharged into the vessel, which is again thoroughly shaken for the same length of time. This process is repeated until the solution just becomes colourless, which should occur after 14 strokes of the pump, plus one added for the air present in the vessel at the commencement. As the accompanying table has been drawn up on a basis of 15 strokes for pure air, it is necessary to adjust the strength of the solution until it responds to 15 strokes. If the solution is either too weak or too strong, it is best to start again with another 2 litres of water in the bottle. With a little practice it becomes easy to hit off the correct amount of strong solution required.

Having adjusted the solution to the required strength, the apparatus can be used to test the amount of carbon dioxide in the air of any room. The inlet-tube should be placed at some distance from the operator, at least 3 feet from any person in the room, and a like distance away from any wall. In an ordinary test of a workroom, the sample should be taken at about the breathing level. Reference to the following table will give directly the parts of carbon dioxide per 10,000 present from the number of strokes:—

Strokes or Pump.	Parts CO ₂ per 10,000.	Strokes of Pump.	Parts CO ₂ per 10,000.
15	3.6	7½	8.7
14	4.0	7	9.3
13	4.5	6½	10.1
12	5.0	6	10.9
11	5.6	5½	11.7
10½	5.9	5	12.7
10	6.3	4½	13.8
9½	6.7	4	15.0
9	7.2	3½	16.4
8½	7.7	3	18.0
8	8.2	2½	19.8

A note of the general condition and temperature of the atmosphere, of the air space available, the number of people present, and the presence or absence of gas-jets and open windows, should accompany the result of this test. In testing exceptionally foul air, it will be found that a solution of twice the usual strength gives results almost exactly corresponding with twice the carbon dioxide content quoted in the above table.

ARTIFICIAL LIGHTING AND ULTRA-VIOLET RAYS.

In the "JOURNAL" for March 31, 1908 (p. 829), some particulars were given of investigations by Herren F. Schanz and C. Stockhausen into the effect of artificial lighting on the eyesight. Their conclusions were that eye troubles were due to the ultra-violet rays emitted by light sources, and also to their brilliancy. That the troubles were not imaginary was shown by the fact that Herr Stockhausen himself experienced severe inflammation of the eyes as the result of working with an electrical arc lamp, though he wore spectacles—glass having been considered some protection against injury due to this cause. His experience has not been singular, for many cases of similar character have been cited by others.

Research work was undertaken by both Herren Schanz and Stockhausen for the purpose of ascertaining how far ordinary glass absorbs ultra-violet rays. They found glass lamp shades, spectacles, and the like, afforded very little protection from the powerfully active rays lying between 0.3 to 0.4 μ . They do absorb, it would seem, rays of shorter wave-length than 0.3; but the latter are of less consequence, since they possess very little penetrating power. Although the lens of the human eye is able to protect the retina from the stimulus of ultra-violet rays, it is a question whether strong illumination by these rays, as derived from artificial light, is not responsible for eye-strain and other troubles, and possibly for the initiation or acceleration of cataract. It is certainly noticeable that the eyes tire more quickly in artificial as compared with daylight; and, as was pointed out, diffused daylight is not very rich in ultra-violet rays, since the atmosphere acts as an absorbent. This, it may be remarked parenthetically, has been confirmed by various authorities.

Herren Schanz and Stockhausen considered it was advisable to

employ some species of glass which would absorb the objectionable rays from artificial light sources; and they were successful in producing a glass (known as "Euphos") suitable for the purpose. The photographs of the spectra of an electric arc light, variously shaded by clear and opal globe, by red "observation glass," and by "Euphos" glass, indicated remarkable differences. Whereas with clear and opal glass very imperfect absorption (varying in favour of the opal) was shown, with red "observation glass" a considerable reduction took place, and with "Euphos" practically no ultra-violet rays would appear to be transmitted; while the visible spectrum was not affected by more than about 3 per cent. The same phenomena are indicated by the photographed spectra of Nernst and metallic filament lamps. The above particulars were embodied in a paper read before the Verband Deutscher Elektrotechniker last June; and in the discussion which followed, corroboration was afforded as to the bad effects of severe exposure to ultra-violet rays. The suggestion was made, however, by one or two members that in ordinary circumstances results were not serious—one speaker (Herr Haagn) considering that the eye, accustomed to daylight and its ultra-violet rays for long ages, could not be very easily injured. Herr Stockhausen's obvious reply was that, although sunlight contained ultra-violet rays, very little of them reached the eye in the case of diffused and reflected daylight by which ordinary operations were carried out.

The work of Herren Schanz and Stockhausen has been here further referred to, and more fully discussed, in view of the fact that Dr. Voegelé has, in the "Elektrotechnische Zeitschrift," somewhat traversed the ground taken by them. This gentleman admits that serious injury to the eye may be caused by the ultra-violet rays as in the mercury quartz lamp; but, while he acknowledges it is also caused by lamps of great intrinsic brilliancy, he is doubtful whether it is solely due to the ultra-violet element. He therefore questions the necessity of using special glass for artificial lights generally, since the eye has been gradually developed and adapted to natural light, which contains the rays objected to. Dr. Voegelé, however, proceeded to investigate the relative strength of the rays in artificial and daylight. To this end he prepared two similar surfaces illuminated respectively by daylight and by the artificial light under test, until the brightness of both appeared to the eye equal. A photographic plate was then introduced, and a negative of the bright image obtained—by this means getting a comparison of the chemically active ultra-violet intensity rather than the brightness of the two surfaces of light. The plates were developed under the same conditions; the exposure and strength of the developer being so selected that the blackness of the negative could be regarded as roughly proportionate to the intensity. A quartz lens which transmits ultra-violet light was used to produce the image. Provision was also made for the insertion of a piece of clear glass, 2 mm. thick, so as to cover the upper half of both patches of light. A solution of nitrosodimethyl aniline was used for the purpose of absorbing light of wave lengths lying between 0.5 and 0.37 μ , but of transmitting light from the H and K lines as far as about 0.2 μ .

Dr. Voegelé obtained negative photographs of daylight and of artificial lights such as the Nernst, miniature arc, carbon, and metallic filament lamps, and the incandescent gas light; and these appeared to indicate that for a given physiological brightness a surface illuminated by diffused daylight was richer in ultra-violet rays than those by the artificial illuminants referred to. He concluded therefore that in the case of artificial light sources, so far as illuminated surfaces are concerned, the eye, under conditions of equal brightness, will be subject to less ultra-violet energy than in the case of daylight. It is acknowledged, however, that injury may possibly arise from ultra-violet rays if the eye looks straight at a brilliant, unshaded light; but where direct light is screened and natural daylight conditions are imitated there is no reason to fear injury from reflected ultra-violet light.

So far as direct light is concerned, Dr. Voegelé obtained spectro-photographs of natural and artificial light sources; and these indicated that the spectrum of direct sunlight extended into the ultra violet further than that of any of the artificial lights. The doctor thinks it possible that where eye-fatigue is experienced it is due rather to want of uniformity in the illumination, or, in the case of the flame arc, by reason of contrast—the background being relatively black—and that in the case of artificial illuminants generally special protective glasses were unnecessary.

The substance of the above appeared in the pages of our American contemporary "The Illuminating Engineer," and recently, through the correspondence pages of that magazine, Herren Schanz and Stockhausen, followed by Dr. Voegelé, have further discussed the matter. We take the liberty of quoting some of the points advanced. The first-mentioned gentlemen remark that the injury done to the eyes by ultra-violet light is shown by the existence of such a trouble as electrical ophthalmia; and they further quote the evidence recently given by Professor Birch-Hirschfeld. The facts are instanced that, under ordinary conditions, the ultra-violet rays in daylight can produce irritation, and in some cases eruptions of the skin; and they adduce cases of "glacier burning" in mountainous districts, "snow blindness," and "red vision," ascribed to the reflection of ultra-violet radiation from the snow in polar regions.

Daylight ultra-violet rays are variable, and daylight illumination is of a diffused character from which almost all the ultra-violet light had been eliminated by successive reflection. Where daylight is strong, protection is sought by headgear to screen the eyes, and by other methods. The writers point out that corresponding

protection from direct rays of artificial lights is usually wanting; and this distinction had not been sufficiently appreciated by Dr. Voegel. Again, since the ratio of ultra-violet to the visible energy in daylight admittedly varies with climatic conditions, it is contended that an attempt to use so variable a source of comparison in a rigid physical proof is unsatisfactory. Herren Schanz and Stockhausen remark that, according to Dr. Voegel, the solution of nitrosodimethyl aniline, employed with the object of eliminating the visible rays, absorbs rays between 0.5μ and 0.37μ , and yet allows those between the H and K lines and 0.2μ to pass unchecked. Yet the H line corresponds with a wave-length 0.4μ , and the K with 0.397μ . The visible spectrum is stated to end at 0.397μ . By using the suggested solution, Dr. Voegel cuts out an intense ultra-violet band occurring in the spectra of the arc light, and of much greater consequence than the simultaneously absorbed ultra-violet region of the daylight spectrum.

Dealing with Dr. Voegel's conclusion that the spectrum of sunlight extends further into the ultra-violet than the spectrum of artificial illuminants, it is remarked that Cornu failed to detect wave-lengths further than 0.295μ , while Rowland placed the limit at 0.300μ . On the other hand, light of wave-lengths as small as 0.2μ have been proved to exist in the arc light spectrum. Even if artificial illuminants were invariably surrounded with a glass envelope, ultra-violet rays of 0.3 to 0.4μ would be allowed to pass unhindered; only those below 0.3μ being, in general, absorbed by glass of the ordinary variety.

To this interesting contribution, reply was made in the March number of the "Illuminating Engineer." Dr. Voegel does not dispute the existence of eye troubles and of inflammation caused by close proximity to arc lights, but thinks such exceptional cases should be left out of consideration. He contested the recommendation that every arc, glow, or incandescent gas-lamp should be shaded with "Euphos" glass. Referring to the contention that daylight as the standard was too variable, he remarks that his experiments were carried out in Hamburg on successive days, about ten a.m., in July, and under a cloudless sky; and the variation could not be very great. He admits, as had been suggested, that optical intensity and photo-chemical intensity are different factors; but the degree of ultra-violet radiation in the two illuminants could only be compared by observations carried out at equal optical brightness. Dr. Voegel combats the suggestion that his solution cut off the intense ultra-violet band in the arc light spectrum; and he describes an experiment which led to the conclusion that, for a given photo-chemical intensity of the total radiation from sunlight and the arc lamp, the rays between 0.3 and 0.366μ have a greater relative effect in the former case than in the latter. It is then pointed out that wave-lengths as short as 0.2 existing in arc light need not be considered, since these very short waves are absorbed by the encircling glass globe. Dr. Voegel explains that his experiments were not purely undertaken for the purpose of disproving the contentions advanced; but he regrets that Herren Schanz and Stockhausen should have published recommendations which, on a still undecided question, may cause anxiety to the general public.

The whole of the discussion is very interesting, particularly when read in conjunction with Dr. Nichols's recent paper contributed to the Illuminating Engineering Society (see "JOURNAL" for Sept. 22, 1908, p. 790), in which the consideration of daylight (with the atmospheric absorption effect) and also of artificial light sources is dealt with in considerable detail.

CORROSION OF OIL-TANKS.

Of recent years, much attention has been given by gas and water engineers to the electrolytic corrosion of iron, owing to the injury done to gas and water mains by stray electric currents. In these cases, the electric current causing electrolysis reaches the body damaged from without; but attention has recently been drawn to corrosion of iron structures due doubtless to electrolysis, but for which no current from without was responsible. Three such cases have been described in a paper by Mr. Knudson at a recent meeting of the American Electro-Chemical Society, and reported in Vol. XIV. of their "Transactions," from which the following abstract has been made.

The corrosion took place in oil-storage tanks, two of them being in gas-works and one in an oil-works. The two gas-works tanks were 35 feet in diameter and 16 feet high, made of riveted sheet steel plates, 11 inch by 5 inch and $\frac{1}{4}$ inch to $\frac{3}{8}$ inch thick, having a pipe 6 inches from the bottom serving both as inlet and outlet. The tanks were enclosed in a concrete wall, and had concrete foundations. As they were leaking, the oil was drawn off, and a sediment resembling soft soap removed, when the bottoms were found to be badly pitted. Examination showed that the pitting started inside the tank, and tapered downwards, causing holes as large, in some cases, as $\frac{1}{4}$ to 1 inch in diameter. In both tanks, the pitting was confined to the same areas, following the line of intake and spreading out at the opposite sides. Samples of water from the bottom of the tanks gave on analysis 1.69 per cent. of mineral residue consisting chiefly of sodium salt. In one tank, oil had been standing about a year; in the other, slightly longer. As neither exterior corrosion nor any current entering

the tanks could be detected, the corrosion was not to be attributed to stray currents, though such currents were known to pass through the yard. The corrosion in the tank at the Standard Oil-Works was similar, but so extensive that the tank had to be rebottomed. It is noteworthy that the sides of both of these tanks showed no signs of corrosion.

The cause of corrosion suggested by Mr. Knudson is as follows: During the process of refining, the crude oil is treated first with sulphuric acid and washed with water, and then with caustic soda; being again washed to remove all traces of it. Should either of these washings be imperfect, traces of acid or alkali may remain, as shown by the analysis given above. In addition, sea water could easily find its way into the oil during shipment, as well as rain water during transit to the works. These, added to the soda, would form, on standing, a layer of an electrolytic liquid upon the bottom of the tank. Potential differences, caused by the impurities or uneven composition of the steel, would be set up; forming a series of galvanic couples, which would continue in action, causing eventually holes in the steel.

Attention has recently been drawn to the influence of surface abrasion as a factor in corrosion—a cut or scratch seemingly serving as a nucleus for corrosion; and in these particular cases it was noticed that the rivet-heads, which would be easily abraded during riveting, suffered severely. A suggested remedy was the use of a bichromate solution, which has been recommended as a protector of iron by Dr. Cushman. It has also been suggested to cover the bottom of such tanks with a layer of cement; but it is doubtful whether this would be sufficiently impervious to the electrolyte.

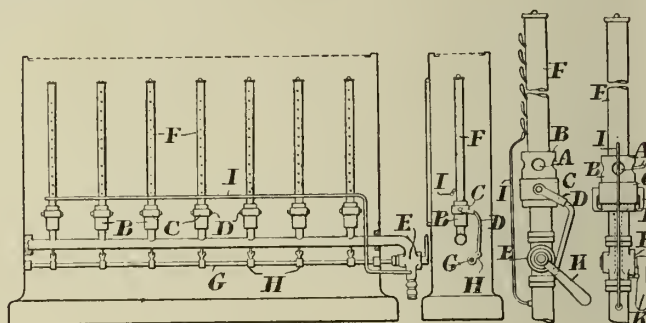
REGISTER OF PATENTS.

Controlling Gas-Burners for Stoves.

KOSCH, C. T. A. & O., of Budapest, Hungary.

No. 11,360; May 25, 1908.

The gas-stove constructed according to this invention consists of vertical burner-tubes closed at their upper ends and having along their cylindrical surface a series of small burner openings—each tube being provided in the proximity of the lowermost burner openings with a lighting jet.



Kosch's Stove-Burner Controller.

The air supply holes of each bunsen burner are formed in a tubular part B, on which is mounted a sliding ring C. To the ring is pivoted a fork D, connected to the gas-supply cock E in such a manner that, in closing the cock, the ring is slid up over the holes, and closes them so that air is no longer allowed to enter the burner. By this means the formation of an explosive mixture in the burner-tube F is prevented, and the lighted gas-jets will be extinguished without any noise. In opening the cock the ring is moved down again by the fork, so as to uncover the holes and allow the burner to operate like a bunsen.

In the main construction shown, a shaft G is mounted in the stove casing and connected directly to the plug of the cock so that it is rotated by the rotation of the plug. At each burner there is fixed on the shaft a lever H connected with the lower end of the fork D. The stove is shown with the gas supply turned off; but, by turning on the cock E, the shaft G is correspondingly rotated, and the levers H draw down the forks D, and by means of these the rings C, so as to cause the latter to uncover the air supply holes of the burners. The burner-tubes are arranged vertically, so that the lighting jet I need be provided only at the bottom hole of the burner. On lighting the gas at this hole, the whole of the gas-jets of the burner light automatically.

In the modified form shown as applied to a single burner, the fork D is connected to the handle K of the cock.

Inverted Incandescent Gas-Burner.

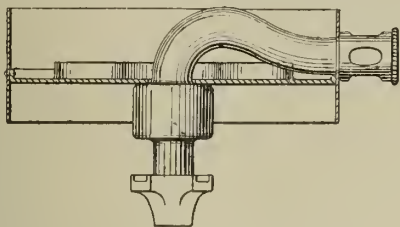
FRANCIS, A. S., of Farringdon Road, E.C.

No. 11,635; May 28, 1908.

This invention relates to inverted burners of the bent-tube type, with the object of producing a burner having an improved appearance and so arranged as to hide the unsightly bent-tube, to keep the greater portion of the bunsen tube cool, and to improve the mixture prior to its reaching the tip of the burner.

In the employment of a bent-tube burner in connection with a globe ring of standard size, the patentee points out, several difficulties present themselves. Firstly, if the horizontal limb of the burner be straight, and it is desired for the vertical limb to depend centrally of the ring,

it is necessary to prolong the horizontal limb beyond the globe ring in order to obtain the requisite length of mixing-tube. Therefore, with such a construction, the nipple chamber would stand out from the globe ring and become unsightly. It has been heretofore proposed to surround such a burner with a deep globe ring; to make the burners with an upward loop in their horizontal limb; and to provide a perforated diaphragm on the globe ring the imperforate portion of which was arranged below the bent burner-tube to protect it.



Francis's Bent-Tube Inverted Burner.

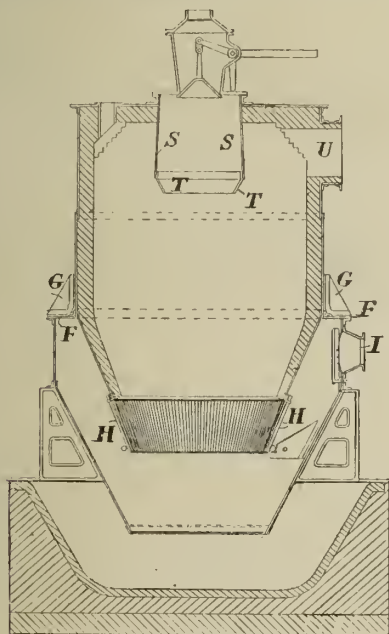
The present invention, however, consists in masking a bent-tube burner, having its horizontal member looped or sinuous in order to bring the nipple chamber close up to the globe ring, by means of a globe ring (as shown) of such a depth as to mask the bent and looped part of the burner, which is protected by means of a diaphragm arranged in the ring. Subsidiary features of the invention consist in arranging a known form of secondary mixing-chamber just beneath the diaphragm of such a burner, and in providing a particular formation of a known type of air regulating sleeve to the nipple chamber.

Gas-Producers.

BONE, W. A., of Leeds University; and WHEELER, R. V., of Altofts, near Normanton.

No. 17,103; Aug. 14, 1908.

This invention relates to the construction of gas-producers in which a mixture of heated air and steam is passed through incandescent fuel—specially adapted for the production of a gas relatively rich in carbon monoxide and low in the proportion of hydrogen.



Bone and Wheeler's Gas-Producer.

In the vertical section of the producer shown, the upper portion of the outer shell is cylindrical and the lower portion conical. The height of the cylindrical portion is half, or thereabouts, that of the conical portion. The inner shell is also formed of an upper cylindrical portion and a lower conical portion. The height of this cylindrical portion, however, is two-and-a-half times or thereabouts the height of the conical portion. Both portions of the inner shell are lined with fire-brick. The upper end of the cylindrical part of the outer shell is about level with the junction of the cylindrical and conical parts of the inner shell; the space between being closed by an annulus or ring F of metal, on which are mounted plate angle brackets G to assist in carrying the inner shell from the outer shell. The height of the conical portion of the inner shell is somewhat greater than the height of the cylindrical portion of the outer shell; and the bottom of the conical portion carries a grate of fire-bars H arranged in a truncated conical manner. The lower end of the conical portion dips into a water seal. An opening I is formed in the cylindrical portion of the outer shell for the admission of air and steam.

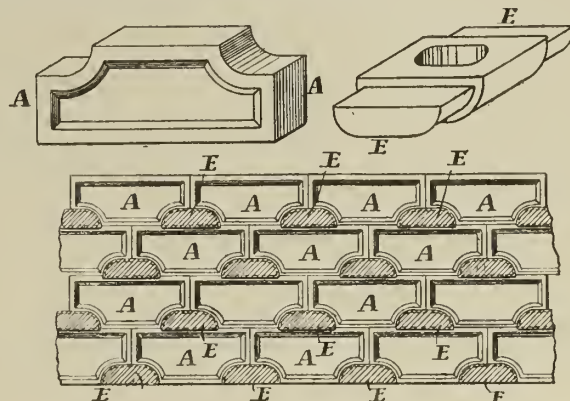
The top of the inner shell is closed by a flat plate roof, lined on the under-side with fire-brick; the corner (at the junction of the side and roof linings) being tapered as shown. The charging bell S is suspended from a large circular opening in the roof, and extends downwards approximately one-third the depth of the upper cylindrical portion, and thus lies wholly (or almost wholly) within the upper part of the inner shell. Further, the bottom end of the bell, contrary to the usual practice, is provided with a shallow converging cone T, so as to heap the load of the producer in the centre instead of up against the sides. The outlet U for the gas generated is in the side of the inner shell immediately below the roof of the producer.

Regenerative Furnace Gas and Air Passages, and Bricks Therefor.

GIBBONS, G. B. A., of Lower Gornal, Stafford, and MASTERS, E., of Harlesden, N.W.

No. 21,643; Oct. 13, 1908.

This invention has reference to the construction of the gas and air passages of regenerative furnaces with bricks of a somewhat similar type to those described in patent No. 16,256 of 1900.



Gibbons and Masters' Bricks for Regenerative Furnaces.

The illustration shows a projected view of one of the improved bricks for forming the side walls of the gas and air passages; a projected view of one of the cross or scotch tiles for use with the bricks; and a longitudinal sectional elevation through a gas-passage formed of the bricks and cross or scotch tiles illustrated.

Instead of the lump on the bricks A being formed with right-angled rebates as in the 1900 patent, they are rounded off so that the sides of the lumps are curved or gradually inclined to the body of the brick; and the rebated end portions of the cross or scotch tiles E which fit into the gaps formed by the recessed parts in the side walls of the gas and air passages between the lumps are shaped to correspond—that is to say, they are rounded or inclined. Again, the bodies of the cross or scotch tiles E are also by preference made of corresponding shape as shown, but so much larger as to leave rebates all round, or partly round, so as to form shoulders which constitute the abutments against the faces of the bricks A forming the side walls. The rebated cross or scotch tiles may also, if desired, be lightened by each having a vertical hole formed in them, and may also, if desired, for the same purpose have a frog impressed on their faces.

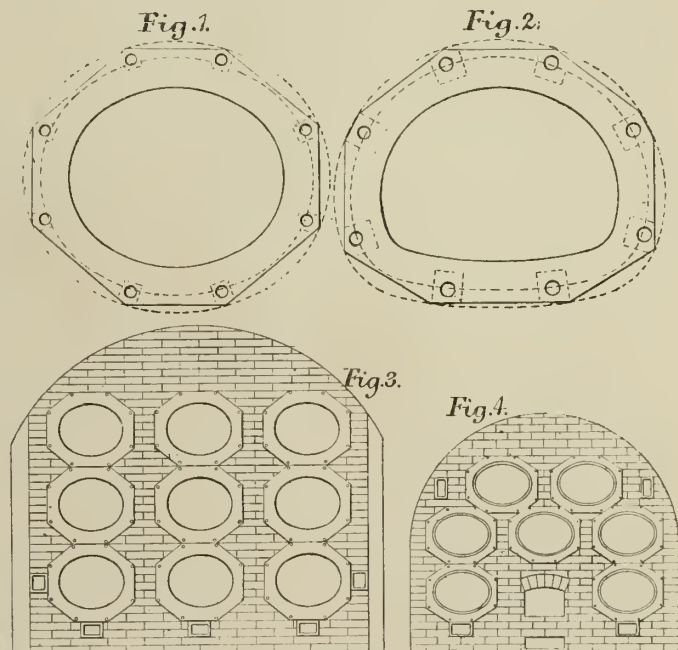
In laying these "improved bricks," it somewhat facilitates the work if the bricks are laid with the lumps at the bottom, as shown—that is, in the reverse position to that noted in the earlier patent—as by so doing when a course of cross or scotch tiles and side bricks have been laid, the top of the course is level for the next course to be laid on it.

Gas-Retorts.

RINDOM, A. J. P., of Copenhagen.

No. 28,349; Dec. 29, 1908. Date claimed under International Convention July 16, 1908.

This invention relates to gas-retorts with heads or flanges of polygonal shape, with the flanges of the retorts formed octagonal, whereby they "are enabled to be placed more closely together, and thus obtain a great saving in space."



Rindom's Gas-Retorts.

In figs. 1 and 2 the usual outline of the retort-heads is shown by the dotted line; while the total width and total height of the flange

becomes smaller when it is given the octagonal shape. In fig. 3—illustrating how a retort-furnace may be built—it is seen that the retort-heads find a firm, direct bearing, partly on the horizontal courses of the end wall, and partly on top of one another. "Besides, the masonry work becomes easier to execute than is usually the case, as the end walls are largely limited by the horizontal and vertical edges of the retort-heads, and not, as usual, by their continuously curved edge. Even those parts of the brickwork adjoining the inclined edges become considerably easier to lay than brickwork adjoining a curved surface. The inclination of the sloping edges is alike throughout, and special blocks with sloping sides may therefore be used for this work. As the retorts rest on the horizontal surface of the retort-heads, all difficulties in getting them adjusted accurately in the proper position disappear, and the same applies to all temporary support during setting. As the retorts may be placed directly on top of one another, the height of the furnace is smaller than usual."

In fig. 4 is shown a retort-furnace illustrating how the retorts may be supported one on top of another, with the sloping edges of their heads in contact. "Especially in this design of furnace the saving of space is evident."

Quenching and Conveying Coke.

RIES, HANS, of Munich.

No. 3677; Feb. 15, 1909.

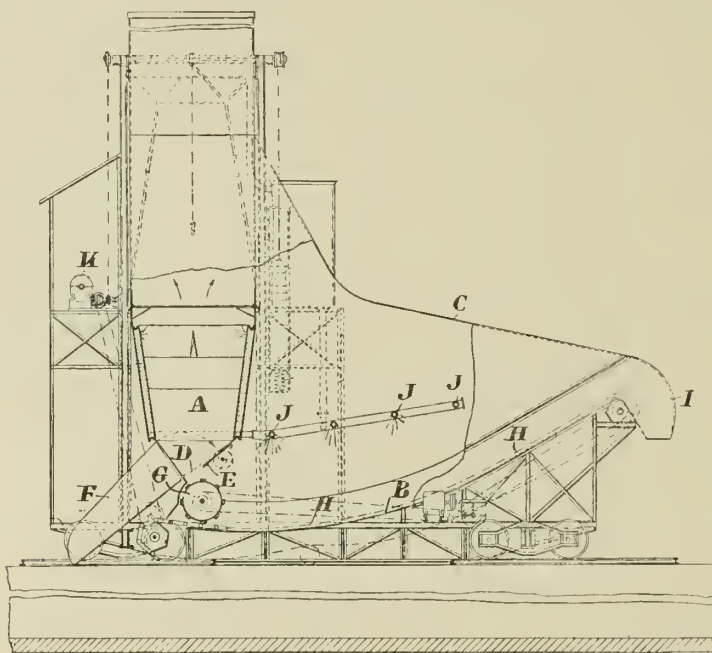
This invention relates to apparatus for quenching and conveying coke of the type wherein incandescent coke is discharged from the retort into a trough mounted on a traveller carrying mechanism for opening and closing the retort doors, and sprayers for the incandescent

coke, which is subsequently discharged into the coke pit. The object is to provide mechanism for regulating the discharge of the partly-quenched coke from the trough, and for spreading the coke before it enters the quenching trough and as it passes thence into a quenching channel.

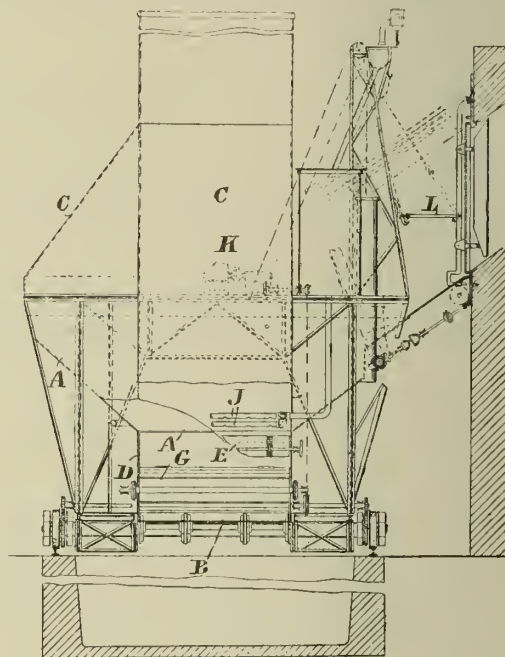
The frame of the traveller is supported (as shown) by bogies having wheels arranged to travel over the pit on rails. Upon the traveller is a trough A, in which the coke is partially quenched, and a channel B in which the quenching of the coke is completed as hereafter described. A shell or casing C is provided on the sides and on the top of the traveller; and the steam formed in the trough when quenching the coke escapes through the funnel above.

The width of the trough A corresponds to that of the retort, and is of rectangular shape, open at the top, and having hollow side walls adapted to contain water. The bottom of the trough is closed partly by a pivoted plate D, and partly by a slide E provided with a rack with which meshes a pinion operated by a hand-wheel to move the slide up or down and regulate the size of the opening left between the plate D and the lower edge of the slide E. By swinging the plate to the right (as indicated by dotted lines), the coke, instead of passing out from the quenching trough to the channel B, may be discharged into a shoot F, and thus reach the pit without further quenching. As a rule, however, the coke passes from the quenching trough to a distributing drum G, which extends the full width of the channel B, and is provided with projecting bars which feed the coke forwards. From the drum the coke passes to the conveyor H, which carries it upward along the inclined channel B, and finally discharges it into the pit through the outlet I.

The frame is provided with supports carrying a reservoir adapted to



Ries's Coke Quencher and Conveyor.



APPLICATIONS FOR LETTERS PATENT.

- 13,297.—WILLOUGHBY, S., and CHAPMAN, J. M., "Dealing with the exhaust gases from internal combustion engines." June 7.
- 13,326.—COMINGS, W. R., "Packing mantles." June 7.
- 13,350.—BLAKE, E. W., "Automatically turning on and off the lights of gas-burners." June 8.
- 13,408.—VERSEN, B., "Gas furnaces." June 8.
- 13,425.—DUKE, J. F., "Automatically lighting gas." June 8.
- 13,428.—MASTERS, E., and HANSFORD, J., "Charging and discharging gas-retorts." June 8.
- 13,435.—SMITH, A., "Filling receptacles from a hopper." June 8.
- 13,491.—HARPER, H., "Pendants and brackets." June 9.
- 13,538.—OGDEN, J. E. L., "Valves or cocks." June 9.
- 13,540.—TUCKETT, F. S., "Tipping coal waggons." June 9.
- 13,549.—TULLY, C. B., "Carburetted gas." June 9.
- 13,593.—HARDY, H., "Indicating and regulating the temperature of gas appliances." June 10.
- 13,602.—WILLIAMS, J. L. H., "Power and gravity conveyors." June 10.
- 13,604.—SIMMONDS, H., "Manufacture of gas." June 10.
- 13,654.—POTTER, W. G., "Water engines." June 10.
- 13,673.—CHCINSKI, A. F., "Water-meters." June 10.
- 13,712.—FOX, H. L., "High pressure oil-gas apparatus." June 11.
- 13,722.—ZIMMER, G. F., and JOHNSON, A., "Combined revolving and reciprocating sifting conveyor." June 11.
- 13,730.—CAMPBELL, T. M., "Rollers of gravity conveyors." June 11.
- 13,796.—ZINDLER, A., "Manufacture of gas by the dry distillation of fuel." June 11.
- 13,820.—KAY, W., "Steel-cutting twist drills." June 12.
- 13,840.—PYNEGAR, H., jun., "Screen conveyors." June 12.

receive water from a stationary main with which the reservoir may be brought into register, and connected to a larger reservoir on the platform of the traveller. From the bottom of the reservoir a pipe leads downward, passing through the side wall of the traveller, and then communicating with two pipes connected with spraying pipes J extending above the channel B and adapted to spray water on the coke passing along the channel. The pipes are also connected with the jacketed wall of the quenching trough.

On the side toward the retorts the quenching trough is provided with an incline adapted to register with a shoot secured to each retort; and on the incline is provided a wedge-shaped upright blade or ridge, which serves to divide and distribute the coke as it passes from the furnace to the quenching trough—"thereby increasing the efficiency of the quenching jets." The partially quenched coke then passes out through the opening at the bottom of the trough, either directly to the shoot F or (as is more usual) to the drum G and conveyor H. In the latter case the coke is further quenched by the jets discharged from the pipes J.

The door of the retort is opened and closed by the motor K. The door swings about a pin located at its upper end, and is held in the closed position by a toothed wheel engaging a toothed rack at the lower end of the door. When it is desired to open the door, the rack is first released from the pinion by turning it by means of the worm in a direction contrary to that used in closing the door. The worm is carried by a shaft, which may be rotated by means of a clutch from a shaft carried by the traveller and driven from the motor by gearing and suitable connections.

The door carries a pivoted bracket L, the downward movement of which is limited by a stop, so that normally the bracket extends in a horizontal direction, or approximately so, as shown. The forward end of the bracket is adapted to be engaged by a hook secured to a chain so as to be raised or lowered—preferably guided in a channel. The chain passes over a sprocket, its free end being capable of being connected to the door, which it opens when the chain is wound up. By rotating in the proper direction the shaft carrying the sprocket the hook will be raised—thus pulling the door into the open position indicated by dotted lines. The coke then passes to the quenching trough over the shoot and the inclined plate. The motor K is also employed to propel the traveller.

Gas and Water Appliances, Limited, is the title of a Company registered on the 14th inst., with a capital of £10,000 in £1 shares, for the purpose of acquiring the business of the Khoma Gas-Arc Lamp Company, Limited (in liquidation), as noted in the "JOURNAL" for the 8th inst.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Vertical Retorts.

SIR,—Looking through British-made spectacles at a foreign name-plate, and at the same time reading of the truth being forced into consciences that have lately developed a Continental taste, seems to bring out confessions, covered by a purpose, to avoid such unpalatable proof as is to be read in the report of Mr. J. H. Brown, of Nottingham, to his Committee.

As everyone knows who has had experience with vertical retorts, the "fill and empty" system—in bulk—yields only gas of low illuminating power unless it be for (say) the first forty minutes after the charge has been introduced, when 21 or 22 candle gas is easily obtained.

The continuous system of feeding and withdrawing coke does maintain the higher candle power, producing from 50 to 60 per cent. less tar than the same coal would yield carbonized in horizontal retorts. Where and why this difference exists is to-day, at any rate, not a settled point, even among expert carbonizers.

The long time experience and work carried out at Exeter produced results just as puzzling as they were too convincing to doubt.

The moment the timely withdrawal of coke was stopped, and the charge allowed to rise in height, the illuminating power of the gas commenced to drop, while the amount of tar increased.

Ideal carbonization appears to remain in the zone-length of a retort fed from 2 to 3 feet from the bottom—occupied by hot coke—and on to a height of not more than 8 feet in all, giving also out of this a clearance of at least 1 foot above the charge at the top of the retort.

It may be worth while to give a few practical results in support of the above. Taking three classes of slack coal (from the many operated upon) with continuous feeding in short length carbonization, the following results were obtained:—

Camerton slack for 9½ hours averaged	20·18	candles.
South Pelton „ 9½ „ „	20·45	„
Newbury „ 9½ „ „	20·75	„

The make of gas averaged about 11,200 cubic feet per ton.

The above short-contact carbonization, with small-quantity feeding and timely removal of coke formed, using slack coal, was continued through longer periods as follows:—

		Candle Power.	Tar.
Six days Hebburn (slack)	= 13,358 cubic feet per ton	13·80	= None.
„ Newbury („)	= 13,266 „ „	13·60	= „
„ West Levers'n („)	= 13,570 „ „	13·50	= „
„ Camerton („)	= 13,282 „ „	13·60	= „
„ Waldegrave („)	= 13,375 „ „	13·80	= „
„ South Pelton („)	= 13,192 „ „	13·70	= „
„ Radstock („)	= 13,260 „ „	13·64	= „

The above, with other slack coals covering three months' tests of six days each, gave an average of 13,189 cubic feet per ton of 14·56-candle gas with no tar—more at the finish than at the commencement. The same coals carbonized in ordinary horizontal retorts yielded about 10,300 cubic feet per ton of 14·7-candle gas, with, of course, the usual quantity of tar produced.

Whatever else attends the non-decomposition of the hydrocarbons in the gas, or the complete decomposition of the tar, much remains in the rapid evolution of gas and the getting of it away as quickly as possible without subjecting it to long surface-contact with heat that it no longer really requires.

This roasting process is more than a hundred years old; and why it is such a "gum label" on carbonization is now, I am happy to see, being seriously considered and worked upon.

That short-length carbonization, small-quantity charges, with great attention to temperatures—more especially the overhead temperatures—are all conducive to the better distillation of the coal, remains, it would appear, in the analyses of the gas obtained.

The following among many are analyses taken at the commencement and finish of a charge carried out as already described:—

	A.	B.
Carbon dioxide	0·30	—
Oxygen	0·00	—
Unsaturated hydrocarbons	3·06	7·06
Saturated „	60·05	52·29
Carbon monoxide	4·02	4·02
Nitrogen	0·00	—
Hydrogen	32·57	36·63
	100·00	100·00

Personally, I am grateful indeed to the President of the Institution of Gas Engineers, Mr. Thomas Glover, to know by his words that I am at least associated with "the germ of continuous carbonization."

Throwleigh, near Okehampton, June 18, 1909.

T. SETTLE.

The Institution Discussion on Mr. Forshaw's Paper.

SIR,—With regard to the paper read before the Institution of Gas Engineers, entitled "A Comparison between the Illuminating Efficiencies of Carbon Monoxide and Hydrogen when Used in Conjunction with the Incandescent Mantle," by Mr. Arthur Forshaw, M.Sc., I was asked previous to the meeting to prepare a few remarks. However, I was unable to speak on the matter, owing to lack of time. I think, therefore, that the gist of what I intended saying may prove of interest to gas makers from a gas-burner maker's point of view; and so I am enclosing this, hoping you will find space for it.

63, Queen Victoria Street, E.C., June 18, 1909.

C. W. BLAND.

[ENCLOSURE.]

It was generally received among gas-burner makers that gases that are identical in calorific power would give approximately the same illuminating efficiency. It seems, however, pretty clear from the ex-

periments made by Mr. Forshaw that the notions of the past have not the fundamental ground for their support that had been imagined—in view of the fact that, taking two pure gases such as hydrogen and carbon monoxide, having practically the same calorific power, one cannot obtain, however much the air supplies are manipulated, the same illuminating efficiencies from mantles.

Of course, in this matter, as a gas-burner manufacturer, I have to deal with gases of complex constitution, and not with single pure gases. This being so, the point in which (having in view the results of Mr. Forshaw's experiments) I am most interested is how to secure maximum efficiencies with similarly constructed burners under the variation of complexity in the constitution of gases which the gas-maker gives me to deal with. We have fully recognized in constructing our burners that, notwithstanding an approximate relationship in calorific powers in different districts, different constituents of the gas have a large effect on the illuminating efficiency obtained from the same burner; and, naturally, we have ascribed this to the differences brought about by the variation in methods of carbonization, and the use of different proportions of water gas, carburetted and otherwise.

To meet this condition of things, has been the sole reason for the introduction of both the gas regulator and the air regulator. This to an extent proves that, though gas-burner makers have not got so far as to appreciate the points that Mr. Forshaw has now brought before them, they have recognized the necessity for varying the ratios of gas and air in different districts to secure the necessary flame-temperature and flame-volume to properly incandesce and fill the mantles.

But after all is said and done, it seems to me that the lessons to be obtained from the paper were more for the gas-maker than for the gas-burner maker. If the gas-maker would give a gas of constant constitution, gas-burner manufacturers will undertake to produce a burner that will with such gas give a constant efficiency.

Purification in Closed Vessels.

SIR,—Although this desideratum of gas manufacture has not yet been attained fully, it seems to me we are within easy reach of most of the advantages that were originally claimed for such a system of gas purification. In this connection, the following experience on our own works may be of interest.

On the 6th of October last, we charged one of our purifiers with 23½ tons of special oxide of iron. The box was left in use without intermission until the 17th of May of this year. The oxide was then, for the first time since being put in new, taken out and revived. On testing, it showed 47 per cent. of sulphur on the dry basis.

In all, 48,794,000 cubic feet of gas passed through the purifiers, which had, in fact, been doing the bulk of the purifying during five out of the seven months referred to.

I think that my experience is not quite an isolated one; and if this be the case, I hope we may be favoured with an exchange of experiences that cannot fail to be of practical interest to the industry.

T. E. PYE, F.C.S.

Chichester, June 17, 1909.

Sunday Labour Question.

SIR,—I enclose a letter from Sir George Livesey, which I received just before the last circulars to gas managers were sent out (1901). It might be interesting just now, as it is the first meeting of the Institution of Gas Engineers after Sir George's decease.

A well-known engineer would have brought it before this year's meeting; but he was uncertain of being able to attend.

Sir George Livesey is best known perhaps for profit sharing, &c.; but the letter I enclose shows his great interest in the Sunday Labour Question.

7, Carlton Road, Sidcup, June 15, 1909.

PETER STEEL.

[ENCLOSURE.]

Peter Steel, Esq.

Shagbrook, Reigate, Aug. 1, 1901.

My dear Sir,—I shall be willing to bear part of the expense (say £5) of the work [sending out circulars to gas managers as to the Sunday Labour Question] you purpose doing through Mr. Shadbolt.—Yours very truly,

GEORGE LIVESEY.

A Brave Gas Coal Porter.—A coal porter at the Shoreditch Gas-Works, Thomas Jackson, aged 46, of 79, Whiston Street, Haggerston, appeared at the Bethnal Green Coroner's Court a few days ago, displaying on his breast a number of medals, and gave evidence regarding a fatal street accident he had witnessed. A man of reserved manner, he told a Press representative the story of the medals he wore. It appeared that he had saved no fewer than 99 lives. One medal he received from his fellow-workmen, in recognition of the fact that, up to May, 1893, he had rescued seventeen children from drowning in the Regent's Canal. He has been the recipient of seventeen testimonials from the Royal Humane Society.

An Object Lesson in Gas Lighting at Hyde.—The Manager of the Hyde Gas Company (Mr. C. Potts) is showing the residents what gas can do in the way of shop lighting, and is following up his object-lesson by distributing a handbill giving the cost for a week with gas and electricity. The shop is fitted up with 20 "Graetzin" incandescent gas-lamps, the lighting power of which the makers claim to be 120 candles each, equalling a total of 2400-candle power. The number of hours they are lighted during the week is 10. The gas consumed, as registered by the meter, is 1000 cubic feet, which, at 2s. 9d. less 7½ per cent. discount, amounts to about 2s. 6½d., or (say) 3d. per hour for a light of 2400-candle power. Mr. Potts says it would take 48 Tantalum incandescent electric lamps, representing, according to the makers, 50-candle power each, to give an equivalent amount of light; and as these lamps would each consume 85 watts per hour, the quantity of electricity used would be 40·8 units. This, at 3½d. per unit, would cost 11s. 11d., against 2s. 6½d.; being an extra cost of 9s. 4½d., or more than four times the cost of lighting by gas. There are many similar instances in Hyde.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Gas Orders Confirmation Bills (Nos. 1 and 2), Lishurn Urban District Council Bill, Stourbridge and District Water Board Bill.

Bills reported, with amendments: Cardiff Corporation Bill, Pontypool Gas and Water Bill [Lords].

Bills read the third time and passed: Blackwood Gas Bill, Clevedon Water Bill [Lords], Gaslight and Coke Company Bill.

THE GASLIGHT AND COKE COMPANY BILL.

Thrd Reading Passed.

House of Commons.—Thursday, June 17.

On the Order for the third reading of the Gaslight and Coke Company Bill, which, as our readers are aware, has been several times postponed,

Mr. W. THORNE moved that the Bill be read the third time that day three months. He said that when it was before the House two or three weeks ago, he was under the impression that there was a possibility of an agreement being arrived at between the promoters and the West Ham Corporation. It appeared that since that time there had been overtures made on one side and the other; and the result was that they stood in exactly the same position now as when the Bill was before the House on the last occasion. Hon. members who had read the clauses of the Bill would have noticed that it was sought to bring about an amalgamation between the Gaslight and Coke Company and the West Ham Gas Company; and the Bill affected a very large number of consumers both in West Ham and in the Metropolitan area. He thought the consumers supplied by the two Companies numbered something like 600,000. Personally he did not think the Bill was required, because there was absolutely no competition between the Gas Companies in London. There were really only four Companies who supplied the major part of the gas; and each had a separate area assigned to it by Statute. He did not know whether what he was going to mention would have any bearing on the question, but he wished to state that there had been no official sanction given by the stockholders of the West Ham Gas Company to the proposal in the Bill. There was a meeting held some time ago which was declared to be illegal; and a meeting to get the stockholders' sanction would not be held until the 22nd inst. Therefore there was no way of knowing whether or not the promoters were voicing the opinion of the stockholders of the West Ham Company. He was of opinion that the Bill had been practically rushed by the Gaslight and Coke Company, because it was not until Nov. 19, 1908, that a circular was sent out by the Directors or the Secretary of the West Ham Company to the stockholders. In the last paragraph, the Directors said they much regretted that they had not been able to include in the communication the terms of agreement; but they pointed out that the shortness of the time available before giving the necessary notice for the Bill had rendered this impossible. This proved to him, at any rate, that the Bill had been rushed to some extent, without getting the official sanction of the stockholders of the West Ham Company. There was no doubt that there was strong opposition to the Bill in the whole borough of West Ham. In connection with the proposal, a public meeting was held at the Stratford Town Hall towards the end of December; and, in spite of the inclement state of the weather, there was a very large attendance. A resolution was carried unanimously against the proposed amalgamation. When an amalgamation was sought by two or more companies, there were generally assurances given to the general public that they were going to be benefited. He could assure the House that, so far as this Bill was concerned, it benefited no one—whether consumer, ratepayer, or workman. No doubt the promoters of the Bill had silenced the regular opposition by the method that had been adopted. Clause 6 provided that they were going to give to the West Ham stockholders £118 for each £100 of ordinary stock; £125 for each £100 of preference stock; and the 4 per cent. debenture holders were to receive £133 6s. 8d. per £100 of stock. No doubt, therefore, the stockholders of the West Ham Company were receiving some little consideration in the price that was to be paid for their stock. The promoters had sent out a circular to the whole of the shareholders, and also to the members of the House of Commons. It was, no doubt, being sent out with the deliberate intention of frightening the shareholders of the West Ham Company, because it stated that unless the amalgamation was brought about they would have to erect new works at East Ham, at an expenditure of £250,000, which would be unproductive for some years to come. He wished to assert that there was absolutely no need at all for the Company attempting to build new works. He was perfectly certain that if it were possible for the members of the House to pay a visit to the West Ham Gas-Works, they would be able to see that the Company had sufficient ground to erect another retort-house and to extend one of the present houses. In his judgment, they had sufficient capacity at these works to supply for the next 25 years the whole of the consumers comprised in their area. So far as the gasholders were concerned, he would admit that they would have to erect another holder; but this would not cost more than £60,000 at the outside. The promoters had adopted another artful way of buying up the opposition to the Bill. They had promised the London County Council to reduce the price of gas 1d. per 1000 cubic feet; but the reason why the promoters had agreed to do this was because in one of the clauses of the Bill they were going to reduce their illuminating power from 16 to 14 candles, and they would save a very large sum of money by this method. When the South Metropolitan, Commercial, and West Ham Gas Companies applied for authority

to reduce the illuminating power of their gas from 16 to 14 candles, they agreed to reduce the price 2d. Again, they had bought out the opposition from the Lambeth Borough Council, who had instructed their Town Clerk to petition against the Bill unless certain concessions were made. One of the concessions asked for was that the price of gas by this particular Company on the south side of the Thames should be reduced 2d. per 1000 cubic feet. The result was that they had agreed to this. If it were possible for the promoters to reduce the price of the gas 2d. on the south side of the Thames in consequence of lowering the illuminating power from 16 to 14 candles, why was it not possible to supply all the Metropolitan area at this reduction? He supposed they thought they would be making too great a concession if they did so. Then they had bought out the opposition of the East Ham Borough Council by erecting a bridge in a certain part of the borough which had been absolutely essential for some time past. So they had "squared" the shareholders, the London County Council, the Lambeth Borough Council, and the East Ham Borough Council; the only people they had not "squared" being the West Ham Corporation. As a matter of fact, he thought what was asked for by the Corporation was only a very fair and reasonable concession. He did not know whether members of the House recognized what it meant to reduce the illuminating power of gas from 16 to 14 candles. As a matter of fact, if it had not been for the introduction of the incandescent mantle, it was very questionable whether the House or anyone else would have given any company permission to reduce the standard. When they came to lower the illuminating power from 16 to 14 candles, particularly in some of the small tenements where it was impossible for the tenants to supply themselves with incandescent gas-mantles in consequence of the expense, the result would be that a great number of the small consumers who had gas on the penny-in-the-slot system would suffer considerably. He also wished to say that, so far as West Ham was concerned, the consumers were receiving absolutely no consideration at all; they would indeed be "worsened." The standard price of gas at the present time, as far as the Gaslight and Coke Company were concerned, was 3s. 2d.; and the standard of the West Ham Company was 2s. 11d. The selling price of the gas under the Gaslight and Coke Company was 2s. 9d. per 1000 cubic feet; it was 2s. 8d. under the West Ham Gas Company. Therefore this proved to him that when the amalgamation had been brought about the Company could increase the price of gas from 2s. 9d. to 2s. 11d., without interfering with their present dividends. Of course, he knew that this was what was known as the sliding-scale, which regulated the selling price of gas and the dividends paid to the shareholders; and he did not say for a single moment that it would be to the interests of the Company to increase the price. He supposed they did their level-best to keep it down as far as they possibly could. But when Bills of this kind were promoted, when there was an amalgamation sought by two or more companies, it was generally understood that no one was going to be worsted. He wished to point out to members of the House that, so far as the workmen were concerned, those of the West Ham Company would be worsted, because they had in operation a pension scheme by which, after serving the Company for 25 years, they had one-third of their maximum pay. Of course, he would have to admit that the Gaslight and Coke Company had a kind of superannuation scheme, and there was a recognized understanding, which he admitted had become a custom, that when a man had worked for a certain number of years he was pensioned off with a certain amount; but then the men were working on sufferance. They had no guarantee that they were going to receive a pension at all; but the West Ham Company were practically under a statutory obligation to pay the men in accordance with the number of years they had worked. There was no doubt, therefore, the men working for the West Ham Company would be worsted by the Bill. One of the chief clauses was the 30th, under which the promoters agreed to keep open the works at their present capacity; but after ten years there was no guarantee that they were going to keep them open at all. In fact, he knew coal could be carbonized at the Beckton Gas-Works very much more cheaply than at the West Ham works. This was a very serious thing to the people in West Ham. Most of the members of the House knew that the borough was a very poor one; and, in consequence of the large shipyard being cut out from building any of the war vessels now, thousands of men had been thrown out of employment. If the gas-works were shut down, as he believed they would be after ten years, it meant that the bulk of the men would be put upon the scrap heap. A number, no doubt, would be transferred from West Ham to Beckton; but the major part of the men would not be able to find any employment at all. He was aware that if the works were shut down, and a certain number of men were not required, then, by mutual arrangement between the men and the Company, certain compensation would be provided; and if the men were not satisfied, he believed it was set forth in one of the clauses of the Bill that they could appeal to an arbitrator. Most of them knew that for ordinary workmen, who had been receiving weekly wages and keeping themselves from hand to mouth for a number of years, it would be utterly impossible to find the wherewithal to fight a rich company like the Gaslight and Coke Company. Moreover, by the closing of the works their rateable value would be depreciated by 50 per cent.; and this meant that the ratepayers would have to raise a few more thousands of pounds in other directions. The Company were also going to shut down another of their works in the borough; but, of course, the Local Authority had no control over them. At the same time, it meant that a number of men would be thrown out of employment. He trusted the House would not give a third reading to the Bill, because, as he had pointed out, workmen would be affected and the rateable value of the borough would be depreciated. The consumers of West Ham were not going to receive any benefit, nor were the ratepayers or the workmen. In view of the facts he had stated, he could not see why the House should pass a Bill of this kind, which apparently was only in the interests of the shareholders and the Directors of the two Companies concerned. Upon these grounds, he moved the rejection of the Bill.

Mr. P. F. CURRAN, in seconding the amendment, desired at the outset to make it perfectly clear that he and his honourable friend were not taking this line of action out of any spite or hatred towards the Gaslight and Coke Company. He did not know the technical details as to how the proposal in the Bill would apply to West Ham so well as

his friend did. But he had been a resident there for more than twenty years, and had had an official association with Trade Unionists who earned their living in connection with the production of gas. At the town's meeting which was held, there were present representatives of all sections of the citizens—business people, workpeople, and a number of members of the Corporation. Though the gathering was essentially of a mixed character, yet the resolution which was submitted against the adoption of the Bill was passed unanimously. In his judgment, this was a strong argument against the Bill. West Ham was not at present governed by Labour representatives—in the borough they were in a minority; yet business people and other men who were considered to have municipal and political views of a moderate character were as bitter in their opposition to the Bill as any other section of the West Ham population. When they found that the representative people—the consumers and especially the workpeople, even those who were employed in the local gas-works—were unanimously against this proposal, he thought the House would concede that it was an opposition of a kind which ought to carry weight. Why were the people of West Ham opposed to the Bill? Those of them who knew anything of municipal as well as parliamentary affairs were aware that it was not always to the interest of the public in general, and the working-classes in particular, that the big fish should come along and swallow the small fish. Yet this was exactly what was taking place in the case of this particular Bill. It was the matter of a great Company who had a practical monopoly of the supply of gas for a large part of London coming to a small Company who supplied a borough, and making with them terms whereby they might be enabled to rush their Bill through the House with as little opposition as they could possibly manage. He did not think that the House should lend itself to any scheme whereby a great company would have some little advantage over a small one, while it would at the same time take advantage of the public in general. In his judgment, the people of West Ham would very much prefer to see the gas supply in the hands of the Corporation—if not at present, at any rate at some future time. It was because of their desire to see the supply come under municipal control that they were largely opposed to the Gaslight and Coke Company taking over the West Ham Company now. He hoped the members who represented various interests in the House would take into consideration the all-important point that it was not only a working-class and a consumers' opposition, but that the commercial people in the whole of West Ham were as much against the Bill as the men in the gas-works. He would undertake to say that not one member of the House had been approached by a representative of the West Ham Company, or by an authorized agent of the Company, to support the third reading of the Bill; and he submitted that the legislative powers conferred on the House should not be utilized for the purpose of going against the express desire of every section of the community in a particular locality, when it was against a Bill. Under these circumstances, they were deadily opposed to the third reading, not only from the Trade Union or working-class point of view, but also in the interests of local employers and other interests, vested and otherwise, opposed to the Bill.

Sir DANIEL F. GODDARD thought the honourable members who had moved the rejection of the Bill had, probably quite unintentionally, misled the House as to its character. In making the statement that there was a "rushing" of the Bill through the House, they altogether forgot the fact that it had been submitted to a very critical examination, and that the Corporation of West Ham had ample opportunity of stating their case before the Committee who considered the Bill. He thought this very materially altered the position. The honourable member who moved the rejection of the Bill seemed to have a complaint that the other parties had been wise enough to settle while the West Ham Corporation were not so wise. The Corporation had, he was told, every opportunity of settling before the Bill went into Committee, but they absolutely refused to come to terms; and surely it was a little late, at this stage of the proceedings, to ask the House to reject the Bill on its third reading, because they had not been wise enough to take advantage of the opportunities offered to them.

Mr. THORNE: As a matter of fact, it is the Gaslight and Coke Company who have gone behind what they promised to the West Ham Corporation.

Sir DANIEL GODDARD said he was informed that this was wrong. They were offered terms before the Bill went to the Committee, without prejudice to either side. The terms were rejected; and it would not be fair, in any business transaction, to bring this out and say it was a breach of faith on the part of those who made the offer. A great deal had been said about a public meeting held at West Ham against the Bill. If there was this strong feeling against it, why was it not opposed when it came up for second reading? That was the time, instead of giving the parties all the trouble and expense of going through the course that had been taken. There was no opposition whatever to the second reading; and it was only now, when the whole matter had been most carefully sifted by the Committee, that opposition was offered, and hon. members moved the rejection of the Bill. On behalf of the promoters, he must protest that there was no warranty for the suggestion that the Bill had been "rushed" through the House.

Mr. THORNE: I did not say it had been rushed through the House. I said the Gaslight Company had rushed the Bill.

Sir DANIEL GODDARD said the implication was the same. It had been put off from time to time, and there had really been no rushing. He did not think the hon. member could substantiate that statement in the slightest degree. The hon. member said that no one was advantaged by the Bill. As he (the speaker) understood it, the Gaslight and Coke Company were willing, when they took over these works, to consider all the payments of the workmen of the West Ham Company in regard to their pension scheme, or any other scheme, as if they had been made under the Gaslight and Coke Company. Surely more generous consideration could not have been given to the workmen. He believed the schemes of benefit of the workmen of the Gaslight Company were much more advantageous than those of the West Ham Company. The hon. member had referred to clause 30 of the Bill as one of the objectionable clauses. This clause, however, seemed to him to be one of its greatest commendations. It was a very unusual clause, displaying most unwonted generosity on the part of the pro-

motors of such a scheme as this. It absolutely stated that the Gaslight Company, in taking over the West Ham Company, were willing to give a guarantee that for ten years they would keep the works in substantially the same condition as now, whether the use of gas went down or anything else happened. He was, therefore, rather surprised to hear the statement made by the hon. member, because he would have deemed this to be most generous treatment both of the workmen and of the ratepayers. The hon. member had also ventured into the region of prophecy, which was always somewhat dangerous. He said he had no doubt that when the ten years had expired, the West Ham Gas-Works would be shut up. He (Sir Daniel) did not think that the hon. member had any real reason for this statement. The Gaslight Company had absorbed many other gas undertakings in the Metropolitan area; and he believed that out of all those they had acquired, only two of the works had been entirely closed, though they were taken over without the safeguard contained in clause 30 of this Bill. Therefore he did not think there was much to be said against the Company on the score of clause 30. It was a very generous concession, and to say that the ratepayers obtained no benefit seemed to him a most absurd line of argument. The hon. member also stated that the works could be kept going, and that the ratepayers would have the benefit of their being carried on in their area. He was advised that it was proved distinctly before the Select Committee that this was not so. He was told that the total daily productive power of the West Ham works was 9,100,000 cubic feet, and that the actual average output for the three heaviest consecutive days in the year 1908-9 was 8,091,000 cubic feet; leaving only a margin of 1,000,000 cubic feet, or 13 per cent. When they remembered that the average increase in the gas supplied during the past five years had been 9 per cent., he thought it would be seen that the works could not possibly have continued for more than two years at the outside, and would then have had to be removed.

Mr. THORNE: The Company have sufficient room to build two more retort-houses, which would increase the capacity by 25 per cent.

Sir DANIEL GODDARD said he was dealing only with questions which were thoroughly proved before the Committee. He could not go behind these, and take what the hon. member considered might be done. The probabilities were that the West Ham Company, if not absorbed by the Gaslight Company, would remove their works to East Ham. If they wanted to build modern works, they would do it very much better there. They had bought land there, and had already expended money in the erection of a gasholder upon it; and it was stated before the Committee that they were prepared to lay out a quarter-of-a-million in the erection of new works at East Ham. What would have been the effect on the ratepayers of West Ham if they had done this? The House must see that in this case they would have lost all the rating on the works. So that the ratepayers would distinctly benefit by the proposed transfer, inasmuch as they had a guarantee that the works would be kept in substantially their present condition for ten years to come. Then there was another advantage which he thought had been quite overlooked by those who opposed the Bill. He was told that the London local authorities would benefit to the extent of £8000 per annum in the matter of public lighting—this was equivalent to 2d. per 1000 cubic feet—and that the authorities, including West Ham, whose area the amalgamation would affect, would benefit to the extent of £1300 per annum, or 4½d. per 1000 cubic feet. Thus there was a direct benefit arising to the public in the matter of public lighting, even if there was no immediate benefit in the price of gas. The hon. member made a great deal of the point that the illuminating standard of the gas had been reduced from 16 to 14 candles. He must know quite well that all legislation had gone in the direction of lowering the illuminating power, because the system of lighting had been completely revolutionized by the use of incandescent mantles. When they wanted to get illuminating power from these, it was not the light-giving but the calorific power of the gas that had to be considered; and the Bill contained conditions as to tests for calorific value, which was a far more important thing, under the present conditions of gas lighting, than illuminating power. Therefore it was really making a mountain out of a molehill to talk of this reduction from 16 to 14 candles as an injury to the people concerned. He was very glad to know from the speech of the hon. member for Jarrow (Mr. Curran) that there had been no "lobbying" in connection with the Bill. If there was one thing to be detested, it was the kind of lobbying which the hon. member said had been absent on this occasion; and at this they must all rejoice. He (the speaker) did not think any case had been made out against the third reading of the Bill. The measure had been thoroughly considered by the Select Committee, who, he believed, were unanimous in passing the preamble. They inserted in the Bill certain provisions which had been beneficial, and would be to the advantage of the neighbourhood concerned; and he hoped, on these considerations, the House would agree to read it a third time.

Mr. J. J. MOONEY explained that he rose only on account of the fact that he was a member of the Committee who considered the Bill. If the facts, as the hon. member who moved the rejection of the Bill presented them, had been accurate, he would not have liked to have been a member of the Committee who passed the Bill. Without reflecting on the hon. member in any way, he might say that the facts, as he had presented them to the House, were quite different from those that were presented to the Committee. It was proved to the satisfaction of the Committee that the shareholders of both the Companies had been consulted, and had agreed to the Bill. It was not right to come down to the House and make *ex parte* statements to the effect that the shareholders had not been consulted.

Mr. THORNE: I did not say that. I said they had not got the official sanction.

Mr. MOONEY said he understood him to say that the shareholders did not agree to the Bill. He (the speaker) said that they had agreed. The next statement made was that power had been given to the Company to reduce their candle power, without any benefit accruing to the consumer. Mr. Thorne rather gave the House to understand that West Ham was going to suffer by the diminution of the candle power in its lighting standard; but surely he knew that what had been done was to reduce the illuminating power over the whole area of the Company from 18 to 16 candles. West Ham had a 14-candle power standard, and was, therefore, not in any worse position than before.

It had been proved over and over again to Parliament that the tendency of modern times among gas companies was to reduce the illuminating power, for reasons stated by the hon. member opposite (Sir Daniel Goddard). They were placed in rather a difficulty in Bills of this kind, because it was very easy to come down to the House and make *ex parte* statements in opposition. But the Committee went into all the facts; and in this case they had found them proved to their satisfaction. He was glad to say that this particular Bill was dealt with by a Committee representing every party in the House; and they were absolutely unanimous in the decision they gave. They had it proved to them that the position of the workmen employed by the West Ham Company would not be made worse, but better, under the Bill. It was proved to them that the Gaslight Company had a very good pension scheme; and under the clause put in for the workmen taken over, they would come into this. West Ham was represented in the Committee-room by Counsel; and the Committee tried to see how they could improve the position of affairs in West Ham. As to the fact that the question of unemployment in West Ham was a serious one, they asked West Ham to help them to find a way out of the difficulty. West Ham's representative came before them and made a statement to this effect: "I tell you frankly it will satisfy me if the Company will undertake that, for the next ten years, they will not close the West Ham works, but that they shall be substantially used for the manufacture of gas. If they do this, it will meet my objection. If they do not agree, I object to the Bill *in toto*." The Committee said they were not aware of any direction of this sort having been given to any local authority or any gas company; but they carefully considered the position of West Ham. They went out of their way to insert a clause in the Bill which, in his opinion, had never been put into a Bill of this kind—to safeguard West Ham. He did think, after the Committee had given time, trouble, and attention to a Bill like this, that, having arrived at a decision on the evidence—the facts—it would be a very strong course for the House to take now to reverse the decision on an *ex parte* statement. The House had the power; but he thought they would do well to hesitate. It was proved to them that the reduction of the candle power was a reduction all round. It was proved that the workmen employed by the West Ham Gas Company would not be any worse, but better, off. It was proved to them that at present the West Ham works were running at their utmost capacity, and that, with the increase that had been going on for the past five years, it was only a question of a very short time before a large capital expenditure would be necessary to meet the increased consumption. The Committee came to the conclusion, taking all these considerations into account, that the amalgamation scheme of the Gaslight and Coke Company was one to be recommended. He did think the House would be very ill-advised, after this consideration, if they agreed with the motion of the member for West Ham.

Mr. A. C. MORTON declared that he found that all the Local Authorities concerned in the matter had agreed to the Bill. He was quite aware, and he was very glad, that the Bill applied to something more than merely West Ham. It applied to a very large part of London. It could not be said that the measure was rushed, because the Local Authorities—and he was speaking for a Local Authority, the Corporation of the City of London—appeared before the Committee who had the Bill in hand. They had taken Counsel's opinion and expert advice, and had done everything that they could to sift the matter; and, as he understood it, the Corporation of London, and every other Local Authority concerned, had withdrawn their opposition, because they had obtained the amendments they asked for, as they did in the City of London. He was rather glad than otherwise that the candle power should be reduced. As a matter of fact, with incandescent mantles 14-candle power gas was just as good as 16-candle gas; and as they obtained it for less, that was so much to the good. Although no doubt in years gone by the Gaslight and Coke Company were in rather a sleepy condition, the competition of electric light and other competition had wakened them up to act more for the people than before. He was glad to know that the Company were about to complete, or had completed, a scheme whereby they were going in the future to do what the South Metropolitan Gas Company had done—that was, to share their profits with their workmen. He trusted that they would carry out the scheme as well as the other gas companies had done. He hoped his hon. friend would withdraw his resolution, because, under the circumstances, all the Local Authorities concerned had come to an agreement on the matter, and it was hardly fair to oppose the Company any further.

On the question being put, Mr. Thorne challenged a division, upon which the amendment was rejected by 203 to 43; and the Bill was then read the third time, and passed.

FERMOY GAS PROVISIONAL ORDER.

House of Commons Committee.—Wednesday, June 16.

(Before Mr. MOONEY, Chairman, Mr. GIBB, Mr. BARRAN, and Mr. BRUNNER.)

This is an Order for the purpose of confirming the Provisional Order granted by the Board of Trade under the Gas and Water Works Facilities Act, 1870.

The promoters were represented by Mr. C. C. HUTCHINSON and Mr. W. SZLUMPER; Mr. VESEY KNOX, K.C., appeared for the Fermoyn Urban District Council.

Mr. HUTCHINSON, in opening the case, said the promoters of the Order were gas undertakers in certain districts in the county of Cork, one of which was Fermoyn. The primary object of the Order was to endow the Gas Company with statutory powers. The capital of the Company was fixed at £14,000, of which £8000 were ordinary and £1500 preference shares; and there was additional capital of £5000. Other provisions were the standard price, subject to which the sliding-scale was applicable, and which was 5s. per 1000 cubic feet. The area of supply was 340 acres; and according to the last census the population was about 6200 persons, of whom 320 were consumers. The out-

put was a variable quantity, having been as low as 6½ million cubic feet and as high as 15 millions. If the conditions under which the promoters had had to work had not been adverse, the output would have been very much larger. In 1851, the town of Fermoyn belonged to Sir Robert Abercromby, who approached the Town Commissioners with regard to the provision of a supply of gas. The predecessors of the Council passed a resolution giving his Agents permission to lay down gas-pipes for lighting purposes; and, later on, the Agents were empowered to enter into the contracts necessary for lighting the town, and all the powers given by Act of Parliament were vested in them. Sir Robert provided the land which was necessary for the purpose of constructing the works, under a lease of 999 years. The works were erected and successfully carried on by a small Company. In 1868, the Company passed into the hands of Mr. George Anderson and Mr. R. H. Jones, and subsequently to Mr. George Anderson alone. In 1900, he handed the undertaking over to his son, Mr. Robert Bruce Anderson, as a gift. Prior to this time, things did not work so harmoniously with the Local Authority as in earlier days; and there were little disputes with regard to the payment of accounts. In 1884, the governing body decided that they would do without gas in the streets, and told the Company to remove their pipes and standards. This took time; and the Local Authority set men to work with sledge-bammers to disconnect the pipes by driving the upstanding pipes underground. They were fractured, and serious leakages occurred, and the town was kept in darkness. Payment was asked for the damage which had been done. It took several years to discuss who should pay; but a compromise was effected. Being a non-statutory undertaking, the Company had no authority by which they could lawfully open the roads, and on each occasion it was necessary to apply to the Local Authority. Permission had previously been given; but when some of these little circumstances occurred, the Local Authority refused to permit the Company to have access to their mains under the roads. The Company then endeavoured to get access privately; but the consequence was prosecution after prosecution, and small fines were paid. There was a large school in Fermoyn; and as a consequence of the leakage of gas, the Medical Officer of Health reported that there was danger to the health and safety of the inhabitants and the children. The Company agreed to put the matter right; but the Local Authority refused permission. Then the Company dug down to the pipes; but the representatives of law and order tried to eject them by force. When this failed, they turned a hose on and filled the trench with water. The result was that the lower part of the main became choked with water, and for fourteen months the town was without a gas supply at all. During the whole of this time no complaint was made that the works were not properly managed, and there was no desire expressed by the Local Authority to purchase the works, as they could have done by agreement. There was an explosion in another part of the town due to leakage; and the Company's men were forcibly prevented from effecting the repairs which were absolutely necessary. The gas supply had been withdrawn from the whole town ever since. In 1904, Mr. Anderson formed a Company, and endeavoured to agree with the Local Authority upon the terms of an Order which would give him the necessary statutory powers; but they refused to agree to any Order at all. Dealing with the Council's petition, Counsel said it was news to him that it was the practice of Parliament to fix the capital at a sum equal to the total cash paid by Mr. George Anderson and the capital expenditure the Company could prove. The petitioners contended that the standard price should be 3s. 9d. The principle upon which Parliament acted when a non-statutory company came before them was that, under certain conditions, the local authority should have the right to take the undertaking into their own hands. But, under the circumstances he had related, the conditions were such that this practice ought not to obtain. There had been no complaint against the manner in which the works had been conducted. Under the Public Health Act, the Local Authority could at any time have purchased the undertaking by agreement, had they wished. Instead, they had adopted the course of trying to drive the concern to the point of bankruptcy, and then, at a favourable opportunity, to endeavour to purchase on the present basis, when it was yielding an inadequate profit as a result of their own behaviour.

Mr. R. B. Anderson then gave evidence. He stated that the undertaking was handed to him by his father. When he took possession, he introduced improvements and considerably developed the concern. In 1902, the Local Authority passed a resolution that in future he would have to pay a rent of £60 per annum for the right of opening the roads. However, they made no attempt to insist, by legal proceedings, upon the payment. He had some difficulty with the Council in regard to certain payments, and, ultimately, he had to take proceedings. When the undertaking was incorporated in 1904, he took all the ordinary shares. The structural value of the plant worked out at £1000 per million. The output last year was 11½ million cubic feet, and in the last two years had increased 40 per cent.

Mr. VESEY KNOX at this stage told the Committee that the Council had twice been refused inspection of the Company's books, and asked that they should be allowed to see them before the Committee met on the following day.

Mr. HUTCHINSON said that, from the point of view of these proceedings, it had nothing to do with the matters to be dealt with, and, moreover, the Council were not entitled to see the books. But if the Committee thought his learned friend should see any of them, they would be produced, if possible. The Council had asked for a purchase clause. They wanted to buy the undertaking as cheaply as possible, and it was not fair that they should get information in this way.

Mr. VESEY KNOX: If we can get a reasonable capital, a reasonable standard price, and a reasonable dividend fixed, we would really sooner not buy. Our object is to get cheap gas, and all we want from the books is such information as will show what has been paid by the undertakers, in order to fix the original capital. The books will be examined by an accountant and not by members of the Council.

The Committee decided that Mr. Knox should have the books.

Witness, continuing his evidence, said he put down £10,000 as the purchase price for the entire undertaking. At present, there were 8000 ordinary shares, 1500 preference shares, and £2000 debenture stock. The output had been 15 million cubic feet per annum; the

highest in any one day being 64,000 cubic feet. This could be continued quite easily, representing a make of about 14 or 15 millions per annum. They had paid a dividend of 12 per cent. on the ordinary shares; but, on an average, the dividend had been 7 per cent. When they were before the Board of Trade, the candle power was altered from 12 to 14. Last year, the price charged for gas was 5s. 2½d. per 1000 cubic feet; but on account of the higher price of coal, it rose to 5s. 10d. They asked the Board of Trade to adopt a standard price of 5s. 9d.; but it was altered in the Order to 5s., which he considered to be too low. If his hopes were fulfilled, and they reached a maximum of 15 millions, they would have to come to Parliament again for fresh capital. As a rule Irish gas undertakings required a larger capital expenditure than English ones.

Thursday, June 17.

When the Committee met this morning,

Mr. Anderson continued his evidence. He said it would be impossible to sell gas at 3s. 9d. per 1000 cubic feet, as was suggested in the Council's petition. The Company had frequently tried to come to terms with the Council with regard to the price which should be charged. The total expenditure in respect of the undertaking was £10,000. When, in 1868, the make of gas was 4½ million cubic feet, the undertaking was purchased for £5000. With regard to the information required by the Council, they had given them all and more than they had asked for. The works had not only been maintained in their original condition, but improved.

In cross-examination by Mr. VESEY KNOX, witness said that in 1886, the then Company was wound up compulsorily, and was purchased by his father, lock, stock, and barrel, for £3000. He did not agree that, when the matter was before the Board of Trade, he stated that they spent £4000 of capital between 1889 and 1904. The total expenditure shown on the books was £1700 odd, which included items entered as renewals.

Mr. HUTCHINSON: And the whole of this was covered by sums drawn from the profits of the undertaking?

Witness: Not necessarily. I do not know how you associate the two sums of money. We took money from our private accounts and placed it to capital when necessary. When it was not necessary, we took sums out. He went on to say that the profits of the undertaking had been as follows: In the year 1889, profit, £185; 1890, profit, £67; 1891, loss £61; 1892, loss £62; 1893, profit £62; 1894, profit £138; 1895, profit £127; 1896, profit £62; 1897, profit £44; 1898, profit £47; 1899, profit £99; 1900, profit £85; 1901, profit £72; 1902, profit £1; 1903, profit £189; and 1904, profit £571. These figures would be in addition to 5 per cent. on the investment of £3000, and improved from year to year as the capital was expended. Immediately after 1904, he began to get the benefit of the capital. It was in that year that he sold the business to a Company, which meant that he was selling it to himself—he was the Company. The purchase price was fixed at £10,000, including everything. He did not admit that £3475 had been put down as goodwill. The whole of the expenditure since the formation of the Company had been met from sources other than the £3000 ordinary capital. The Company was started with £8000 ordinary capital and £2000 debentures, all of which were paid over to him. As against this, there were certain outstanding debts, which he valued at £1500; so that he got £8500 for the structural debts. Anything that had been spent since was accounted for by the issue of preference shares or the diminution of working capital, or overdrafts from the bank. In 1905, the sale of gas was something over 13 million cubic feet, of which more than 6 millions were supplied to the War Department, who were supplied at 3s. 1d. The Company had now lost this contract; but they found it only paid expenses with a little profit. For a works making 10 million cubic feet, the cost would be 3s. 5d. The leakage had been very large; and they had been selling only 8000 feet per ton. The total supply to the town had been 6½ millions.

Mr. VESEY KNOX: You are asking a capital of £11,500 on a sale of 6 millions?

Witness: On a reduced sale of 6 millions.

And that is £1750 per million feet?—Yes.

I put it to you that there is only one statutory company in the whole of Ireland which has a capital of over £1000 per million feet of gas sold, with the exception of Queenstown, which is your own?—There are hardly any statutory undertakings in Ireland which can be compared with Fermoy.

Replying to further questions, witness said he did not press upon the Urban District Council the desirability of their buying the undertaking at an arbitration price on five or six different occasions. The object of this fight was to get a good price. There was considerable discussion as to the price of gas and the capital; but the consumers were not dissatisfied with the price charged.

In re-examination by Mr. SZLUMPER, witness said it would be impossible for the Company to sell gas at the price suggested by the Council. He had charged nothing for engineering expenses; his profit came out of the dividends of the undertaking. The most he had drawn out of the undertaking had been 5 per cent. upon the capital. As to output, he said the works were capable of producing 15 million cubic feet; but the largest amount supplied in any one year in the town (apart from the barracks) was 7½ millions.

Mr. H. E. Jones was then called. He said the works could put out over 14 million feet, and they had actually produced and delivered over 11 millions. He regarded £11,000 of capital as not exorbitant. Slot-meter installations required a different sort of capital altogether. There should be a minimum of £300 and a maximum of £500. Of the 320 consumers at Fermoy, 138 were slot consumers. He valued the works at £10,254. Taking into account all the justifiable capital expenditure, the situation of the works, and the cost of production, 5s. per 1000 cubic feet was a moderate price to charge.

Mr. VESEY KNOX: Can you tell me of any case where a promoter, having purchased works from a liquidator at a bargain price, has been allowed to take the goodwill value as part of the original capital?

Witness: No.

In further reply to Mr. VESEY KNOX, witness said that his structural valuation was what it would cost to provide these works in good con-

dition; and undoubtedly the Company's works were in good condition. He did not think that, after Mr. Anderson had put all his skill and energy into the works, they should be handed over to the town. He was charging nothing for his skill and services. During the last year of the Company's working, the Council were having gas for public lighting at 5s. per 1000 feet.

Mr. Geo. W. Anderson, the Engineer of the Fermoy Gas-Works, gave his valuation of the works as £9898, after making a deduction for depreciation. In order to extend the works so as to be capable of dealing with 50 million cubic feet of gas, it would be necessary to spend £300, together with an allowance for extensions of mains.

Evidence was then tendered on the petition of the District Council.

Mr. E. H. Stevenson was called. He said that the land on which a value of £500 had been placed was worth very little. A small amount of capital expenditure would be required for some years to come. The buildings were substantial; but one of the gasholders was in a bad state. Generally, however, the works were in good condition. His valuation of the works was about £8000; and his valuation of the work which had been done since 1889 was £3000 odd. The additional capital asked for was excessive. The proposed original capital was £11,500; whereas the sale of gas in the town itself was 6½ million cubic feet, which was about £1750 per million. This was not a fair figure for capital expenditure in the town, although, of course, some of the capital had been expended upon the War Department. The way in which the standard price had been fixed had always been, upon opposition, with reference to what the gas could be supplied at. It was sometimes an excuse, in the small towns of Ireland, that coal was dearer than in England; but that was not true when speaking of places which were near a railway. A fair standard price would be 4s. per 1000 cubic feet; 5s. was very excessive. The working expenses and maintenance ought not to amount to more than 1s. 6d. per 1000 cubic feet. It was the practice of Parliament to put in a purchase clause where a non-statutory company was coming for statutory power. If the standard price were lower, it would result in an immediate profit to the undertaking. He disagreed with Mr. Jones, and held that the works were badly managed.

Friday, June 18.

Mr. Stevenson, in further cross-examination this morning by Mr. SZLUMPER, said that the Company should sell 6½ million cubic feet of gas for £650; and they ought to make 10,000 cubic feet of gas per ton of Durham coal. It was well known that between 11,000 and 12,000 cubic feet had been produced from Durham coal of 14 or 15 candles, and using the No. 2 "Metropolitan" burner. His valuation of the works at Fermoy was approximately £8000; but he had allowed nothing for depreciation. Mr. Jones's valuation was, in his opinion, £2000 too high. The capital asked for was excessive—£4000 would be ample. There were people who might be served with gas; but when he visited the place, he was told the gas was bad. If the Council obtained what they asked for, they did not desire a purchase clause. But if the Committee considered the prices charged to be fair, they would not be satisfied. They would ask for a purchase clause.

In re-examination by Mr. VESEY KNOX, witness said there ought to be more gas sold in Fermoy; but it would not reach the amount stated by the promoters. The Board of Trade returns indicated that in small towns in Ireland gas was enormously dear. With proper management gas could be sold in Fermoy for 4s. per 1000 cubic feet, and could be made for less than 2s. 6d. The Local Authority did not wish to burden the rates with the risk of the undertaking if they could get gas at 4s.

Mr. C. F. Spencer, an accountant, said the total capital expenditure from 1889 to 1904 amounted to £1759, including certain items for renewals which ought not to have been charged to capital. Since March, 1908, the expenditure had been £1817. The average selling prices in Fermoy had been: In 1905, 4s. 2½d.; 1906, 4s. 2½d.; 1907, 4s. 0½d.; and 1908, 4s. 0½d.

Mr. VESEY KNOX, addressing the Committee on behalf of the Urban District Council, held that when the Company were charging the consumers generally a price of about 6s., while the consumers knew that the price in neighbouring towns was about 4s. and the price charged to the War Department was only about 3s., there was cause for friction. The Company for years tried to drive a bargain with the Council, and promised to come to Parliament for statutory rights; but so long as the District Council retained their right to question the amount of the original capital and standard price, they neglected to do so. With regard to the standard price, he contended that the fact that the Company had been able to supply the War Department at 3s. 1d. indicated the price at which they could make the gas.

Mr. HUTCHINSON pointed out that the whole matter had been very fully considered by the Board of Trade; and the Provisional Orders issued by them were handled with particular care. The Board decided equally between the parties, and had accepted the voluntary offer of the promoters to reduce the ordinary dividend of 10 per cent., as authorized by the Gas-Works Clauses Act, to 8 per cent. The contention of the District Council was that if the price to be charged for gas was fixed so low that there was little probability of a profit, they did not want to purchase; but if the price promised a profit, then they asked for a purchase clause.

The Committee confirmed the Provisional Order; but altered the price to 4s.; the original capital to be £8000; the additional capital, £3500; and the dividend on the whole of the capital, 7 per cent.

Mr. SZLUMPER asked for time to consider whether the promoters would take the Order. Eventually, however, they decided to do so.

Basford Water Supply.—At the meeting of the Basford District Council last Tuesday, it was mentioned that a letter had been received from the Local Government Board intimating that authority had been given for the borrowing of £3150 for the Ruddington water scheme, but that sanction had been deferred with regard to the loan of an additional £850 for future extensions until the Council were actually prepared to carry them out.

LEGAL INTELLIGENCE.

SUPPLYING WATER BEYOND STATUTORY LIMITS.

Bristol and West Gloucestershire Companies' Case.

In the Court of Appeal last Wednesday, the Master of the Rolls and Lords Justices Farwell and Kennedy had before them an appeal by the West Gloucestershire Water Company from the order of Mr. Justice Neville, restraining them from supplying water to any person in the parish of Henbury, or in any other place or places outside the area within which they were authorized by Statute to supply water. The proceedings in the Lower Court were reported in the "JOURNAL" for the 2nd of March (p. 634). The dispute between the parties arose with regard to a large house called Hollywood Towers, with a model dairy, gardener's cottage, stables, &c., attached, belonging to Sir George White, and occupied by his son. It is situated partly within the parish of Henbury, in the district of the Bristol Water Company, but very near the border of the parish of Almondsbury, which is within the defendant Company's district. Their main came to a dead-end in the high road near the property in question, but was continued a short distance outside their limits to a hydrant and overflow, for the purpose of allowing accumulations of muddy water to be run off. Above this, just outside defendants' district, a service-pipe was taken off to supply the house; and the contention of the plaintiffs (the Bristol Water Company) was that the delivery of the water was not at the point in the main within the defendants' district, but at the house, which was beyond their limits. It was contended for the appellants, for whom Sir Alfred Cripps, K.C., and Mr. Christopher James appeared, that the real place of delivery was where the water left the main, and that therefore the supply was not outside their district. Their Lordships, without calling upon the respondents' Counsel, Mr. Upjohn, K.C., and Mr. Cann, dismissed the appeal with costs; holding that a statutory company could only do what they were authorized to do by their Acts, and if these provided that water should only be supplied within prescribed limits, they could not carry on business outside them.

Unsuccessful Action against the Alliance and Dublin Consumers' Gas Company.

Last Friday, in the Irish Probate Court, before Mr. Justice Andrews and a Special Jury, the trial was concluded of an action in which Messrs. Forrest and Son, Limited, of Grafton Street, Dublin, were plaintiffs, and the Alliance and Consumers' Gas Company defendants. The plaintiffs alleged that the defendants, in disconnecting and removing gas cooking-stoves, which they had hired to the plaintiffs, neglected to use due care and skill, and, as a consequence, an explosion took place on the plaintiffs' premises on Nov. 1, doing very considerable damage to property and injuring one of their employees. The plaintiffs claimed £14,799 damages, made up of £2018 for injury to their buildings, £11,770 injury to the contents of the buildings, £902 cost of fitting up and rent of temporary premises during the repair of the building, &c., and £108 for injury to adjoining property. The defendants denied that the explosion took place by reason of any neglect on their part, and pleaded that it was caused by the negligence of the plaintiffs and their servants in the care, working, and management of the cooking-stoves and meter, gas pipes, fittings, and appliances attached thereto and used in connection therewith. The Jury found that the explosion was not caused by any negligence on the part of the Gas Company's servants; and a verdict was entered for the defendants.

Conviction for a Bogus Sale of Gas Shares.

At the Somerset Assizes last Thursday, Thomas William Wrightson (41) was indicted for unlawfully obtaining by false pretences from Mr. Henry Smith Lewis a banker's cheque and order for £25 5s., with intent to defraud, at Axbridge, on the 15th of March last. Mr. Vachell was Counsel for the Crown; the accused conducted his own defence. Mr. Vachell said prisoner represented that he was a stockbroker in London, and was carrying on a genuine business under the name of G. F. Sutton, Sons, and Co., at No. 145, High Holborn. He said he had for sale five fully-paid £5 shares in the Axbridge Gas Company, and the plaintiff was induced to buy them; but he had never received the shares or the return of his money, and the prosecution alleged that Wrightson was not a stockbroker at all. The address given by him was a room on the third floor, and he did no genuine business there. Prisoner was carrying on, or pretending to carry on, the business of a stockbroker at other places under other names. The prosecutor—a baker of Axbridge, and a Director of Axbridge Gas Company—was called, and stated that on the 13th of March he received a circular from "G. F. Sutton and Sons," stating that they were instructed to sell five shares in the Axbridge Gas Company. His wife sent a telegram purchasing the shares; and he subsequently drew a cheque for £25 5s. on the Wilts and Dorset Bank in payment. The cheque had been duly honoured; but he did not receive the shares. He received a number of type-written letters delaying their delivery on some pretext or other, till at length he placed the matter in the hands of the police. He knew there were only two blocks of £5 shares, and one of these was held by his niece in London. Prisoner addressed the Jury, and said the prosecution was based on a misrepresentation of the facts. There was no evidence in support of the false pretence. He afterwards went into the witness-box and swore that Joseph William Willis, of Bridgwater, instructed him on the 26th or 27th of February to sell five shares in the Axbridge Gas Company, and he sold the shares, which he had not got. The certificate of Mr. Willis's death was put in, and was to the effect that he died on the 6th of March. Prisoner was found guilty. He admitted a previous conviction, and was sentenced to four years' penal servitude.

MISCELLANEOUS NEWS.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspector's Reports.

In the last number of the "JOURNAL," the report of the Chief Inspector under the Alkali Works Act, 1906 (Mr. R. Forbes Carpenter), for the past year was dealt with. To-day we give some extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard. He says that, on the whole, the sulphate of ammonia works are carefully conducted; only two cases having occurred where complaints of any kind had to be made. In one of them, the oxide in the purifier was hardly fresh enough to last out the run which was just commencing; and in the other, sulphuretted hydrogen was creeping up the wall of the purifier between the oxide and the brickwork. In both instances the cause of complaint was removed before the Inspector left the premises. In two more works, continuous stills were substituted for the old-fashioned intermittent ones. Taking all the places where sulphate of ammonia is made in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 36; and in two works it is burnt. There are 32 works operating on the continuous system of distillation and six on the intermittent system. Products equivalent to 2768 tons of sulphate of ammonia were made during the year.

In the North of England district, which is now under the supervision of Mr. E. Morley Fletcher, who succeeded Mr. John W. Young about the middle of last November, there are seven additional sulphate of ammonia works; and one ceased to register last year. The report on the work of the district has been prepared, at the request of the Chief Inspector, by Mr. Young. In all, 77 works produced sulphate of ammonia, and one liquor ammonia. The output from coke-ovens increased 12 per cent. during the year; but that from gas-works remained stationary. There was 9.9 per cent. of the sulphate made in connection with vitriol plants, and 13.3 per cent. in connection with the Claus process; the acidity of the gases from the exits of the latter averaging 0.7 grain of sulphur trioxide per cubic foot. There was no cause for complaint against either class. As before, the greater number of works use oxide purifiers; 45 works producing 25 per cent. of the total sulphate. In 15 cases the purifiers are on the heap system. Mr. Young says it is interesting to note how in the ordinary form of box purifiers the oxide is not generally employed to the best advantage. At one works there are two purifiers, each 20 feet square and 5 feet deep. The annual make of sulphate is from 450 to 500 tons; and the whole process is carefully supervised. When in use, the gas is diverted to them alternately every 12 hours, and while at rest they are gently revived by chimney draught. Mr. Young was informed by the engineer, who gave him permission to present the above figures, that the oxide remained for a year unhandled, except that round the inner walls of the purifiers for a space of 18 inches the material was deeply trenched on three occasions, and fresh oxide filled in.

In the district comprising Cheshire, North Wales, and part of Lancashire, which is under the supervision of Mr. E. G. Ballard, there were 20 works registered last year for the manufacture of sulphate of ammonia, excluding two transferred to another district. All the works were carefully conducted. The heap form of purifier for the absorption of sulphuretted hydrogen still holds its own, and continues to be further adopted. In every case it is giving satisfaction, as being far more easily managed (thus effecting a saving of labour) than the old box form of purifier. No complaints arose from this manufacture; and the various plants were kept in a good state of repair. Taking all the sulphate of ammonia works in the district, the number using continuous distillation plant is 21. The last plant on the intermittent system was replaced by a continuous still during the past year. The methods by which the sulphuretted hydrogen evolved in the process of manufacture is dealt with at the various works in the district are as follows: To vitriol chambers, none; by Claus process, 2; by absorption in oxide of iron, 19; by combustion, none; by special process, 1. The proportion of sulphuretted hydrogen treated by the above different processes, in terms of sulphate of ammonia made, and percentage of total make, is as follows: To vitriol chambers, none; by Claus process, 4.3; by absorption in oxide of iron, 27.2; by combustion, none; precipitated by metallic salts, 68.5. There are three works in the district in which gas liquor is concentrated for shipment to works where it is utilized in other manufacture. This class of work was carefully conducted; and no complaints arose of noxious gases.

In the district comprising Widnes, Runcorn, and Liverpool, which until September was under the sole supervision of Mr. Ballard, but subsequently supervised by him in collaboration with Mr. Herbert Porter, there were more gas liquor and sulphate and muriate of ammonia works last year than before, owing to the extension of the district. The following are the different methods of treating the sulphuretted hydrogen evolved, in terms of the percentage of sulphate of ammonia made: Absorbed by lime, 13.9; by combustion, 10.1; by other methods, 76. All the plant in this class was properly worked and maintained during the year. The six tar-works in the district were kept in good order.

In conjunction with Mr. Young, who entered upon his duties in September, Mr. Porter had the supervision of the district comprising North and East Lancashire and Yorkshire, in which there are 13 liquor works, and 46 works producing sulphate or muriate of ammonia. The proportion distilled by the continuous process is 97.5. The methods of dealing with the foul gases are (expressed in percentages): To vitriol chambers, 30.5; absorbed by lime or oxide of iron, 34.3; by Claus process, 19.9; by other methods, 15.3. These figures show only slight variations from last year. The Claus process has given excellent results in the yield of sulphur in works where careful study has led to the adoption of improvements in the construction of plant. The best yield of sulphur is 6.6 tons per 100 tons of sulphate made, the next best being 5.5 tons of sulphur. As a result of this improvement, the total

acidity of the gases leaving the sulphur-depositing chambers is much lower. In one works it rarely exceeds 2 grains of sulphur trioxide per cubic foot, with only slight traces of sulphuretted hydrogen, which are afterwards absorbed in oxide purifiers. Much of the improvement has been effected by placing the kiln on the top of a brick chamber, so that the gases pass down through the packing in the kiln in a uniform manner; the bottom of the kiln being open all over below the grid. As mentioned in the last report, a superficial area of 4 square feet in the kiln per ton of sulphate made in 24 hours appears to be most effective; greater or less space not giving such good results. At two large works the sulphuretted hydrogen is burnt in the oxide burners for the production of sulphuric acid; and at one works experiments have been continued since last year in trying to remove the tar mist in the gases, which is detrimental to the acid manufactured. All the works in this class were maintained in proper order during the year; and there was no case of infraction due to foul purifiers or escaping gases.

Coming to the East Midland district, of which Mr. E. Morley Fletcher has charge, the manufacture of sulphate of ammonia was commenced in three additional places—one a gas-works, and the other two coke-oven works where bye-products are recovered. Again there was a large increase in the quantity of sulphate made in the works of the latter class. The total quantity of liquor distilled was equal to 27,840 tons of sulphate. The proportion of sulphate and muriate of ammonia made by continuous processes was 99·1 per cent. The percentage of sulphuretted hydrogen treated by the various methods of disposal, expressed in terms of the sulphate equivalent of the liquor distilled, was as follows: To vitriol chambers, 14·4; by Claus process, 24·1; by oxide purification, 22·4; by combustion, 39·1.

Mr. E. Jackson has something interesting to say about the South Midland and Norfolk district, in which 100 works are registered where the manufacture of sulphate, chloride, or carbonate of ammonia or the concentration of gas liquor is carried on. In consequence of the rearrangement of the boundaries of the districts adjoining, 22 works for the manufacture of sulphate of ammonia (with six exceptions, mostly small plants at gas-works scattered over a rather large area) were transferred to another district, six works were brought in, and a like number of new works for the manufacture of sulphate were registered during the year. At three of the new works the plants are erected at gas-works. The usual continuous stills, with hand-fishing saturators, have been put down. At one works, one oxide purifier only has been attached; in another, two purifiers, with hydraulic change-valve; and in the third, two oxide heaps are employed, with suitably concreted floor and also an hydraulic change-valve. The fourth new works are attached to a plant where ammoniacal liquor is obtained by a special coal-distillation process. A continuous still is erected here, and the usual hand-fishing saturator; two oxide heaps being attached, with a hydraulic change-valve. The fifth sulphate plant is connected with coke-ovens, and the saturator gases are returned to the condensers and scrubbers of the gas plant. What remains, being thus mixed with the gases used for heating ovens and boilers, is subsequently burnt. The increase in the total acidity of the chimney gases by the adoption of this method of disposing of the noxious gases was not found, from a series of tests taken, to be too great to require any alteration of method before the works could be passed for registration. No trace of sulphuretted hydrogen has been found in the flue gases. In all the foregoing new works, the "devil" liquor from the condensers is returned to the crude liquor well. There are already in the district 16 coke-oven works with recovery bye-product plants, and at two more collieries patent ovens are being erected. There are also four works where coal is carbonized in retorts for products. The sixth works consist of large power-gas sulphate of ammonia apparatus of the usual type. The number of works using the continuous method of distillation is 94; and the proportion of liquor distilled by the continuous process is 99·7 per cent. The following figures show the proportion (expressed in percentages) of gas liquor produced in the district from the different sources, worked out on a sulphate of ammonia basis: Gas-works, 61·2; iron-works, 2·9; producer gas, 4; carbonizing (coal) works, 4·1; and coke-ovens, 27·9. It is interesting to note the gradual increase in the figure for the coke-ovens in the district during the last five years: For the year 1904, the relation was 7·9 per cent.; for 1905, 9·8 per cent.; for 1906, 15·4 per cent.; and for 1907, 20·9 per cent. If the sulphate of ammonia produced at iron-works (from blast-furnace gases) and producer-gas and coal-carbonizing plants are added to the coke-oven figures, the increase in proportion between the sulphate obtained from these sources and that from ordinary gas-works plants is considerably more. The percentage from all these various sources, other than gas-works, in 1904 was 16·9; in 1908 it had risen to 38·9. Thus, of the total sulphate of ammonia produced in the district, only 61 per cent. is now obtained from ordinary gas-works liquor.

Reporting upon the district embracing the South and South-West of England, Dr. A. C. Fryer states that there are 95 registered works where the manufacture of sulphate and muriate of ammonia is carried on. Two new sulphate of ammonia plants were registered during the year; both being provided with good condensers and oxide of iron purifiers. In a few cases the oxide purifiers were found to be overworked, and complaint had to be made. These, however, were isolated instances, and the reason was usually uneven charging. The use of heap purifiers continues to extend. This form of purifier was first used by Mr. John J. Jervis, the Manager of the New Swindon Gas-Works, in 1886. In the annual report for 1887, it is stated that "this form of purifier is not only simple and inexpensive, but performs its work effectively."* Dr. Fryer says this statement can still be endorsed as correct; and at the present time 43 per cent. of the sulphate of ammonia plants are fitted with oxide of iron heaps where this material is employed for absorbing the sulphuretted hydrogen. The number of works in the district using continuous distillation plants is 68; those using the intermittent system being 25. The proportion of liquor distilled by the former process is 93·6 per cent. Purification by oxide is employed in 86 works.

In South Wales and Monmouthshire, which are under the supervision of Dr. T. Lewis Bailey, ten of the works registered are gas-works, or others dealing with the liquor from gas-works, and four are coke-ovens

with bye-products plant. The total amount of ammonium salts, in terms of sulphate of ammonia, shows an increase of 12·5 per cent. over the previous year, for which increase coke-oven plants are mainly responsible. One sulphate plant was entirely renewed during the past year; and the plant generally in all works was kept in an efficient state of repair. In several instances it was necessary to insist on better cooling of the foul gases before they passed to the oxide of iron purifiers or heaps; but, speaking generally, the purification of the exit gases was efficiently carried out.

The last report of the series furnished by the District Inspectors is that of Mr. F. Napier Sutton, in whose district, comprising the Eastern and South-Eastern counties, there are under supervision 89 works concerned with the treatment of gas liquor. The total quantity of ammoniacal compounds manufactured in the district in the past year was much the same as in 1907. The products manufactured consist chiefly of sulphate, but include carbonate and nitrate of ammonia, and liquid (concentrated and refined) and anhydrous ammonia. With the exception of a few hundred tons obtained in the manufacture of bone charcoal, the whole of the production is derived from the carbonization of coal in the gas-making industry of the district. The gas-works belonging to statutory companies and local authorities furnished 90·3 per cent. of the products, and the rest was made in the works of private firms. An increased quantity of ammoniacal liquor was treated by the desulphurizing process in use at one works in the past year. The plant for this purpose was remodelled in 1907 and made more continuous in action, whereby the liquor completes a larger number of cycles before passing on for the final recovery of the ammonia. The equivalent, in terms of sulphate, of the liquor desulphurized is added to the total make of sulphate in the following statistics, and is included for the purpose of calculating the proportion of sulphuretted hydrogen dealt with by the various methods of disposal: Total quantity of liquor distilled, equivalent to 52,385 tons of sulphate; number of works using continuous distillation plants, 82; proportion of liquor distilled by the continuous process, 99 per cent.

The Claus sulphur-recovery process is in use at nine works in Mr. Sutton's district; and 13 units of plant are in operation. Absorption of the foul gases in oxide of iron is the method used at 60 works; and the proportion of gas so treated amounts to 9·3 per cent. The use of oxide heaps in place of the open box form of purifier continues to extend in popularity as the advantages of the system are appreciated; and the heap purifiers are now in use at 21 works in the district. Hitherto this form of purifier has chiefly been in use at small and moderate sized works; but the method has recently been adopted in place of the Claus process at works where the daily make of sulphate reaches 7 tons. Two pairs of oxide heaps are arranged upon a cemented floor, and each heap is regulated by a separate hydraulic change-valve. The pairs are worked alternately, and generally deal with a make of from 50 to 60 tons of sulphate before requiring change and renewal; and the cost for labour is low. The number of works at which the gases are burnt in a special kiln, with subsequent neutralization of the acid products, is now 11. In two instances the method is used in conjunction with the Radcliffe process for the removal of sulphocyanide in the spent liquor, and for decolorization of the effluent. The average neutralizing efficiency of the plants reached 92·5 per cent. in the past year; while the majority of them yielded upwards of 95 per cent. neutralization. The disposal of the saturator gases by passing them into the crude gas-main, and so to the purifying system, is practised at three works.

The distillation of coal tar and gas tar is carried on in the districts under consideration at 19 works of greatly varying distillation capacity. No additions to plant have to be recorded. There are in use in the district 109 intermittent pot stills and four of Lennard's patent continuous stills, the largest of which treats 24,000 gallons of dehydrated tar per diem. At the larger works, the more complete separation of tar and water is practised by the preliminary heating of the raw tar in bulk, whereby the subsequent distillation process is materially curtailed. But at many of the smaller works such facilities do not exist; and tar is frequently in the stills for two days—the first being occupied in the troublesome task of getting the stills to "stand fire," and the second for the distillation proper. Mr. Sutton thinks more attention to this matter should lead to greater economy. Complaint has on several occasions been made of the evil-smelling gases evolved during the distillation of water-gas tar; and he says it is evident that certain noxious gases other than sulphuretted hydrogen pass through both oxide and lime purifiers. Very strong complaints were made recently in respect of one works where this tar alone is distilled. The lime purifier was greatly increased in size, and while the lime showed no sign of fouling, the nuisance continued. Treatment by absorption has, therefore, been abandoned for combustion in the boiler fire; and this alteration of method appears to have put an end to the trouble.

Report to the Secretary for Scotland.

Following the reports of the District Inspectors is the Chief Inspector's report to the Secretary for Scotland. The details of the work done in this portion of the United Kingdom are, as usual, furnished by Mr. W. S. Curphey; and we extract the following particulars.

The number of works in Scotland registered under the Alkali Act during the past year was 163—an increase of five over the corresponding number in 1907. Nine new works were admitted to the register, and in four cases registration for 1908 was not renewed. Of the total number, nine were registered as "alkali" works; and in the case of 154, one or more of the various chemical processes enumerated in the first schedule to the Act were carried on. These processes numbered 267, compared with 260 the previous year. The quantity of salts of ammonia made (expressed as sulphate) was—

	Tons.
Gas liquor works	19,794
Iron works	16,737
Shale works	53,628
Producer gas, coke, and carbonizing works	15,311
Total	105,470

* The apparatus referred to was described in the "JOURNAL" early in 1888 (see Vol. LI., p. 553).

The make in 1907 was 103,342 tons. The number of registered works in Scotland in which sulphate, chloride, or hydrate of ammonia was made during 1908 was 98; being nine more than in 1907. The increase in numbers was due to the addition to the register of eight gas-works in which sulphate manufacture was commenced, and of one new coke-oven works which started operations. This class of works now comprises 16 iron-works, 13 shale-works, 10 coke, gas-producer, and carbonizing works, and 60 gas-liquor works—one being both carbonizing and gas-liquor works. For several years past an increase in the number of works in which gas liquor is treated for the manufacture of sulphate of ammonia has had to be reported; and Mr. Curphey says that further additions may be looked for. During the past ten years, the number of such works has risen from 9 to 41, or more than fourfold in this short period. The number of works using continuous distillation plant is 60; and the whole of the liquor is dealt with by this method. The sulphuretted hydrogen evolved in the process of manufacture was dealt with by various methods in the following proportions, expressed in terms of sulphate of ammonia and percentage of total make: Claus process, 10.9; oxide of iron purifiers, 79.3; combustion, 8.4; metallic salts or other methods, 1.4. These figures do not include the ammoniacal liquor obtained in iron-works, shale-works, coke-oven works, or producer-gas works. In all these works the continuous method of distillation is now universal. The production of sulphate of ammonia in Scotland from all sources amounted to 105,470 tons—an increase of fully 2000 tons over 1907. Despite a further diminution in the yield from iron-works, the increased production made from gas liquor and in shale and coke-oven works was sufficient to give the net increase noted.

Mr. Curphey presents, in continuation of previous annual records, some interesting statistics on the production and recovery of ammonia in Scotland last year. The coal fed blast-furnaces in Scotland contribute nine-tenths of the total recorded under the head of "iron-works" in the table given in the "JOURNAL" last week (p. 707). In the years 1906 and 1907, the sulphate of ammonia recovered in iron-works in Scotland amounted to 20,204 tons and 19,719 tons respectively; but in 1908, owing chiefly to the great depression in the iron industries, only 16,737 tons were recovered from this source. The average numbers of furnaces in blast in the years named were 90.35 and 90.44 respectively; while in 1908 this figure had dropped to 75.95—a reduction of nearly one-sixth. The Chief Inspector remarks that the two years were years of maximum activity; and it may possibly be the case that, with the increasing scarcity of coal possessing sufficient hardness to stand internal crushing in the blast-furnaces, conditions will not again favour so large a return of sulphate as that recorded in 1906.

In continuation of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Carpenter gives the figures compiled from the statistical returns to the Home Office on Mines and Quarries for the ten years ended Dec. 31 last. The figures show that the total quantity of shale mined in the

United Kingdom in 1899 was 2,210,824 tons; the amount of sulphate of ammonia recovered being 38,780 tons, or 39.3 lbs. per ton of shale. In 1904, the figures were 2,333,062 tons, 42,486 tons, and 40.8 lbs.; while last year they were 2,891,564 tons, 53,628 tons, and 41.5 lbs.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Reorganization Scheme and the Salaries Question—Price of Gas for Manufacturing Purposes.

At the Meeting of the Birmingham Corporation last Tuesday, the questions of the reorganization of the Gas Department and the salaries of the officials were again under consideration. The amended scheme of the Gas Committee was set forth in the report given in the "JOURNAL" for the 8th inst. (p. 657).

Alderman Sir HALLEWELL ROGERS, in proposing the adoption of the scheme, said the Council would remember that at the meeting on the 11th of May the Gas Committee brought forward a scheme for the future working of the department, and it was defeated by two votes in the Council. It was evident from the debate that took place that no opposition was offered to the scheme itself, but only to the proposal made by the Committee, asking the Council to agree to maximum salaries for four of the principal officers, and empowering the Committee from time to time to raise their salaries within the maxima. He would not reopen the discussion on the question except to say that he was firmly convinced that, in the interests of the ratepayers, generally it was necessary, for the proper working of the department, that the Committee entrusted by the Council with such wide responsibility should be given an absolutely free hand on this point; and he expressed the hope that at some future meeting the Council would review the matter. With regard to the scheme of reorganization, he reminded the Council that it was tentatively sanctioned by them a year ago, and that it had proved so successful that the Gas Committee were unanimous in their recommendation that it should be permanently established. The pith of the scheme lay in the fact that it was a combination of the engineering and commercial elements, which, working in harmony together, produced the best financial results, and ensured that no experiment should be tried and no work undertaken without being thoroughly considered, not by one engineer, but by a Committee consisting of the Engineers-in-Charge of all the works, the Chief Chemist, and the head of the commercial department who was responsible for its financial success. Their officers were all tried, and if they were not, in the opinion of the Committee, thoroughly competent to undertake the various duties they now recommended, they would not bring the scheme before the Council.

Alderman EDWARDS seconded the proposition; and it was agreed to. Alderman Sir HALLEWELL ROGERS then proposed a resolution

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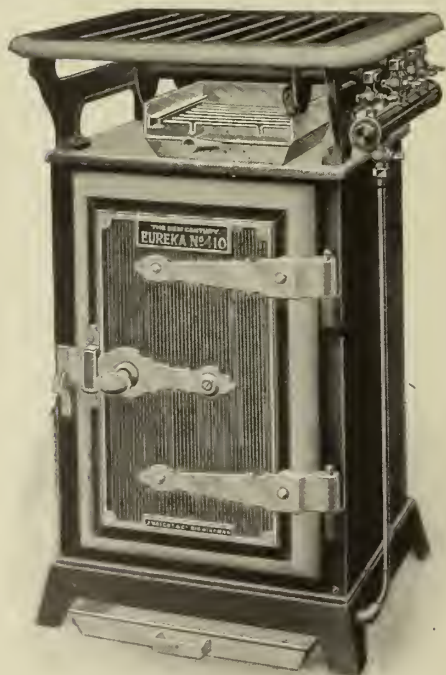
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increasing Mr. Hampton Barber's salary as Secretary of the department from £1400 to £1600, the advance to date from the 1st inst. He said the recommendation of the Gas Committee was unanimous. Mr. Barber had been with them for eight years, and during this time he had given the utmost satisfaction to the Committee. They had all been struck with his business capacity, his executive ability, his powers of organization, and his astuteness in purchasing and selling materials. He had no hesitation in saying that during Mr. Barber's term of office he had greatly helped to develop and strengthen the whole business of the gas undertaking. Those members of the Council who had served on the Gas Committee must have realized the magnitude and complexity of the business, and the absolute importance—nay, necessity—of grappling with all the details, and of organizing and controlling the large staff needed for its effective administration. He would remind them that it was the largest commercial undertaking in Birmingham, having a capital of about £3,000,000, and an annual income of some £1,000,000. It was the greatest municipal gas undertaking in the country, and the third largest gas undertaking in the United Kingdom. Since 1901, when Mr. Barber entered their service, the number of consumers had increased from 85,000 to 135,000, and the annual sales of gas were more by 1300 million cubic feet. One of Mr. Barber's principal duties was to negotiate and complete the purchase of hundreds of thousands of pounds' worth of coal, oil, and other stores each year; and if he told the Council that 1d. per ton on the coal purchased annually amounted to £2500, and 1d. per gallon on the oil required for carburetting gas amounted to the same figure, they would see that, unless they had a keen business man, in these two transactions alone thousands of pounds might be lost to the ratepayers. Having obtained what they believed to be an able administrator, he would remind the Council that they would get the best of his services if he felt that he had the confidence and support of those under whom he was directly serving. Mr. Barber had not been with the department many months when, dissatisfied with the income they were deriving from residual products, he personally took the sales in hand; and, by securing new and more remunerative markets, the department had obtained for these products alone an increased income during the past eight years of no less than £496,000. After allowing for the greater volume of trade in the later period, there had been a net increased profit during the past eight years of upwards of £400,000—an average of about £1000 per week during the entire period. Early that year, upon the Secretary's advice, and before the usual time for inviting tenders, the Committee authorized him to purchase considerable quantities of coal; and it would be satisfactory to the Council to know that their requirements had been secured at a saving of approximately £15,000. During his service with the Corporation, an average of £22,000 more per annum had been contributed in aid of the rates; while the price charged for gas had been lower, and in fact to-day was the lowest in the history of the undertaking. An increase in the salary of an official in a commercial department did not necessarily mean increasing the rates of the city—in fact, it generally had

exactly the opposite result. A thoroughly competent official was able to save thousands of pounds to the ratepayers. The Committee were unanimous in their opinion that the position of Secretary and Manager, with all the responsibilities it involved, was worth at the present time a salary of at least £1600 per annum; and he had no hesitation in saying that were theirs a commercial company the remuneration would be very much larger. In at least two instances of gas companies in this country, the commercial managers received salaries of more than £2000 per annum; and one of them, which was one of the most prosperous in the country, was not more than half the size of the Birmingham undertaking. The present Secretary was untiring in his efforts to further develop the business of the department, to extend its usefulness throughout the area of supply, and to render the undertaking still more profitable. He trusted the members of the Council would agree with the Gas Committee that it was in the best interests of the city that they should recognize and encourage such service as the Secretary had rendered. They were anxious to maintain the present degree of efficiency in the conduct of the business, and hoped the Council, if they had confidence in their judgment, would support their recommendations to this end.

Mr. NEWBY seconded the proposition.

Mr. GAUNT strongly opposed the resolution, and pointed out that if it were passed Mr. Barber's salary would have been increased by £600 in five years. The Secretary's experience had been gained, he said, at the expense of the city. He objected to the amount handed over by the Gas Committee being called profits. If the Gas Committee charged the consumers at the same rates as in other cities, and then made a profit, it would be a different matter. In addition to these reasons, he did not think they were justified in granting an increase at the present time, when the trade of the city was in such a depressed state. He believed in paying a fair market price for all services rendered; but he thought the Council had already acted generously. If they passed the resolution, they would be unjustifiably extravagant; and if the Council two years ago had thought that another advance would be asked for so quickly, they would not have readily granted the increase on that occasion.

Mr. WALTHALL remarked that the general opinion of the ratepayers of the city was against any increase of the Secretary's salary. He agreed as to the ability of Mr. Barber, but pointed out that the latter's duties did not involve the sole management of the gas undertaking. He was not responsible for the manufacture and supply of the gas; these duties being performed by most competent men with scientific knowledge.

Mr. NETTLEFOLD, in supporting the resolution, referred to the latter statement by Mr. Walthall, who, he said, should know that they required to have a business man to look after the whole concern. Experts could not be done without; but they must be directed and controlled by business men. He might point out that in 1900 the aggregate salaries in the Gas Department amounted to £5280, and in 1909 to £4740. Supposing the proposed increases were granted, the total



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salaries would be £5265, or no more than they were in 1900, when their profits were only two-thirds of what they now were.

Alderman BEALE reminded the Council that during the last few years the whole of the methods of the Gas Department had been changed; and this had placed increased responsibility on the principal official. It seemed to him, therefore, that, as a necessary consequence, the remuneration should be raised in accordance with the increased responsibility.

Mr. PENTLAND remarked that anyone who went about the city would tell the Council that Birmingham people were not in favour of the advance suggested. He personally was in favour of the increase to the Engineers; but he honestly believed the present was not the time for raising the salary of the Secretary from £1400 to £1600 a year.

Alderman HUNT, speaking in opposition to the proposal, said the returns of the last eight years had been the result of the excellent management of the previous fifteen or twenty years; and Mr. Hampton Barber came into a wonderful heritage. The men who really saved the ratepayers' pockets were the men at the works, who only received half Mr. Barber's salary.

Mr. BROOKS said there was a strong feeling outside the Council against the increase; and he personally was rather apprehensive that it was only a step towards the £2000 previously mentioned by the Committee. If so, he thought that there would be considerable difficulty in passing it through the Council. He moved, as an amendment, that the salary of Mr. Hampton Barber be increased from £1400 to £1600 as from June 1, 1910.

Mr. DAVIS seconded the amendment; and after further remarks,

Alderman Sir HALLEWELL ROGERS replied to the discussion. He said it had been suggested that the proposal before the Council came from Mr. Hampton Barber himself; but there was no truth whatever in the suggestion. The recommendation came direct from the Gas Committee, and was consequent upon the reorganization scheme, which placed additional responsibility on the shoulders of the Secretary. Alderman Hunt had given it as his opinion that the success of the department was due entirely to the seeds sown fifteen years ago. He (the speaker) admitted that it was owing in a large measure to the work then accomplished, but not entirely. Mr. Hampton Barber, by his treatment of residuals, had increased the profits of the department by several thousands of pounds. In appealing to the Council to have confidence in the Committee, Sir Hallewell said they would certainly not have brought forward the proposal had they not considered it fair and just.

On the amendment being put to the vote, it was lost. The resolution was then submitted; and it was rejected by 33 votes to 28.

The Council then agreed, without discussion, to the following increases of salaries of the Engineers-in-Charge, to date from the 1st inst.: Mr. J. Foster (Windsor Street), from £650 to £700 per annum; Mr. W. Chaney (Nechells and Adderley Street), from £625 to £700 per annum; Mr. F. J. Bywater (Salisbury), from £425 to £600 per annum; and Mr. T. H. Hack (Swan Village), from £375 to £400 per annum.

Alderman Sir HALLEWELL ROGERS then moved that as from next Michaelmas the price of gas used for certain heating purposes should be reduced by 3d. per 1000 cubic feet on the current lighting rates. He said though this matter had directly arisen from a memorial from the Birmingham Chamber of Commerce, it had been before the Council on more than one occasion. It was obviously the duty of the Gas Committee not only to assist in every possible way the manufacturers of the city, who were their largest customers, but to protect the gas undertaking itself from any competition that might arise, and to obtain as large an output as possible, for this alone enabled them to supply gas to the smaller consumers at comparatively low prices. The difficulty in dealing with this question had been to ascertain exactly the quantity of gas consumed for manufacturing purposes other than for gas-engines. They did not feel prepared, therefore, to recommend that gas used for manufacturing purposes should be at once supplied upon the same terms as gas for motive power. Thus the scheme was to this extent a tentative one, and must be reconsidered when they had the exact position before them, and had ascertained more nearly the quantity of gas that would be consumed at the reduced charges. As far as could be learnt, the quantity of gas used for heating was probably one-fifth of the entire output. Competition with other heating agents had rendered it necessary for the department to meet the market, if they were to retain the trade; and as at the price now proposed there would be a satisfactory margin of profit, the Committee considered it was in the interests of the city that the proposed reduction should be made.

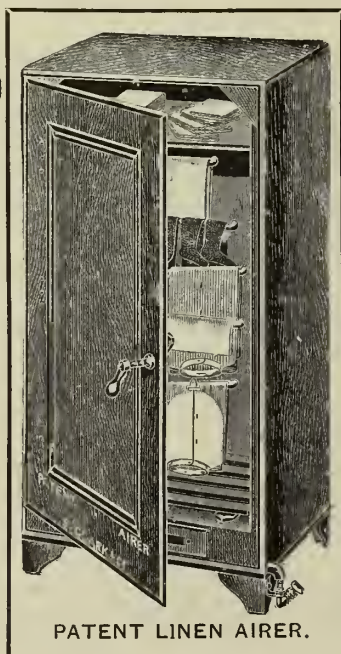
Mr. NEWBY seconded the motion; and it was carried.

Owing to the length of the proceedings, three resolutions bearing upon the salaries of officials in the service of the Corporation, of which notice had been given by Mr. Manton, were withdrawn.

REINSTATEMENT OF ROADS IN LONDON.

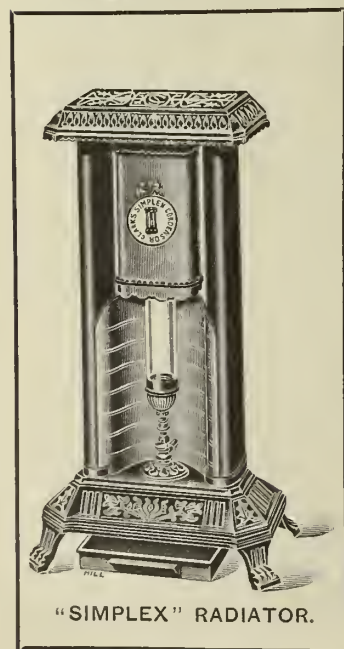
At the Meeting of the London County Council last Tuesday, the General Purposes Committee reported that the Metropolitan Water Board had inquired whether the Council would be prepared to enter into a written agreement with the Board regulating the terms upon which the reinstatement of streets or pavements broken up by the Board in pursuance of their statutory powers should, in cases where the Board are liable for the cost of reinstatement, in future be carried out by the Council, and indemnifying the Board against any damage or loss owing to defective reinstatement. The Committee pointed out that it had been the practice, where the property of the Council is affected, for the Council, with the assent of the Board, to reinstate the ground, though the Board have the right to reinstate footways and roadways disturbed in connection with the laying of their pipes and mains. After consideration of the reports of the officers, they were of opinion that this practice should be continued, and that an agreement should be entered into with the Board on the lines suggested by them. They

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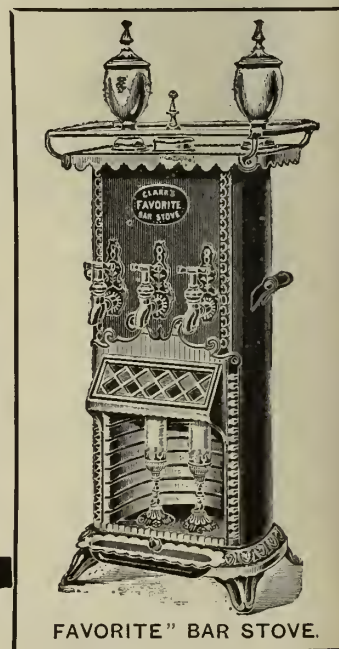


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accordingly recommended—"That the Council do enter into an agreement, in a form to be approved by the Solicitor, with the Metropolitan Water Board, regulating the terms upon which the reinstatement of streets or pavements broken up by the Board in pursuance of their statutory powers should in future be carried out by the Council, and indemnifying the Board against any damage or loss owing to defective reinstatement."

PRESENTATION TO MR. AND MRS. CHARLES HARRISON.

The annual picnic of the officials employed by the Accrington District Gas and Water Board took place last Wednesday, at Coniston, which place was reached via Fleetwood and Barrow-in-Furness. Mr. Councillor Dewhurst, the Chairman of the Board, accompanied the party, along with Mr. Charles Harrison, the Engineer and General Manager. At the Sun Hotel, Coniston, the party had dinner, under the presidency of Mr. Dewhurst, who announced that a presentation would be made to Mr. Harrison in recognition of his forty years' connection with the gas undertaking. A congratulatory telegram was read from the members of the Accrington District Club.

Mr. Gill, the senior member of the official staff, made the presentation (consisting of a diamond ring) to Mr. Harrison, and briefly reviewed the progress of the undertaking during his term of office. He said Mr. Harrison had served under six Chairmen, and had given satisfaction to all in his capacity as General Manager. Mr. Harrison had always been a man of order, system, and method, and a capable Manager of their large combined undertaking, with a capital of £401,284 in the gas and £517,713 in the water portion. There were 77 miles of gas-mains and 72 miles of water-mains in the district; and Mr. Harrison had behind him no less than fifty loyal officials, who held him in the highest esteem. He (Mr. Gill) knew that, in the districts supplied, Mr. Harrison had made many friends, and among the gas managers of Lancashire and the country he was widely known and much respected.

Mr. Harrison, in acknowledging the gift, expressed his pleasure at being with them on this occasion. He thanked all present for their devoted services in the past, extending over many years, and said the Board had an excellent body of officials to look after their interests. He appreciated the presentation, and felt delighted that he had the good wishes of all with whom he had to work—many of them having seen long service.

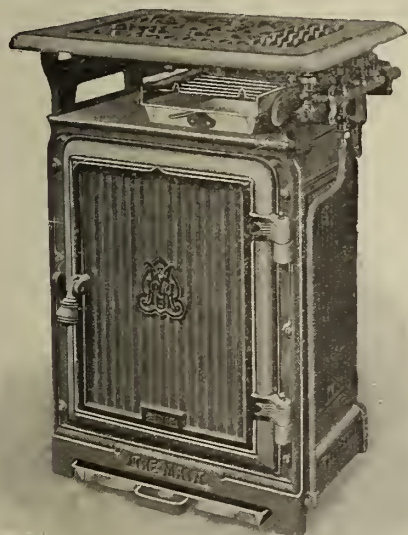
The Chairman then asked Mr. Harrison's son, Mr. Cedric Harrison, who has just attained his majority, to accept a diamond and ruby ring, on behalf of his mother, who was not able to attend. Mr. Dewhurst said Mrs. Harrison had the sympathy of all present, and they insisted that in any form of presentation she must be taken into account.

Mr. Cedric Harrison expressed his pleasure that he had the duty to perform of handing to his mother so valuable a token of the officials' respect and esteem. He was proud to witness the proceedings of the day, and hoped to follow in his father's footsteps.

Mr. Clayton, the Works Manager, moved a vote of thanks to the Board for granting the day's holiday; and Mr. Holgate, in seconding the motion, said he hoped they would have a continuance of such pleasant meetings for promotion of goodwill among the employees.

In connection with the proceedings here reported, it may be of interest to give a sketch of Mr. Harrison's career. He was educated at the Accrington High School, and entered the service of the Accrington Gas and Water Company. After the first nine years' service, he went to Luton, as Assistant-Secretary and Manager to the Luton Water Company; afterwards for three-and-a-half years he was Assistant to the late Mr. George Garnett, the Engineer of the Ryde Gas Company. In 1877 a vacancy occurred at Accrington, and he was appointed Engineer and General Manager—a position he has filled with conspicuous success. The undertaking is an important one, supplying gas and water to a district comprising seven townships, besides the borough of Accrington, with a combined population of 90,000, and covering an area of 22 square miles. There are two stations for the manufacture of gas—one at Accrington and the other at Great Harwood; the latter having been duplicated since Mr. Harrison took office. The Board have just secured additional land at Great Harwood, and are now preparing for the erection of sulphate of ammonia and carburetting plants. The annual make of gas in 1877 was 112 million cubic feet; whereas last year it reached 452 millions. At an early stage Mr. Harrison launched out into the gas cooking and heating business, and opened with a combined exhibition in the Town Hall. There are now 6880 cookers and fires in daily use in the district. There are 6364 prepayment meters fixed, with an average yearly consumption of 10,726 cubic feet per meter. At the Accrington works, the retort-house has been enlarged, and carburetted water-gas plant of 500,000 cubic feet capacity per day put down. In the water branch, Mr. Harrison's capacity has been brought more into service, and comprises the completion of the Dean Clough embankment, the erection of the Cliffe pumping-station and filter-beds at a cost of £30,000, filter-beds at Mitchell's reservoir, and, just recently, the erection of a pumping-station at Altham and the laying of three miles of 15-inch pipes at a cost of £26,630. On the transfer of the property from the old Company to the Joint Board in 1894, but only after a strong parliamentary fight, Mr. Harrison's services were recognized in a tangible form by the retiring Directors; and he was unanimously appointed Engineer and General Manager under the new Board. Mr. Harrison joined the British Association of Gas Managers in 1880, passed into the Gas Institute, and is a member of the present Institution, as well as of the Manchester District Institution of Gas Engineers. Needless to say, Mr. Harrison enjoys the full confidence of the Board under whom he serves; and the handsome presentation just made to him is proof that the fifty subscribing officials also hold him in the highest esteem.

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AUTOMATIC LIGHTING AT NEWCASTLE-ON-TYNE.

Proposed Trial of Alder and Mackay Controllers.

Early in the present year, the Lamp Inspector of the Newcastle-upon-Tyne Corporation (Mr. George Lamb) presented to the Lighting and Tramways Committee a report on the automatic lighting and extinguishing of the public-lamps of the city; and it was noticed in the "JOURNAL" for the 26th of January (p. 259). The Committee's attention had been called by the Newcastle and Gateshead Gas Company to the advantages which would accrue to the Corporation by the adoption of a system of simultaneous lighting; and besides showing the Committee experiments in one of their works, they erected experimental apparatus in parts of the city which would, in their opinion, be most difficult to reach with a pressure wave. These experiments were eminently satisfactory, so far as proving the practicability of controlling the lighting and extinguishing of gas-lamps from a centre. As, however, other towns had adopted forms of apparatus varying in mechanism but controlled on two principles—viz., by pressure wave centrally, and by clockwork, each lamp with its own independent controller—a resolution was passed by the Lighting Committee, and confirmed by the Watch Committee, that a deputation accompanied by the Lamp Inspector should visit Bournemouth, Tottenham, Lambeth, Windsor, and Liverpool, to inquire into the various methods, the conditions of the districts in which they had been adopted, and the practicability of applying a system that would be satisfactory in Newcastle. The Committee's instructions were duly carried out; and besides the places named, the deputation also visited Gosforth and Darlington.

Interviews took place with Dr. Rostin, who exhibited several adaptations of his apparatus which had not yet been put upon the market; and in the course of conversation with the Committee he stated that he had upwards of 5000 of his appliances fixed in the London district. The deputation also interviewed Mr. Schwab, sole agent in England of the "Bamag" apparatus. Mr. Schwab explained it, and informed the deputation that in Germany upwards of 40,000 of these appliances were in actual use, and said he knew of no instance where it had been discarded after its adoption. An interview was also arranged with the representative of Messrs. Alder and Mackay at the Lighting Inspector's office. At other interviews, opinions were obtained from the officials of the borough of Lambeth, the British Gaslight Company, and other gentlemen of high standing in connection with the gas lighting world which were of great assistance to the deputation. They also obtained a copy of a communication on the subject made by M. Lhomme to the Société Technique last year. The deputation were received with great courtesy by the members of corporations, officials, and others with whom they had interviews; and in the report they have just presented on the result of their inspections (a copy of which we have received from Mr. Lamb), they express their sincere thanks for the ready manner in which information was at all times given.

The Committee deal in detail first with the Gunning clockwork apparatus at Bournemouth, next with the Rostin pressure-wave apparatus at Tottenham and Lambeth, then with Messrs. Alder and Mackay's system at Windsor, the Gunning, Horstmann, and Anderson systems at Liverpool, the Rostin, Alder and Mackay, and "Bamag" systems at Darlington, and the last-named system at Gosforth. Illustrations of the systems accompany the particulars furnished. At the close of their inspections, the deputation had interviews with Messrs. T. Waddon (Secretary), W. Doig Gibb (Engineer), T. Hardie (Manager of the Redheugh station), and J. Lewis (Distributing Superintendent), of the Newcastle and Gateshead Gas Company, and were informed that great difficulties had been experienced in controlling a pressure-wave system, owing to the intercommunication of the Company's mains, the very wide range of altitudes of the district, the industrial requirements for gas, and the necessity for giving to the city and the large area beyond an adequate supply of gas at all times. It was therefore suggested that, before any mechanical system should be adopted, experiments should be carried out by the Company with the latest improved clock system and the "Bamag" pressure apparatus, in conjunction with an experiment suggested by the Committee.

The following are the Committee's findings: "(1) The possibility to light and extinguish public lamps automatically is established. (2) That this can be accomplished by (a) the pressure-wave system, (b) the clockwork system, or (c) a combination of both systems. (3) That there is a considerable saving with automatic lighting over present-day methods in wages, lamp maintenance, and gas consumption, especially as a system of alternate lighting (say from midnight) is permissible. (4) That the pressure-wave system, centrally controlled, outweighs in advantages any clockwork system. (5) The Alder and Mackay type appears to be at once efficient, simple, and less costly than others seen in actual operation."

The deputation recommend that a trial of 250 Alder and Mackay's controllers be made forthwith. Such an experiment, which would, they say, cover a distinct "section," would enable a concise estimate to be formed of the actual saving to be obtained. The deputation have, however, every confidence in stating that, in their opinion, after paying off the interest and redemption on the capital cost of the automatic apparatus, and allowing a liberal margin for contingencies, there would be a clear saving of from £2000 to £3000 per annum on the present cost for public lighting.

Hunstanton Gas Supply.—At the last meeting of the Gas and Water Committee of the Hunstanton Urban District Council, the Gas Manager (Mr. P. E. Hart) presented his carbonizing statement for the year ended March 31: Coal used, 1500 tons 18 cwt.; gas made, 16,357,000 cubic feet; gas sold and used, 15,479,650 cubic feet; increase in gas made compared with the year 1907-8, 1,738,000 cubic feet; increase in gas sold and used, 1,893,650 cubic feet; average proportion of gas unaccounted for during the year, 5·3 per cent. of the make.

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DUNDEE CORPORATION GAS SUPPLY.

The Corporation of Dundee met as the Gas Commissioners on Wednesday last to consider the accounts of the Gas Department for the year ending April 30, particulars of which were given in the "JOURNAL" for the 1st inst., page 593. Lord Provost Urquhart presided.

There was submitted a supplementary report by the Auditor, in which it was set forth that the amount authorized to be borrowed had been exceeded by £17,068, and that there was in the bank, on current and deposit account, £12,363. The sum required to be set aside for sinking fund was £1000 a year. As the whole amount of £40,000 had now been set aside, it was a question whether further instalments required to be made. He pointed out that no allowance for depreciation had been charged with respect to certain plant. The difference in the original cost of the Dudhope Crescent Electricity Station (to be used as a sub-station) was stated at £21,983; and of this amount, £5966 had been charged to revenue. No provision had been made for depreciation; and a proportion of certain capital expenditure had been charged to revenue.

Treasurer Soutar moved the adoption of the accounts, which, as previously stated, provided for a reduction in the price of gas by 1d.—making it 2s. 3d. per 1000 cubic feet. The reduction in the rate they might regard as permanent. A suggestion had been made that as the rate diminished, so did the quality of the gas. From all inquiries and the assurances they had received from the responsible officials, however, there seemed to be no substantial ground for this. Underneath the estimates for the current year there were evidences of vim and vitality and progress. For several years it had been under consideration that something should be done by the Department with the view of providing cheap gas for gas-engines. This year proposals had been made for a differential rate, which was equitable alike to the consumers and the Commissioners, and which would have the effect of acting as a feeder and a help to various industries in the city. There was also a proposal to extend the principle which commenced with the introduction of cooking appliances and gas-fires. At a former meeting, Bailie Martin had very properly pointed out that a public department was not expected to enter into cut-throat competition with parties in the trade. The Gas Department, however, had no intention of doing anything of the kind. They had not crossed the border-line in their proposals up till now; and he considered that the proposals relative to gas-fires were eminently fair and reasonable.

Mr. J. Reid, the Convener of the Gas Committee, in seconding, said that in the matter of gas-fires they were not taking the trade from the ironmongers; they were proposing to hire stoves to the great body of ratepayers, who in no circumstances would become purchasers.

Bailie High called attention to their having over-borrowed to the amount of more than £17,000; while they had £12,480 in the bank. They had £7362 on current account, for which they got nothing, and £5000 on deposit receipt, for which they would be getting probably

1 per cent. Why should they over-borrow, paying 3½ per cent., when they had money in the bank?

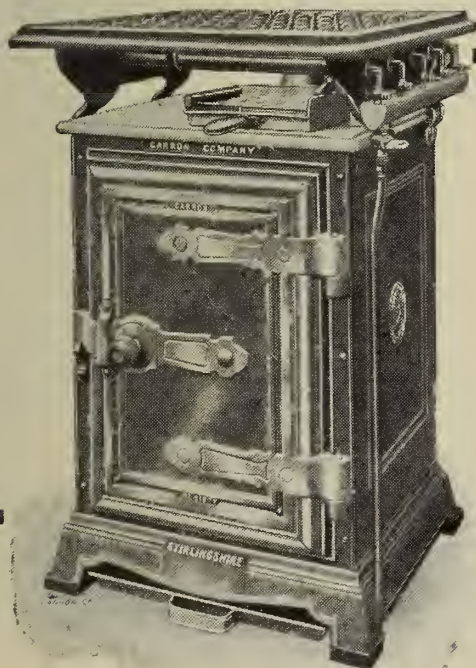
Treasurer Soutar explained that there was an expectation that they would have to repay a loan; but it had not been called for. This accounted for over £12,000 being in the bank.

The estimates and proposals of the Committee were adopted.

GAS EXHIBITION AT HORNSEY.

As briefly mentioned in the "JOURNAL" last week, an interesting and instructive gas exhibition is being held in the Parish Hall, Edison Road, Crouch End, under the management of the Hornsey Gas Company. The Davis and Richmond Gas-Stove Companies are showing their various makes of gas cookers, grillers, &c.; and cookery lectures, which are well patronized, are given twice daily by Mrs. Godfrey Sutcliffe, who in her demonstrations uses alternately the cookers of the above-named makers. An attractive and pleasing exhibit is that of the Bland Light Syndicate, Limited; all the gas-fittings on their stand being of the best make and finish. The Edgar system of high-pressure lighting is the one installed for the illumination of the hall. The power required for driving the compressor is supplied by a small and compact hot-air engine; and the compressor is capable of supplying twelve 300-candle power burners. The whole plant occupies the small floor space of 2 square feet—a fact which has aroused much comment among the visitors. The main hall is lighted by a "Taj" lamp and four No. 16 high-pressure lamps. In the "Taj" lamp is fixed a three-light cluster of brass high-pressure burners, the whole combined giving a powerful diffusive light equal in illuminating power to 1000 candles. The No. 16 lights have one burner each; the candle power of each burner being 600. Mr. Edgar's stand is furnished with a complete collection of gas lighting and heating appliances; one of his most up-to-date introductions being a neat and attractive inverted outdoor lamp called the "Reqs," made for one or three burners. The casings are constructed of copper, and the burners are of the finest cast brass. One of the three-light "Reqs" is utilized for the illumination of the entrance to the hall. "King" and "Eclipse" lamps are also shown. The "Blenheim" gas-fire is still gaining in popularity; and the several parts of which it is composed make this an interesting exhibit. The "Cutmore" greenhouse heater deserves mention. This apparatus has been introduced during the last few months, and has met with much success. The burner chamber is of cast iron, with a heavy copper boiler; while the burner itself is of cast brass, and consumes only from 5 to 7 cubic feet per hour. Other interesting exhibits are the Edgar pattern geysers, the interiors of which are of tinned copper throughout, while the whole of the casing is of heavy polished copper. The valves and fittings on all the patterns are of the finest brass. The most recent type is the Edgar automatic safety geyser. In the event of the water supply failing, the gas is automatically turned off; the pilot-jet only remaining alight. This makes it impossible for the interior to be burnt.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Dundee Gas Department for the past year, which were adopted by the Town Council on Wednesday, disclose that the gas sold—875,347,000 cubic feet—was the largest quantity ever sold in any single year, and exceeded the previous year by 49½ millions. The price is now 2s. 3d. per 1000 cubic feet, which is the lowest ever reached in Dundee. During the year, the capital account was increased by £13,610; but the capital per million cubic feet of gas delivered fell from £442 to £433. There is a sinking fund amounting to £11,171. From all points of view the Gas Department in Dundee is, in the words of Treasurer Soutar, in good circumstances. Such a large increase in the consumption of gas, in a year in which decreases have been more experienced, would seem to point to the industrial activity of Dundee having been well maintained.

In the Dunfermline Town Council on Monday, the Gas Committee submitted estimates for the current year, which had been prepared by Mr. A. Waddell, the Engineer and Manager. These showed an anticipated credit balance of £357. The Committee recommended that the prices charged for gas should be the same as last year, with the exception of that for prepayment meter consumption, which is reduced by 1d. Mr. T. Stewart, the Convener of the Committee, in moving approval of the estimates and recommendation, said that the reduction to prepayment meter consumers was an equivalent to the abolition of meter-rents and stove-hires, upon the basis of which the estimates had been prepared. These represented a considerable item in the revenue. The Committee could have reduced the price of gas to the general consumers; but it was thought that the abolition of meter-rents and stove-hires was the better course to adopt. The reductions would apply to Limekilns and Charlestown. If, by reducing the charges, they could increase the consumption of gas, that would be beneficial both to the Corporation and the consumers. The increased make of gas during last year amounted to 9 million cubic feet; there having been a record output of 126 millions. An ample sum had been taken out of revenue to keep the works in first-class condition. At the present time the works were in such a state that, although bad times should come against them, he did not think the community need have any fear of a substantial increase in the price of gas. The recommendations of the Committee were adopted. It was reported that the Gas Committee had withdrawn, meantime, their offer to the Dunfermline District Committee to light Crossgates with gas.

It was reported to the Peebles Town Council on Monday that the quantity of gas made in the year ending May 15 was 36,355,400 cubic feet—a decrease of 322,200 cubic feet upon the previous year.

The first annual general meeting of shareholders of the recently constituted Leven and Methil Gaslight Company, Limited, was held on Monday last. In submitting the balance-sheet, the Chairman—Mr. A. Hogg—said the Directors felt that they could congratulate the Company on the result of the first year's working. They were able to recommend a dividend of 6½ per cent., and to carry forward a substantial sum to the reserve account. The foresight of the Directors, who five or six years ago resolved to extend the supply to Methil, had been justified by the great increase in the gas consumption, which amounted to 36 million cubic feet last year, as compared with 18 millions five years ago. The price of gas had been reduced by 5d. in Leven and 2½d. in Methil.

The Arbroath Town Council on Monday reduced the price of gas by 2½d. per 1000 cubic feet, making it 2s. 8½d., with rebates for gas used in gas-engines of 2½d. per 1000 cubic feet up to 250,000 feet, and of 5d. above that quantity. The price of gas consumed through prepayment meters has now been reduced to 3s. 1½d. The Council considered the report on the gas-works by the Manager—Mr. A. C. Young—which has already been referred to in this column. In speaking to it, Bailie Smith, the Convener of the Gas Committee, said it compared favourably with that of any previous year. The suspense account had been practically cleared off; but it would begin again, on account of the new holder and condensers. For the first time in the history of Arbroath, the price of gas was now as low as 2s. 8½d.

The Directors of the Stirling Gas Company have fixed the prices of gas, as from May 15 last, at: To ordinary consumers, 2s. 6d. per 1000 cubic feet—a reduction of 4d.; for gas-engines, 2s.—a reduction of 4d.; and to prepayment meter consumers, 2s. 10d.—the same as last year.

A statutory meeting of the newly-formed Fauldhouse Gas Company was held on the evening of Monday last—Mr. W. Prentice, the Chairman, presiding. The Chairman reported that 3000 shares of the Company had been issued. The shares were £1 each, and upon each 10s. had been paid; making the receipts £1500. The amount expended upon construction to May 31 was £306. The report of the Directors was adopted, on the motion of Mr. T. Wilson, of Coatbridge, the Engineer to the Company; and the Board of Directors were re-elected.

In the Wishaw Town Council on Monday, Bailie Bell, the Convener of the Gas Committee, referred to the report upon the gas-works by Mr. T. Wilson, of Coatbridge, and moved that the new plant recommended be obtained, but that the ovens remain as they are, while the 9-inch pipe at the gas-works be removed and replaced by a 12-inch one. He also proposed that a Livesey washer be erected, and a further set of pipe condensers; and that two retort-house governors be fitted up. Mr. Loudon moved that eight retorts be placed in each of the larger ovens, and six in the smaller ones, and that they do not expend more money in the meantime on the condensers or retort-house governors. He had no objection to the Livesey washer. He thought the report of the expert justified the position he took up when he was Convener of the Gas Committee. Provost Thomson moved, as a further amendment, that the works be carried on as they were at present, with the exception that the 9-inch pipe might be replaced by a 12-inch one. At the same time he thought that eight retorts should be put into each oven, as they had been before. It was his opinion still that the works had been mismanaged; and he could only accept the expert's report in so far as it coincided with his own experience. If their plant were

APPRECIATIONS.

SERIES No. 4.



From photo. supplied by our Correspondent at Belper.

Mr. Hy. GILLETT, Sanitary Plumber and Hot Water Engineer, BELPER, writes:

May 18, 1909.

"I have used your Richmond No. 100 Model Cooker for nearly 20 years, during which time it has given every satisfaction. It has been a great saving in coal and labour, besides a great convenience. I would not be without it. You may be interested to see a photograph of this Cooker, which must have been one of the first of your make."

We made, 20 years ago, our "Model" Cooker with Removable Burners and parts. All Makers TO-DAY have adopted them. Maintenance has been reduced to a minimum by our up-to-date construction.

THE RICHMOND GAS STOVE & METER CO., LTD.

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON.

sufficient, if properly wrought, there was no reason why they should spend money for new machinery. The motion by Bailie Bell was adopted by six votes to three. The recommendations of the Gas Committee as to coal were adopted.

The output of gas at Broughty Ferry last year was 1,733,000 cubic feet more than in the previous year. The financial results have been most satisfactory, and a substantial credit balance has been assured.

In the Tayport Town Council on Monday, Mr. Allan moved that the Council offer the Ferry-Port-on-Craig Gaslight Company, Limited, £2750 for their undertaking, works, and property, the Company to discharge all debts, subject to details being arranged to the satisfaction of both parties; and that a remit be made to a Committee regarding the matter. The motion was agreed to, Mr. Scott dissenting.

The Inverurie Gaslight Company had an income last year of £1428, and an expenditure of £1047; leaving £381 as profit. Of this sum, £99 has been allowed for depreciation; £146 has been absorbed in paying a dividend of 6½ per cent.; and £136 has been carried forward. The price of gas for cooking and heating has been reduced from 5s. to 4s. 7d. per 1000 cubic feet.

The Dalbeattie Gaslight Company have paid a dividend of 6 per cent., and have reduced the price of gas from 5s. to 4s. 7d. per 1000 cubic feet.

A public meeting, called by the Town Council, was held in Carnoustie on Tuesday evening, to consider the subject of the taking over of the gas undertaking. The Council have offered £16,000; but the Directors of the Gas Company have declined this sum. Although no figure has been mentioned authoritatively, it is understood that the Directors of the Company look upon £23,000 as a fair price. Provost Walker, who presided, stated that the Town Council had engaged an expert, who had gone over the works and everything connected therewith, and had given them his report and the price they should pay. Ex-Provost Soutar considered it was absolutely necessary that they should take over the gas-works, either now or at some future time. He reckoned that the gas consumers in Carnoustie had contributed, in the price of gas, £8000 to £10,000 of the capital in the gas concern; and they did not have a share. Mr. Ferrier suggested that before adopting the Gas Act, they should make one more effort to come to an arrangement with the Directors. He suggested that three members of the Town Council, with three gentlemen nominated by that meeting, should meet in conference with three of the Directors, to see if they could not arrive at a figure which would be satisfactory to all concerned. This course was unanimously adopted; and the nominations were made.

At a meeting of the Largs Town Council this week, intimation was made of an action for damages, in which claims are made for £1500, £1000, and £700 respectively, in respect of gas poisoning, said to have been due to a road-roller breaking gas-pipes in New Street, and the escaping gas getting into the houses. The action has been intimated to the Insurance Company with whom the Corporation have insured their employees and covered third-party risks. It was reported to the Council that two other claims had been settled for £2.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 19.

Demand has improved as the week has progressed, and, available supplies not being too abundant, there has been a slight improvement in values at all points. The closing quotations are £11 1s. 3d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Leith. For near months small premiums on prompt prices have been paid. For delivery up to the end of the year, buyers' views are hardly above £11 5s. per ton, whereas makers are asking a premium on this price of 2s. 6d. to 5s. per ton, according to port. There is a similar divergence in ideas for delivery over the spring months. Consequently, any business being done abroad is being taken speculatively.

Nitrate of Soda.

There has been a substantial decline in values on the Continent, but, local supplies being strongly held, spot prices are maintained at 10s. 4½d. per cwt. for 95 per cent., and 10s. 7½d. for refined quality.

Tar Products.

LONDON, June 21.

The markets for tar products have been firm throughout the past week, with the exception of carbolic acid, in which article business appears to be impossible at the present moment. Apparently the rise which took place a little while ago was entirely speculative; and as it received no support whatever from the manufacturers, the price has gone back to the level of about 1s. for 60's. Pitch is very firm; and though no business is reported, prices are certainly as strong as ever. But owing to the fact that manufacturers are fairly well sold, and there is no desire on the part of Continental buyers to purchase, it is doubtful whether any considerable business will be done for the next few weeks. Benzol 90 per cent. is steadier; and for prompt delivery a fair price is reported to have been paid. Fifty-ninety per cent. benzol is also slightly improved; but toluol remains unchanged. Solvent naphtha is decidedly easier, especially in the North. Heavy naphtha is quiet, and there is not very much business in this article. Creosote is steady, and the majority of manufacturers appear to be fairly well sold. Refined naphthalene is quiet; but salts maintain their price.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 27s. 6d. to 28s.; east coast, 27s. to 27s. 6d.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others, Benzol, 90 per cent., casks included, London, 6d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 6¾d. to 7d.; North, 6d. to 6½d. Toluol, casks included, London, 8½d. to 8¾d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 2¾d. to 3d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10¾d. to 11d.; North, 9¾d. to 10d. Creosote, in bulk, London, 2¾d. to 2½d.;

SAWER & PURVES,

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Prepayment Meters,
Ordinary Meters,
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Main Taps,
and Brasswork,
of every
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North, 2½d. to 2¾d. Heavy oils, in bulk, 2¾d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 1½d. to 1s., west coast 1½d. to 1½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been steady throughout the past week, and prices have hardened slightly all round. It is reported that Japan is again a buyer; and should she come into the market to any extent, it is bound to improve the prospects for this article. London Gas Companies still quote £11 10s.; but it is possible to buy outside makes on Beckton terms at £11 to £11 1s. 3d. In Hull, business has been done at £11 2s. 6d., and in Liverpool at £11 3s. 9d. In Leith, business is reported at £11 6s. 3d.; and the majority of manufacturers are now asking £11 7s. 6d. for prompt, and £11 10s. for forward.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has felt the influence of the unrest among miners. There has been a pressure to get coal away for this reason, and also because the great Tyneside holidays this week will lessen the output in some measure. Prices have varied a little, but perhaps less than might have been expected. Best Northumbrian steam coals are from about 12s. to 12s. 3d. per ton f.o.b., second-class steams from 10s. 9d., and steam smals from 5s. 3d. to 6s. 3d.; but the prices may change when the decision of the Welsh miners is made known. In the gas coal trade, the demand is full for the season, and the output appears to be well taken up. The prices of Durham gas coals vary from about 10s. to 11s. f.o.b., according to quality, for the usual classes; and up to 11s. 6d. for "Wear specials." The markets are generally firm, with rather heavy exports. As to contracts, a few small lots have been sold for some of the ports of the Mediterranean, at prices that should leave something like the current values at the pit. The Brussels gas coal contract has been divided—foreign collieries obtaining a large part of the order, and the rest (some 9000 tons) going to Yorkshire, owing to the higher prices of Durham. There is a firm market for coke. Gas coke is not much altered, though the output is low. Good gas coke is from 12s. 9d. to 13s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Business is restricted, and prices are firmer all round. There is still a belief among consumers that an agreement will be come to between the coalmasters and the miners as to wages, and consequently there is no greatly increased demand. On the other hand, coalmasters are practically declining to sell for forward delivery. The prices quoted are: Ell 9s. 6d., splint 9s. 6d. to 10s., and steam 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 321,915 tons—a decrease of 15,365 tons upon the preceding week, but an increase of 37,953 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,338,066 tons—an increase of 456,470 tons upon the corresponding period.

Coventry Gas Workers Pension Scheme.

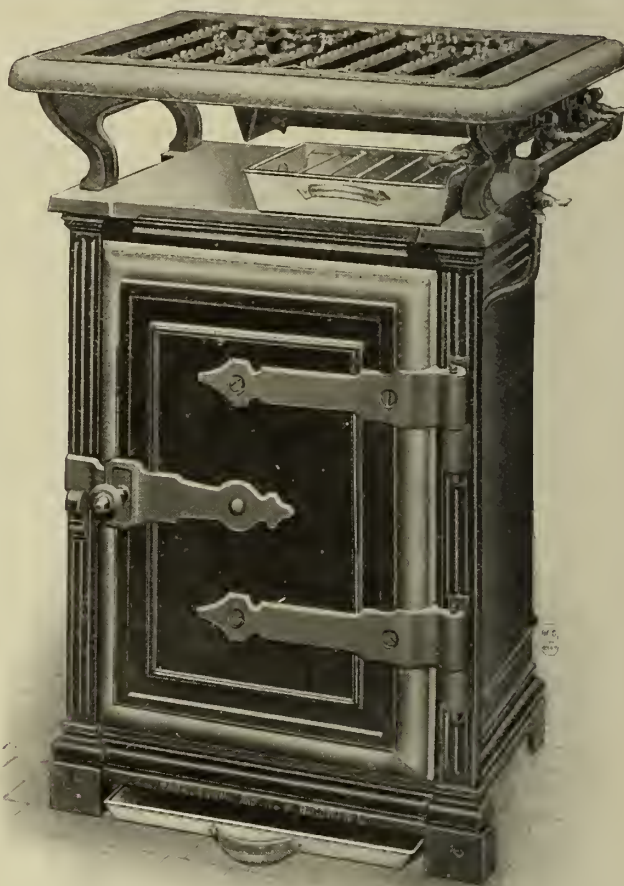
The reconsidered scheme of the Gas Committee of the Coventry Corporation for the establishment of pensions for displaced employees of the Gas Department, consequent upon the abandonment of the old works on the removal to the new buildings at Foleshill, came before the Town Council at their last meeting. The Chairman of the Committee (Mr. Councillor Batchelor), though proposing the adoption of the amended scheme—with its reduction of 2s. per man on the original scale—confessed that he was more in agreement with the more liberal payment; but the Council having asked the Committee to reconsider the whole matter, it was felt that it would be useless to bring up the same scale again. Mr. Bannington moved an amendment, rejecting the lower scale in favour of the old one. He urged that this would only mean an increase of about £60 in the total cost. He compared this with the expenditure of between £60 and £70 on the production of a souvenir of the opening of the new gas-works—an expense that Mr. Cash described as lavish and unnecessary. Incidentally, the last speaker referred to the cost of the new works, and said, in his view, the scheme was far in excess of requirements. Alderman Drinkwater said that, as one who voted for the matter being referred back (mainly on the ground that it might have been possible to retain the services of these men), he was now prepared to vote for the higher scale. The Council, on a division, adopted the Committee's original proposal, which allows of payments from 8s. to 14s. a week according to length of service.

Middleton Gas Undertaking.—In a paragraph which appeared in the last number of the "JOURNAL," it was stated that there had been a falling off in the profits of the gas-works in the past financial year. It appears that the gross revenue was £23,517, and the gross expenditure £15,593; leaving a gross profit of £7924, against £8880 before—a decrease of £956. The net profit was £1651, against £2460—a decrease of £809 10s. 11d. The reduced profit, says Mr. C. F. Broadbent, the Gas Engineer and Manager, is due to a combination of circumstances. While the price of coal has reached a very high figure, the losses due to the reduced consumption, and the low prices obtained for residuals through bad trade, have been severe. Excellent working results were maintained throughout the year, and repairs and extensions of plant, which are urgently needed, are being pushed on as rapidly as possible. The quantity of gas sold was 117,190,100 cubic feet—a decrease of 4,432,400 cubic feet, or 3.64 per cent., compared with the previous year. The consumption in mills, &c., fell 11.88 per cent. The leakage amounted to 9,848,300 cubic feet, or 7.61 per cent., against 6.12 per cent. in 1907-8. This is said to be chiefly accounted for by the increase in heavy motor traffic; roads not being constructed nor gas-mains laid to stand the excessive weight now carried.

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Landlords' Liability for Water-Rent.

The Crediton District Council were plaintiffs in an action tried at the Crediton County Court last Tuesday, in which James Buckingham, the owner of certain cottage property, was sued for £1 9s. owing in respect of water-rents for the property. Defendant said the water-rent had been levied for fifteen years; but he had never paid it. It had always been paid by his tenants, who had the benefit of the water; and he did not consider he was liable. The tenants had, as a matter of fact, tendered the money; but the collector had refused to accept it. The collector explained that the money was not tendered until after the issue of the summons. His Honour Judge Lush Wilson, in giving judgment for the District Council, said that if the tenants were liable to pay the water-rent, then the landlord was also liable. If the tenants chose to pay the rent, and if the District Council chose to accept it in discharge, that was a matter for those concerned. But the Council clearly had the statutory right to come down upon the landlord; and they were not bound to accept payment from the tenants.

A Water Board's Heavy Loss.—The Heywood and Middleton Water Board last Thursday reported a loss on the past year's working of £11,027. The deficiency for the previous year was £5007; and it was explained that the increased loss this year was due to a full year's interest having been charged on the Ashworth Moor new reservoir, which has cost £239,915 exclusive of £3796 for plant. The Board "without pleasure, but with feelings of regret," ordered precepts to be made on the Heywood and Middleton Corporations for sums of £5692 and £5335 respectively, to meet the deficiency.

Sale of Bristol Gas Stock.—Last Thursday, Mr. Nichols (Messrs. Geo. Nichols, Howes, Young, Alder, and Co.) offered for sale, in accordance with the recent announcement in our advertisement columns, £25,000 of 5 per cent. general capital stock and £10,000 of 4 per cent. new debenture stock of the Bristol Gas Company. The former realized prices ranging from £117 5s. down to £114 5s. (the reserve being £113); the entire issue bringing in £28,765 10s., or an average of £115 1s. 2d. per £100. The debentures fetched an average of £101 12s. 11d. (the reserve being £100); and they produced £10,164 15s.

New Joint-Stock Companies.—The Syva Indestructible Mantle Company, Limited, has been registered with a capital of £60,000, in £1 shares, to carry on the business of incandescent mantle manufacturers, gas-burner makers, &c. The Syva Mantle Syndicate, Limited, consent to the registration. The offices are at Suffolk House, Cannon Street, E.C. The Mazza Centrifugal Gas Syndicate, Limited, has been registered with a capital of £35,000, in £1 shares, to adopt an agreement between Edoardo Natale Mazza and H. A. Bourich; to acquire any invention or machinery in connection with the separation of air, or any other gaseous mixtures, compounds, liquids, and other bye-products and processes; to develop and turn them to account; and to carry on the business of founders, engineers, millwrights, machinists, wheelwrights, &c. One of the first Directors is Mr. C. B. Tully. Among other registrations during the past week are the Golden Gleam Mantle Syndicate, with a capital of £10,000, in £1 shares; and the United Tar and Chemical Company, with a capital of £10,500, in 10,000 preferred shares of £1 each and 10,000 deferred shares of 1s. each.

Birmingham Gas Department Figures.—We have received from Mr. Thomas H. Clare, the City Treasurer of Birmingham, a copy of the detailed accounts prepared by him for the twelve months to March 31. Those relating to the Gas Department furnish some figures in addition to what were given in the "JOURNAL" for May 4 (p. 320). The revenue account shows a balance of income in excess of expenditure of £190,302 for 1908-9, carried to profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £71,459. The amount of capital expended during the year was £25,511; and the value of buildings and plant abandoned, &c., was £59,041. The total expenditure on capital account to March 31, 1909, was £2,476,325. The amount of the reserve fund provided out of revenue, with accumulations, was £100,000; while the gross total of loans negotiated, including annuities, was £2,908,949. The amount provided from revenue for redemption of debt during 1908-9 was £45,375; and the gross amount provided for redemption of debt to the end of the year was £882 567. The balance of loans remaining to be provided for was £2,026,382.

Explosions in Bermondsey.—A report was presented at the meeting of the Bermondsey Borough Council last Tuesday on two explosions which have recently occurred in the district. These accidents, following upon the serious explosion towards the close of last year in Grange Road, which caused two deaths, have created a feeling of uneasiness among the inhabitants. In his report, the Borough Engineer says: "It was reported to the General Purposes Committee on April 21 that there had been an explosion in Long Lane, which was supposed to be due to the overcharge of the London County Council's sewer. The effect was to blow up the footpath and to disturb about 54 square feet of York paving. The explosion was accompanied by a loud report, which caused much alarm to the tenants of the neighbourhood. At the same time a very large quantity of water was emitted from the opening. A letter of complaint was sent to the Chief Engineer of the London County Council; but no reply was received. Again, on the morning of May 25, another explosion occurred at the same place, presumably from the same cause. This second occurrence caused considerable excitement among the residents, and has rendered them in a state of fear of possible consequences that might arise to passers-by; and it is suggested that a strong letter of complaint should be sent to the Main Drainage Committee of the Council, calling upon them to take such measures as will prevent the recurrence of like accidents. On this second occurrence, about 100 square feet of paving were blown up, and the post-office box was disturbed; and since the Borough Council have their electric main close by, there is imminent danger of serious consequences to the installation taking place."

"CANNON"

Imperial Exhibition,
Shepherd's Bush, W.

SMOKE ABATEMENT.

See the **REPORT** of the
COAL SMOKE ABATEMENT SOCIETY

17th November, 1906.

The following is from Table II. of the
Report giving Particulars regarding Eight of
the Best Gas-Fires tested.

MAKER AND STOVE.

1. CANNON CO.'S "IRIS"
2. "A"
3. CANNON CO.'S "VICTORY"
(LARGE)
4. "B"
5. "C"
6. "D"
7. "E"
8. "F"

See columns for details in full report in "Lancet,"
17th November, 1906, page 1366, and "Journal of
Gas Lighting," 20th November, 1906, page 540.

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Exmouth Water Supply.—After a fortnight's continuous pumping, the operations at the Dotton borehole in connection with the proposed augmentation of the water supply of Exmouth have been suspended. The results of this test have been most satisfactory. An average yield of about 45,000 gallons per hour, or more than a million gallons per day, has been obtained; and there is no indication that the abundance of the supply has been in any way affected. Mr. Hill, the Engineer, who visited the works last week, expressed himself as thoroughly satisfied in every way; and there appears to be no doubt that the people of Exmouth have now the means of settling in a definite way the question of the water supply for a very long time to come. The present supply is about 300,000 gallons a day; so that the Dotton well will yield sufficient water for a much greater population than is now to be served. It is expected that the necessary steps will be taken to promote again next session the Bill which an adverse vote of the ratepayers prevented the District Council from proceeding with this year.

A Cornish Village Water Supply.—An inquiry was held at Polruan, a Cornish fishing village, last Tuesday, by Mr. H. A. Reed, a Local Government Board Inspector, respecting the water supply. It transpired that for many years this was vested in feoffees, but that at the Diamond Jubilee of Queen Victoria they made a gift of it to the village. Since then it has been managed by the local landowners, who have connected the houses of all persons willing to pay the local rate. Both the supply and the management were said to have given complete satisfaction to all the villagers except two, and these, after failing to induce the District Council to acquire the water supply, moved the Local Government Board to take action. The Clerk to the District Council admitted that the position was anomalous and irregular; but he pleaded that it was what the people liked, and that the landowners had acted with the sole desire to benefit the village. The fact that the inhabitants are satisfied with the existing state of things was emphasized at the close of the inquiry by a hostile demonstration against one of the persons who had made complaint.

Petersfield Water Supply.—At the meeting of the Petersfield Urban District Council last Tuesday, the Chairman (Mr. W. C. Burley) stated that, as the result of considerable negotiation, Mr. Charles W. Seward, a member of the Council, obtained the option to purchase Oakshott Farm, Hawley, the property of Sir Jonathan Hutchinson, on which there is an abundant water supply of excellent quality. Mr. H. W. Taylor, the Engineer of the Liss Water-Works, was employed to test the springs, and reported that without tunnelling they would produce 150,000 gallons per day. The springs are sufficiently high to enable the water to be brought into the Council's present reservoir by gravitation, and thus save all the expense of pumping. The purity of the water is undoubted, and it would not require filtration. The site is about 138 acres, including 50 acres of hop land, farmhouse and buildings, and five cottages. The purchase-money was £5100. Mr. W. G. Nicholson, M.P., had very kindly consented to provide the money at the low rate of 3½ per cent. until the scheme was sanctioned by the Local Government Board. At a previous meeting, it was decided to purchase the site, and a cheque was drawn for the deposit.

Water Supply of Saltash.—Mr. H. A. Reed held an inquiry at Saltash last Wednesday, on behalf of the Local Government Board, with reference to an application by the Town Council for power to borrow £2000 for works of water supply. Mr. F. E. Cleverton, the Town Clerk, explained that the water was obtained from the Plymouth Corporation, and had been conveyed across the River Tamar by a 5-inch steel pipe laid in the bed of the river. During the past five years, the pipe had burst three times in the river; and there had been eight instances of its hursting on the foreshore. This had caused much inconvenience, and the cost of the repairs—especially those which had to be done under water—was considerable. An agreement had accordingly been made with the Great Western Railway Company for carrying the water-main across the Royal Albert Railway Bridge. Mr. H. Bulteel, the Engineer for the scheme, said the new pipes had been laid and tested, and it was found that they gave very satisfactory results.

Experimental High-Power Lighting at the Chichester Railway Station.—An interesting experiment is being carried out, by the courtesy of the Railway Company, in high-power lighting at the Chichester Station. The new lighting is by gas compressed to from 8 to 10 inches of water; the compressor used being by the Scott-Snell Vacuum Gas Compressor, Limited, of Westminster. The two large burners at the railway bridge are by the James Keith and Blackman Company, Limited, and are of 600-candle power each; the other pair being by Messrs. George Bray and Co., Limited, and of about 300-candle power each. The installation is a tentative one, and has been put up by the Chichester Gas Company, under the supervision of Mr. T. E. Pye, the Engineer and Manager, to ascertain the capabilities of the system as applied to combination lighting of both large and small units. The efficiency per cubic foot of gas burned is stated to be very high; and from the work so far done the cost promises to be about 1½d. per 1000 candle power inclusive.

Halifax Reservoirs Claims Settled.—An important meeting of the Halifax Town Council was held last Wednesday, to consider a proposed settlement between the Corporation and the Executors of Mr. Enoch Tempest, the Contractor for the Walshaw Dean Reservoirs. The Water Committee advanced Mr. Tempest, during the construction of the reservoirs, about £23,000, which has not been repaid. On their part, the Executors preferred a claim for £80,000, alleged to be due for different works carried out beyond the contract. Extra works, it was admitted, had been executed in connection with the removal of additional peat from the beds of the reservoirs, and in the introduction of extended "beaching" on the sides; but it was claimed that all had been paid for on a schedule of prices previously arranged. It was stated that a settlement had been effected, under which the claim for £80,000 was to be abandoned, and the Corporation were to forego their claim for the £23,000 advanced. The Council passed a resolution agreeing to this. The original estimate of the cost of the reservoirs was about £170,000; but the outlay actually made upon them exceeds £300,000.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 804.

Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue	Share.	When ex- Dividend.	Dividend or Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½-18	..	5 11 1	195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
298,955	10	"	7	Do. 7 p.c.	12½-13	..	5 7 8	561,000	Stk.	Feb. 25	10	Liverpool United A.	226-228	+1	4 7 9
210,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	9-100	..	4 0 0	718,100	"	"	7	Do. B.	168-170	..	4 2 4
200,000	5	May 27	6½	Bombay, Ltd.	5½-5½	..	5 12 7	306 083	"	Dec. 30	4	Do. Deb. Stk.	105-107	..	3 14 9
40,000	5	"	6½	Do. New, £4 paid.	4½-4½	..	5 18 10	75,000	5	June 11	6	Malta & Mediterranean	48-48*	..	6 3 1
50,000	13	Feb. 25	14	Bourne 10 p.c.	28½-29½	..	4 15 9	550,000	100	Apl. 1	5	Met of 5 p.c. Deb.	100-102	..	4 18 0
51,810	13	"	7	mouth Gas B 7 p.c.	16½-17	..	4 2 4	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101-103	..	4 7 5
53,200	10	"	6	and Water Pref. 6 p.c.	15½-15½	..	3 15 7	541,920	20	May 27	3½	Monte Vid. Ltd.	12½-13	..	5 7 8
380,000	Stk.	"	12½	Brentford Consolidated	252-255	+2½	4 18 1	1,775,892	Stk.	Feb. 25	4½	Newcastle & Gt. S. d. Con.	106½-107½	..	4 3 9
300,000	"	"	9½	Do. New	194-196	+1	4 16 11	518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	92-94	+1	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½-20	..	5 0 0
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102*	+1	3 18 5	55,940	10	"	7	Do. 7 p.c.	13-13½	..	5 3 8
212,000	Stk.	Mar. 12	10½	Brighton & Hove Orig.	220-214	..	5 0 6	300,000	Stk.	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
246,320	"	"	7½	Do. A Ord. Stk.	154-156	..	4 19 4	60,000	5	Mar. 31	8	Ottoman, Ltd.	6-6¼	..	6 8 0
467,000	27	Apl. 16	10	British	42½-43½	..	4 12 6	31,800	53	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	110-121	..	4 19 2	60,000	50	"	13	Do. B.	129-131	..	4 19 3
165,700	"	"	4½	Do. B 3½ p.c.	80-91	..	4 18 11	100,000	50	"	12	Do. C.	119-121	..	4 19 2
82,278	"	"	3½	Do. C 5 p.c.	108-110	..	5 0 0	114,800	50	"	10	Do. D and E.	101-103	..	4 17 1
50,000	"	Dec. 30	5	Do. 3½ p.c. Deb.	89-91	..	3 16 11	398,490	5	May 13	7	Primitive Ord.	6½-7	..	5 0 0
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½-14½	..	4 18 3	795,850	5	Jan. 28	5	Do. 5 p.c. Pref.	54-5½	..	4 10 11
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	481,900	100	June 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
100,000	13	"	—	Cape Town & Dis., Ltd.	4-5	..	—	1,000,000	10	Apl. 29	8	River Plate Ord.	14½-15½	..	5 4 11
100,000	13	"	—	Do. 4½ p.c. Pref.	54-56	..	—	312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95-97	..	4 2 6
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	250,000	10	Mar. 31	8	San Paulo, Ltd.	13½-14½	..	5 12 3
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	80-82	+2	5 9 9	62,500	10	"	6	Do. 6 p.c. Pref.	11½-12½	..	4 18 0
157,150	Stk.	Feb. 25	5½	Chester 5 p.c. Ord.	109-111	..	4 10 1	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50½-51½	..	4 17 1
1,493,280	Stk.	Mar. 12	5½	Commercial 4 p.c. Stk.	108-110	..	4 14 6	135,000	Stk.	Mar. 12	10	Sbeffield A.	236-238	..	4 4 0
570,000	"	"	5	Do. 3½ p.c. do.	10½-105	..	4 15 3	269,984	"	"	10	Do. B.	233-235	..	4 5 1
475,000	"	"	5	Do. 3 p.c. Deb. Stk.	81-83*	..	3 12 3	523,500	"	"	0	Do. C.	231-236	..	4 4 9
800,000	Stk.	June 11	5	Continental Union, Ltd.	96-98*	..	5 2 0	70,000	10	June 11	10	South African.	13½-14*	..	7 2 10
200,000	"	"	7	Do. 7 p.c. Pref.	135-137*	..	5 2 2	6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122-124	..	4 6 0
492,270	Stk.	"	5	Derby Con. Stk.	121-123	..	4 1 4	1,895,445	"	Jan. 1	3	Do. 3 p.c. D-b.	85-86	..	3 9 9
55,000	"	"	4	Do. Deb. Stk.	103-105	..	3 16 2	209,821	Stk.	Mar. 12	8	South Shields Co., Stk.	152-154	..	5 3 11
148,995	"	Mar. 31	4	East Hull 5 p.c. Ord.	100-102	..	4 18 0	605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
486,090	10	Jan. 28	12	European, Ltd.	24½-24½	+½	4 17 0	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 10s. paid.	184-184	+½	4 16 0	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
15,191,545	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0	502,310	Stk.	May 13	5	Southampton Ord.	110-112	..	4 9 3
2,600,000	"	"	3½	light 4½ p.c. max.	88-89	..	3 18 8	120,000	Stk.	Feb. 25	6½	Tottenham A 5 p.c.	132-134	..	5 0 9
3,799,735	"	"	4	Do. 3½ p.c. Con. Pref.	105-107	..	3 14 9	423,940	"	"	5½	Do. B 3½ p.c.	111-113	..	4 12 11
4,193,975	"	June 11	3	Coke 4 p.c. Con. Deb.	94-95*	..	3 10 7	149,470	"	Dec. 30	4	Edmonton 4 p.c. Deb.	101-103	..	3 17 8
253,740	Stk.	Mar. 12	3	Hastings & St. L. 3½ p.c.	93-95	..	5 0 0	182,380	10	Jan. 11	8	Tuscan, Ltd.	9-9½	+½	8 8 6
82,590	"	"	6½	Do. do. 5 p.c.	113-120	..	5 4 2	149,900	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½-18	..	6 2 3	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	109-111	+4	4 10 1
123,570	Stk.	Mar. 12	6½	Ilford A and C	140-142	+2	4 11 7	255,610	Stk.	Feb. 25	6½	Wands B 3½ p.c.	139-141	..	4 12 2
65,790	"	"	5	Do. B	106-108	+1	4 12 7	79,416	"	Dec. 30	3	Do. 3 p.c. Deb. Stk.	73-75	..	4 1 1
65,790	"	Dec. 30	4	Do. 4 p.c. Deb.	102-104	..	3 16 11	835,872	"	Feb. 25	5½	West Ham 5 p.c. Ord.	121-123	..	4 5 4
4,940,000	Stk.	May 13	8	Imperial Continental	179-181	..	4 8 5	210,000	"	"	5	Do. 5 p.c. Pref.	126-128	+1	3 18 2
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95-97	..	3 12 2	253,300	"	Dec. 30	4	Do. 4 p.c. Deb. Stk.	107-109	..	3 13 5

Prices marked * are "Ex div."

Public Lighting of Marylebone.—At the meeting of the Marylebone Borough Council last Thursday, the Lighting Committee reported that they had considered a letter from the Gaslight and Coke Company, stating that they were prepared to contract for the lighting of the 35.8 gas-lamps at present in use in the borough, and for their maintenance in the highest state of lighting efficiency on the following terms: (1) A contract to be entered into for a period of three years from the 1st prox., and thereafter until terminated by six months' notice from either party, to include the whole of the street-lamps at present lighted by gas in the borough; the Council to have the right to increase or decrease the number at any time within the contract period for any purpose other than the substitution of another illuminant. (2) The Company to supply gas to, light, extinguish, clean, paint two coats annually, repair, and maintain in thoroughly efficient lighting order, the lamps at the following rates of charge: Lamp containing one burner consuming 4 cubic feet per hour, £3 1s. 7d. per annum; 4½ cubic feet, £3 4s.; 4½ cubic feet and bye-pass, £3 7s. 10d. Lamp containing two burners consuming 8½ cubic feet per hour, £5 10s.; 8½ cubic feet and bye-pass, £5 17s. 9d. Lamp containing three burners consuming 12½ cubic feet per hour, £8 3s. 6d.; 12½ feet to 1 a.m. only, £6 1s. At these prices, the gas-lamps would cost the Council £14,120 per annum—a saving of more than £860 per annum compared with what the Company understand to be the present total cost.

On Tuesday last eleven shares of £5 each, and forty shares of £10 each, of the Coatbridge Gas Company were exposed for sale; and the prices realized were £12 10s. and £17 10s. respectively.

The Swansea Town Council have accepted Messrs. John Aird and Sons' tender for constructing a second line of pipes to the Cray Water-Works, amounting to £99,738 in value. The undertaking has already cost the town half-a-million sterling.

At the last meeting of the Directors of the Reading Gas Company, tenders for £5000 of 4 per cent. perpetual debenture stock were opened, and allotments made. The tenders amounted to over £12,000; and the average price realized was 104½ per cent.

At the Armoury, Stockport, yesterday evening, an exhibition of gas appliances, comprising samples from all the leading stove makers, was opened under the auspices of the Gas Department, and will be continued till Friday; cookery lectures being delivered twice daily by Miss Crichton.

The Directors of the European Gas Company, Limited, have decided to recommend the payment of the same dividend and bonus as last year—viz., 10s. per share on the fully-paid shares, and 7s. 6d. on those on which £7 10s. has been paid; and a bonus of 2 per cent. on all shares, according to the amount paid thereon.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

DRAUGHTSMAN. No. 5107.
AGENTS. Julius Norden, 44, Farringdon Street, E.C.
IMPROVER TO GAS-FITTING. No. 5110.

Situations Wanted.

ENGINEER AND MANAGER OR ASSISTANT. No. 5104.
FITTER OR FOREMAN FITTER. No. 5108.
SECRETARY, MANAGER, OR ACCOUNTANT. W. B. Mimmack, St. Paul's Cray.
SLOT COLLECTOR AND CLERK. No. 5109.
SULPHATE LEADWORK. Leadburner, 117, Galloway Road, Shepherd's Bush.

Correspondence Classes.

CORRESPONDENCE COLLEGE COMPANY. Department B., Cambridge.

Patent Licences.

EXTRACTION OF AMMONIA FROM DISTILLATION GASES. Haseltine, Lake, and Co., Chancery Lane, W.C.

Plant, &c. (Second-Hand), for Sale.

ASCENSION PIPES, &c., CONDENSERS, PURIFIERS, GOVERNOR, ENGINE AND EXHAUSTERS, WEIGHBRIDGE, &c. Draycott Gas Company.
EXHAUSTERS, &c. Stirling Gaslight Company. Tenders by June 30.
GAS-WORKS PLANT. Long Eaton Gas Company.
PURIFIERS, &c. Sutton Gas Company.
STATION METER. T. G. Marsh, Manchester.
"JOURNAL" VOLUMES. Gregory, Wealdstone.

TENDERS FOR

Coal and Cannel.

ACCINGTON GAS AND WATER BOARD. Tenders by July 6.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 19.
PONTYPRIDD URBAN DISTRICT COUNCIL. Tenders by June 28.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by June 29.
STRETFORD GAS COMPANY. July 10.

Cookers.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.

Fire-Clay Goods.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.

General Stores (Lead, &c., Tubing, Barrows and Rake Heads, Oils, Tallow, Paints, Sulphuric Acid, Gaskin, &c., Brushes, Rubber Tubing, &c., Timber, Castings, Iron and Steel).

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.
SALFORD GAS DEPARTMENT. Tenders by July 1.

Incandescent Materials.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.

Lamps and Copper, Pendants, Brass Fittings and Sundries, Slot Fittings, &c., Main Taps, and Locks.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.
SALFORD GAS DEPARTMENT. Tenders by July 1.

Lime.

MANSFIELD GAS DEPARTMENT. Tenders by June 19.

Meters.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.
SALFORD GAS DEPARTMENT. Tenders by July 1.

Oil for Gas Manufacture.

MANCHESTER GAS DEPARTMENT. Tenders by July 1.
PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.

Pipes, &c.

PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.
SALFORD GAS DEPARTMENT. Tenders by July 1.

Retort-House Governors.

WISHAW GAS DEPARTMENT. Tenders by June 30.

Tar and Liquor.

CANTERBURY GAS AND WATER COMPANY. Tenders by June 26.
KESWICK GAS COMPANY. Tenders by June 23.
MANSFIELD GAS DEPARTMENT. Tenders by June 19.
PONTYPRIDD GAS DEPARTMENT. Tenders by June 28.

Washer and Condensers.

WISHAW GAS DEPARTMENT. Tenders by June 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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See Advertisement on p. 759.
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See illustrated advertisement, June 8, p. 1. of Centre.
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THE very best Patent Grids for Holding
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See Illustrated Advertisement June 1, p. 559.

GAS TAR wanted.

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WORKS: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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SULPHURIC ACID for Sale, specially
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For all Gas Joints.
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For all Ammonia Joints.

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MEADE-KING, ROBINSON, & CO.
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Enrichment, 18, EXCHANGE STREET, MANCHESTER, and
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"GAZINE" (Registered in England and
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SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges
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Tanks, Valves, Connections, &c. Also a few COM-
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TO Gas Managers, &c., Wanted, Old

Condensed GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim, Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
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J. WILSON, Pleasant Grove, York Road, King's Cross,
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PREPARED from Pure Iron.

Twice as Rich as Bog Ore.

Gives no back Pressure.

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FULL Courses now starting in Gas En-
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MR. W. B. MIMMACK, for many years

Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
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GAS Manager for rising Fifeshire Town.

This Situation is NOW FILLED. Testimonials
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J. DISHART, 23, Rutland Street, EDINBURGH.

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Recipients. Numerous unsolicited Testimonials. Write
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WANTED, A Situation as Engineer

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200 Million Cubic Feet per Annum, or ASSISTANT in
Larger Works. Advertiser is thoroughly familiar with
the Duties of either Position, including Office Work,
and working accounts, is a Practical Engineer and
Expert Draughtsman, thoroughly Steady and Reliable.
Full Particulars as to Qualifications and Character on
Application to No. 5104, care of Mr. King, 11, Bolt
Court, FLEET STREET, E.C.

SLOT Collector and Clerk, desires

change, any distance, 8 years' experience. Ex-
cellent References from previous employers.
Address No. 5109, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

WANTED, a Situation as Fitter or

FOREMAN FITTER in Gas Company. Has
had Seven Years' Experience as Fitter and 4½ Years' as
Foreman in Large London Gas Company. Age 34.
Good References. At Liberty at once.

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PLUMBER of Great Experience. Worked at Beckton,
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possible Prices. Own Plant. Any Distance for Odd
Work. Day or Contract.

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AGENTS wanted in all parts of the

Country with Good Connection among Gas Com-
panies, &c. Good References required.
Apply to JULIUS NORDEN MANUFACTURER OF INCAN-
DESCENT MANTLES, LIMITED, 44, Farringdon Street,
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WANTED, a Smart, Intelligent Young

Man as IMPROVER TO GAS-FITTING. One
trained on a Gas-Works preferred. A Knowledge of
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mediate Delivery by Railway Trucks, in Large or
Small Quantities, Fine Material from a large English
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FERRIC OXIDE, and should be Useful for Gas Purifi-
cation Purposes. Free Sample sent on Application.

Address No. 5102, care of Mr. King, 11, Bolt Court,
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FOR SALE—Three Purifiers, by Newton,

Chambers, and Co., 20 ft. square by 5 ft. deep,
Planed Joints, 18-inch Valves and Connections, with
Bee-Passes, Travelling and Lifting Gear. In Good
Condition. Being Removed for Extension.

Apply to the SECRETARY, Gas Office, Sutton, SURREY.

LONG EATON GAS COMPANY.

FOR SALE—The Plant at the Sandiacre

Gas-Works.
Schedule and further Information may be had from
the undersigned.

G. STEVENSON,
Secretary and Manager.

Long Eaton, near Nottingham.

FOR SALE—Square Station Meter,

10,000 feet per Hour (New Drum by Braddock),
Replaced by larger size Rotary Meter.

Apply to T. G. MARSH, Mawson Chambers, 28, Deans-
gate, MANCHESTER.

DRAYCOTT GAS COMPANY.

FOR SALE—The Dismantled Plant at the Castle Donington (near Derby) Gas-Works, viz.: ASCENSION PIPES, ARCH PIPES, MOUTH-PIECES, HYDRAULIC MAIN, CONDENSERS, PURIFIERS, CENTRE VALVE, STATION GOVERNOR, EXHAUSTER, and CART WEIGHBRIDGE. Also at Draycott Gas-Works, FOR SALE (but still in use) FOUR PURIFIERS (nearly new), GAS-ENGINE, EXHAUSTER, &c.

For further Particulars and to view, Apply to the MANAGERS at the respective Works.

STIRLING GASLIGHT COMPANY.

FOR SALE—Two Rotary Exhausters, with Valves and Compensator complete, each capable of passing about 25,000 Cubic Feet of Gas per Hour. Each Exhauster has a separate Steam-Engine. The Exhausters are in Good Working Order, and are being Replaced with larger ones. The Exhausters may be seen working by Appointment with the undersigned. Delivery about August.

Offers to be lodged with the undersigned not later than the 30th inst.

JAMES D. SMITH,
Engineer and Manager.

Gas-Works, Stirling,
June 9, 1909.

CANTERBURY GAS AND WATER COMPANY.

TENDERS are invited for the Purchase of the Surplus TAR produced for the Twelve Months ending June 30, 1910.

Delivery to be made free by the Company either into Contractors' Barrels or Tank-Waggons on the South Eastern and Chatham Railway, Canterbury.

Tenders to be delivered at the Company's Offices on or before the 25th of June inst.

By order,
JAMES BURCH,
Secretary.

WISHAW CORPORATION GAS-WORKS.

THE Town Council of Wishaw (Gas Department) are prepared to receive OFFERS for the Supply and Erection of the following PLANT, complete with By-Pass Valves and Connections, at the Wishaw Corporation Gas-Works.

I.—One LIVESEY WASHER, to deal effectively with 1 Million cubic feet of Gas per day of Twenty-Four Hours.

II.—One Set of CONDENSERS, composed of 12-inch Cast-Iron Pipes, with Bridge Pipes, Seal Box, &c., to deal effectively with 500,000 Cubic Feet of Gas per day of Twenty-Four Hours.

III.—Two RETORT-HOUSE GOVERNORS.

Further Particulars on Application to the subscriber, Gas-Works, Wishaw.

Parties tendering to Supply Plans, with Specifications, of the Plant offered; also to state time of delivery.

Offers to be posted and in the hands of John L. Jack, Esq., Town Clerk, Wishaw, by the 30th, inst., marked "Tender for Gas Plant."

PETER B. WATSON,
Engineer and Manager.

Gas-Works, Wishaw,
June 15, 1909.

STRETTFORD GAS COMPANY.

THE Directors of the Stretford Gas Company invite TENDERS for the Supply of Unscreened GAS COALS, NUTS, SLACK, and CANNEL, to be delivered at the Gas-Works, Stretford, on the Bridgewater Canal, or at Stretford Station (M. S. J. & A. Railway) during the next One, Two, or Three Years, in monthly Quantities as may be required, commencing Aug. 1, 1909.

The Tenders must state:
Price per Ton in Waggons at Pit.
Railway or Canal Rate to Stretford.
Wagon or Boat Hire to Stretford.

Tenders to be delivered to the Gas-Works, Stretford, not later than noon on Saturday, the 10th of July, 1909, endorsed "Tender for Coal, &c.," and addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any Tender.

Forms of Tender can be obtained on Application to the undersigned.

By order of the Board,
BENJAMIN HAYNES,
Secretary.

Stretford, June 19, 1909.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

GENERAL STORES.

THE Gas Committee invite Tenders for the following MATERIAL, in such Quantities as may be required during the Twelve Months ending the 31st of August, 1910:—

- 1—Gas-Meters.
- 2—Cast-Iron Main Pipes and Connections.
- 3—Iron Castings.
- 4—Gas and Steam Tubing, and Sundry Fittings.
- 5—Iron and Steel.
- 6—Gun-Metal Meter and Lamp Taps, and Meter Keys.
- 7—Brass Fittings for Meters.
- 8—Brass Pendants and Brackets.
- 9—Lead Pipe.
- 10—Ropes, Tared and Spun Yarn and Twine.
- 11—Oils and Tallow.
- 12—Paints.
- 13—Brushes.
- 14—India-Rubber Tubing, Sheetting, &c.
- 15—Timber.

Forms of Tender and all Information may be obtained, and Samples seen, on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Stores," to be delivered to me not later than Three p.m. on Thursday, the 1st of July, 1909.

L. C. EVANS,
Town Clerk.

Salford.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THE Board are prepared to receive TENDERS for the Supply and Delivery of Screened and Unscreened GAS COAL and of GAS NUTS at their Accrington and Great Harwood Works, in such Quantities, and at such times, as the General Manager may require.

Sealed Tenders (on own Form), addressed to the Chairman, must be in my hands not later than Tuesday, the 6th of July.

By order,
CHAS. HARRISON,
General Manager.

Offices of the Board,
Willow Street, Accrington,
June 14, 1909.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

OIL FOR CARBURETTED WATER-GAS PLANT.

THE above Council are prepared to receive TENDERS for the Supply of 200 to 300 Tons of OIL for the Manufacture of Carburetted Water Gas, for the period ending March 31, 1910.

The Oil to have a flashing point of not less than 73° Abel's test.

Sealed Samples and Analysis of Oils offered must be sent to Mr. E. H. Swain, Gas Engineer, Treforest Gas-Works, Pontypridd, from whom any further Information may be obtained.

The prices should be quoted per Imperial Gallon, and must include delivery in Sellers' Tank at the Gas-Works Siding, Glyntaff, on the Alexandra Docks and Railway Company's Line.

Tenders, Sealed and Endorsed "Gas Oil," must be received by the undersigned on or before Monday, June 28, 1909.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, June 14, 1909.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for the Supply of the following STORES and MATERIALS during the period ending March 31, 1910:—

- No. 1—Gas-Cookers.
- No. 2—Sulphuric Acid.
- No. 5—Fire-Clay Goods, &c.
- No. 5A—Silica Fire-Clay Goods.
- No. 6—Wrought-Iron Tubes and Fittings.
- No. 7—Lead and Compo Tubing.
- No. 8—Barrows, Rake Heads, &c.
- No. 9—Oils.
- No. 10—Brass Fittings and Sundries.
- No. 11—Slot Fittings.
- No. 12—Meters.
- No. 13—Main Taps and Locks.
- No. 15—Cast-Iron Mains and Specials.
- No. 16—Incandescent Materials.
- No. 18—Lamps and Copper.
- No. 19—Horse Feed.

Forms of Tender and Specification may be obtained on Application to Mr. E. H. Swain, Engineer, Gas-works, Treforest, Pontypridd.

Tenders, on the prescribed Forms, Sealed and Endorsed "Tender for Stores No. —," must be received by the undersigned on or before Monday, June 28, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, June 14, 1909.

PONTYPRIDD URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of the following for the period ending March 31, 1910:—

- (a) 8500 Tons of GAS COAL } for the Gas-Works.
- (b) 1500 Tons of CANNEL }
- (c) 1500 Tons of WASHED NUTS—for the Electricity Works.

All the above to be delivered at the Gas-Works Siding, Glyntaff, on the Alexandra Docks and Railway Company's Line.

Forms of Tender and Specification may be obtained, for Gas Coal and Cannel, on Application to Mr. E. H. Swain, Engineer and Manager, Gas-Works, Treforest, Pontypridd, and for Washed Nuts, to Mr. J. E. Teasdale, A.M.I.E.E., Engineer and Manager, Electricity Works, Treforest, Pontypridd.

Tenders, Sealed and Endorsed "Gas Coal," "Cannel," or "Electricity Coal" (as the case may be), must be received by the undersigned on or before Monday, June 28, 1909.

The Council do not bind themselves to accept the lowest or any Tender.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, June 14, 1909.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE above Council invite Tenders for the Purchase of the Surplus COAL-GAS TAR and WATER-GAS TAR produced at their Treforest Works during the period ending March 31, 1910.

Tenders to state the Price per Ton (or per 200 Gallons) (a) For Coal-Gas Tar; (b) for Water-Gas Tar.

The Tar will be delivered into the Contractor's Railway Tank-Waggons at the Treforest Gas-Works Siding (Alexandra Docks and Railway Company's Line).

Tenders, Sealed and Endorsed "Surplus Tar," must be received by the undersigned on or before Monday, June 28, 1909.

J. COLENSO JONES,
Clerk to the Council.

Municipal Buildings,
Pontypridd, June 14, 1909.

RADCLIFFE AND PILKINGTON GAS COMPANY.**TENDERS FOR COAL AND CANNEL.**

THE Directors invite Tenders for a Twelve Months' Supply of GAS COAL and CANNEL.

Particulars may be obtained from the undersigned, by whom Tenders will be received until Tuesday, the 29th inst.

JAMES BRADDOCK,
Manager and Secretary.

Gas Offices, Radcliffe,
June 14, 1909.

THE Directors of the Keswick Gas Com-

pany invite TENDERS for the Supply of 2000 Tons of Best Screened GAS COALS or NUTS, to be delivered at Keswick Railway Station between the 1st day of July, 1909, and the 30th of June, 1910, in such Quantities and at such times as may be required.

Tenders, stating Price per Ton, endorsed "Tender for Coal," to be sent to the undersigned not later than the 23rd inst.

The Directors do not bind themselves to accept the lowest or any Tender.

No Form of Tender supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 11, 1909.

THE Directors of the Keswick Gas Com-

pany invite TENDERS for their Surplus TAR and AMMONIACAL LIQUOR for Twelve Months from the 30th inst., at per Ton delivered into Contractors' Tanks at Keswick Railway Station.

Tenders, endorsed "Tender for Tar," or "Liquor," will be received by the undersigned on or before the 23rd inst.; but the Directors do not bind themselves to accept the highest or any Tender.

Forms of Tender are not supplied.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
June 11, 1909.

MANCHESTER CORPORATION GAS-WORKS.**TO OIL IMPORTERS AND OTHERS.****THE Gas Committee of the Corporation**

of Manchester are prepared to receive TENDERS for the Supply of 20,000 Tons of OIL for the Manufacture of Carburetted Water-Gas.

Conditions of Contract, and further Particulars may be obtained on Application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.

Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee and endorsed "Tender for Gas Oil," must be delivered at the office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 1st of July, 1909.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
June 18, 1909.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL, CANNEL, AND LIME, AND TENDERS FOR SURPLUS TAR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 12,000 Tons of Best Screened GAS COAL, delivered at Mansfield Station for One Year from the 1st of July, 1909, to the 30th of June, 1910.

LIME.

For the Supply of about 150 Tons of best Hand-Picked LIME. Delivered as above.

TAR.

TENDERS for Surplus TAR made from the 1st of July, 1909, to the 30th of June, 1910.

Tenders, endorsed "Coals," "Lime," or "Tar" as the case may be, to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before June 19, 1909.

Particulars and all other Information from the undersigned.

NOTE: No Special Forms of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
June 8, 1909.

THE Proprietor of the Patent No.

15,646 of 1905, for "IMPROVEMENTS IN AND RELATING TO THE EXTRACTION OF AMMONIA FROM DISTILLATION GASES," is desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, and Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, CHANCERY LANE, W.C.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 17th inst., and RE-OPENED on the 1st of July, 1909.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane,
June 16, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER

COLONIAL & FOREIGN GAS & WATER COMPANIES & MUNICIPALITIES

BEFORE PURCHASING

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Engineers and Merchant Shippers,
who have had 25 Years' Practical Experience in the Designing, Buying, Inspection, and Shipment of Machinery and Plant, and invite Correspondence on the Subject.
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Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON AND
ALL OTHER GAS APPARATUS.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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ALFRETON IRON-WORKS, DERBYSHIRE,
AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS, and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

TROTTER, HAINES, & CORBETT, BRETTLE'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

MIRFIELD GAS COAL UNEQUALLED.

Sperm Value 878.85 lbs. per Ton.

Please apply for Price, Analyses and Report, to the

MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.

LONDON: 16, Park Village East, N.W.

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MANUFACTURERS OF

FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.

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HEATHCOTE GAS COAL

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GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

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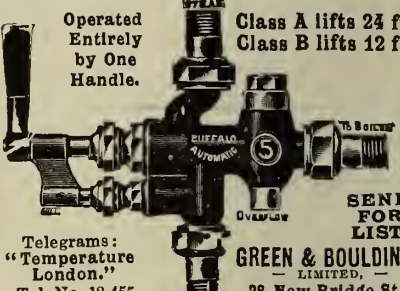
Highest Results in Gas, & Excellent Coke.

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'BUFFALO' INJECTOR

Operated Entirely by One Handle. Class A lifts 24 ft. Class B lifts 12 ft.



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CLAPHAM'S
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SPECIAL RUBBER
JOINT
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RAPID FASTENERS.

FOR DRY-LUTE
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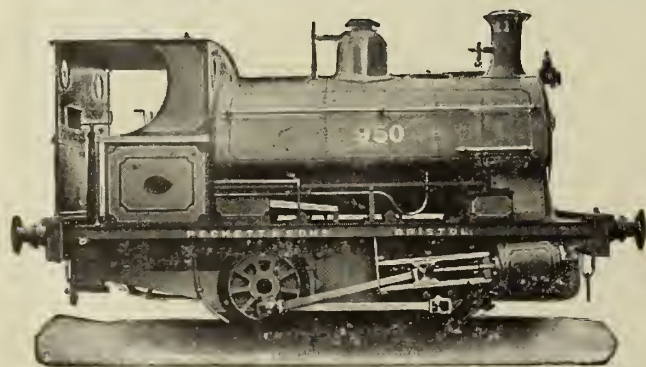
29,000 feet and 10,000 Fasteners sold.

CAST-IRON PIPES FOR GAS, WATER, & STEAM,

also VALVES of all descriptions.

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LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate delivery.

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India-Rubber and Airproof Manufacturers and General Contractors,
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Largest Manufacturers of Gas Main Bags.

Patentees of the DENMAR BAG,

Impervious to Main Liquor and Climatic Influences.

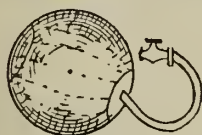
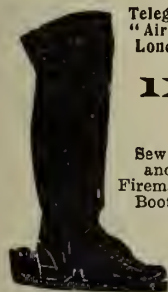
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Gas Bags for repairing Mains. All Seams Stitched and Taped.

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Specially distil Carburine Spirit, specific gravity '680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process. Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthalene, &c.

Samples and Prices may be had on application.

ALL the **BOYS CALORIMETERS**

which have been in daily use in all the Official Testing Stations in London for the last Three Years

WERE MADE BY

JOHN J. GRIFFIN & SONS, LTD.

Those desiring to obtain Gas Calorimeters as used in the Official Testing Places should see that the apparatus bears the name of the original makers.

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Each Apparatus should be marked thus



Modern Carbonizing Plant.

THE INCLINED MUNICH CHAMBER FURNACE (RIES PATENT).

The Coke Ovens & By-Products Co., Ltd.,
PALACE CHAMBERS, WESTMINSTER,

are prepared to undertake the Construction of these Carbonizing Chambers—Capacity from
3·5 Tons to 7 Tons per Chamber per 24 Hours.

**The undermentioned includes Chambers Erected and in
course of Construction.**

Munich, Gas-Works	Kierstein .	(Capacity in 24 hours)	49	Tons.
„	„	Moosach .	116	„
„	„	„ .	117	„
Hamburg	. . . . .	„	175	„
Berlin	. . . . .	„	525	„
Rome	. . . . .	„	350	„
Paris	. . . . .	„	272	„
Leipzig	. . . . .	„	155	„
Hanau	. . . . .	„	109	„
Regensburg	. . . . .	„	84	„

„ Total 1952 Tons.

ADVANTAGES.

1. Highest Capacity on same ground space as compared with any other Carbonizing System.
2. Highest Yield of Gas from given quantity of Coal.
3. No Night Shifts.
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Converted to easily pass **40 to 80%** or even 100% more through
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AND USUALLY WITH SAME ENGINE.

For new machinery we can do still better. Even the Converted Exhauster is suitable for
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Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbohc Acid,
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SIMPLE AND INEXPENSIVE.



**INCREASED
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WRITE FOR PARTICULARS
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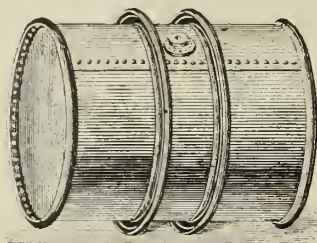
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PRICE 2s. EACH.



STEEL DRUMS
Of any capacity. Electrically Welded,
Hand Riveted, Lead, Tin, and Zinc
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For Coke Oven Gas.
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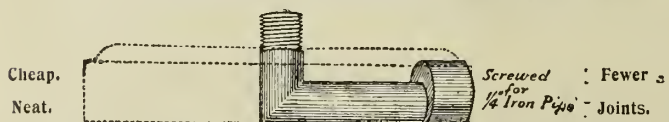
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THE "ECCENTRIC" MALLEABLE IRON ELBOW.



These BLOCKS and ELBOWS have been introduced by
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AS CIRCULATORS,
AS FIRE BURNERS,
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possess advantages contained by no other make.

**FENLON'S
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CIRCULATING**

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represents the maximum re-
sults with the minimum con-
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The Thermostatic Valve
shuts down the gas when
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An important and distinctive
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ASSURING A MAXIMUM OF EFFICIENCY.

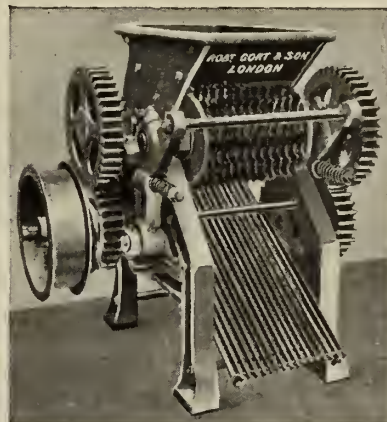


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**Dust Reduced to a
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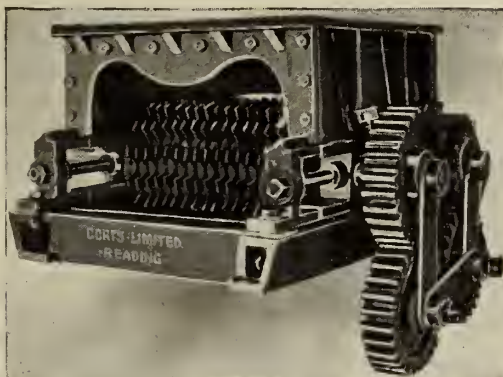
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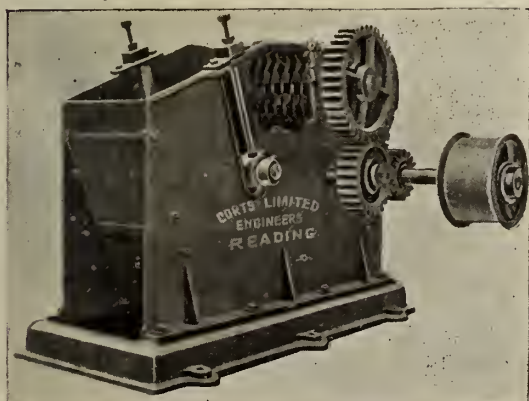
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varied by
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**Suitable Types for
All Conditions.**

**Capacities from
One Ton Per Hour
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Combined Coke Elevator Boot and Coke Cutter.

WE SOLICIT YOUR ENQUIRIES.

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(Registered in England and Abroad.)

**A Radical Solvent and Preventative
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HYDRAULIC COKE PUSHERS

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**WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.**

Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, June 8, p. 676]

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(PATENTED PROCESS)

*Awarded a DIPLOMA OF MERIT at the recent Smoke Abatement
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The New Smokeless Fuel.

Why Gas Companies should adopt the above Process:—

- (1) Because no extra Capital is required.
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- (3) The Cost is repaid by increased Price on Coalexld.
- (4) Coalexld finds a readier Sale than Coke.
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MANIFEST SUPERIORITY
OF THE
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Contrast for a moment a burner with a solid casing and one with a perforated casing—the "OMAR."

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Look at the casing of the "OMAR!" It gives to the whole burner a light and artistic appearance, and the light passing through the perforations thoroughly illuminates the upper portions of the room in which the burner is fixed.

Result: Superior appearance; no waste light; whole burner luminous.

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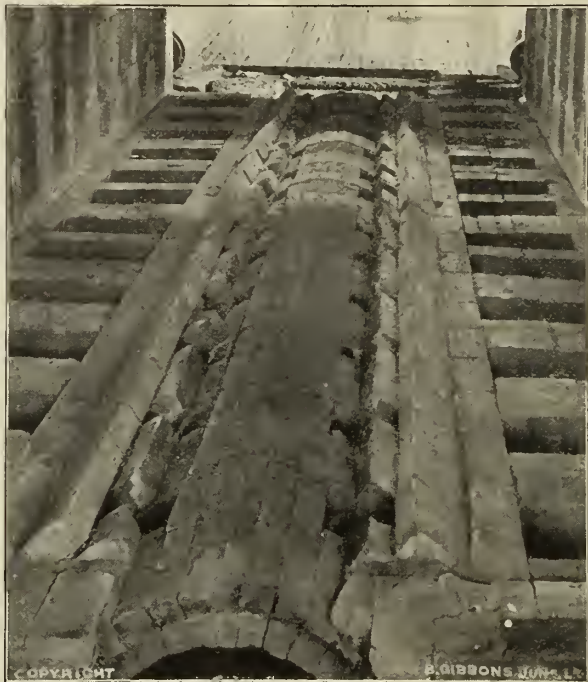
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LONDON—
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B. GIBBONS, JUNR., LTD.,



Photograph of Producer Arch with old setting taken out after working 2000 Days.

MANUFACTURERS OF

HORIZONTAL, INCLINED, and VERTICAL MACHINE-MADE

GAS RETORTS,

NOTE.—We have Patent Dies for making Retorts with Tapered Sides. These Dies mechanically expand as the Retort is made, thus ensuring a perfectly gradual increase of area. With all our Machine-made Retorts, the material is of one consistency throughout, which is impossible with hand moulding.

AND ALL DESCRIPTIONS OF

FIRE-CLAY GOODS,

including SPECIAL TILES for GENERATOR and REGENERATOR RETORT SETTINGS.

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Special Firebricks for Producer Gas and Water-Gas Plants. Also for the Construction of Furnaces for Annealing, Enamelling, etc., etc.

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HOT COKE CONVEYORS.

GIBBONS BROS., LTD., DUDLEY, WORCS.

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MANCHESTER.

"Bamag" Patent Distance Lighter

Suitable for all Pressures and all Conditions.



Suitable for all Burners, Upright or Inverted.

Close on 40,000 in Operation.

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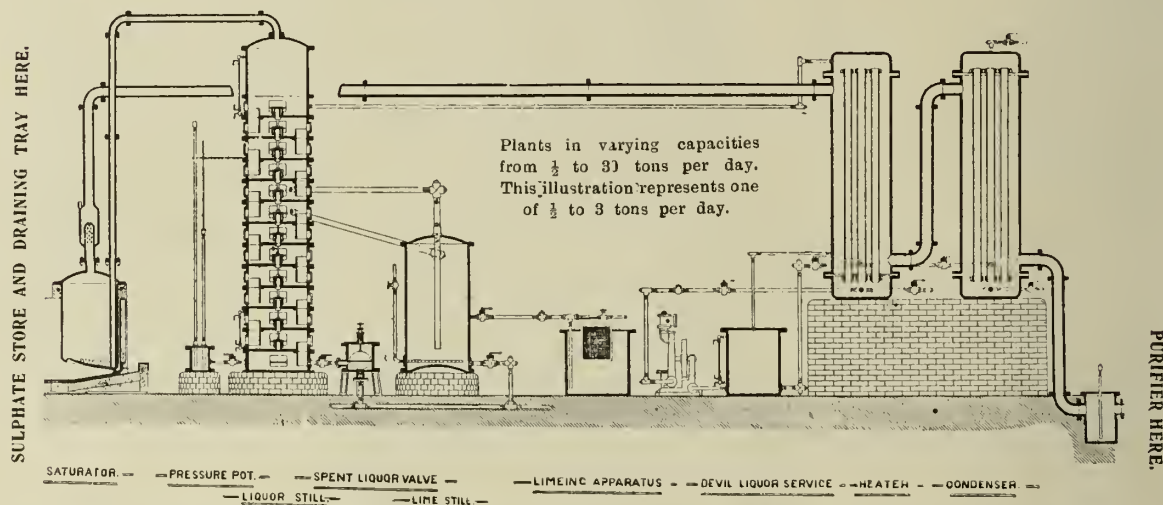
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Works: MIDLAND RAILWAY GOODS STATION, HENDON.

MR. GEORGE WILTON,
Managing Director,
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Telephone No. 2669 AVENUE.
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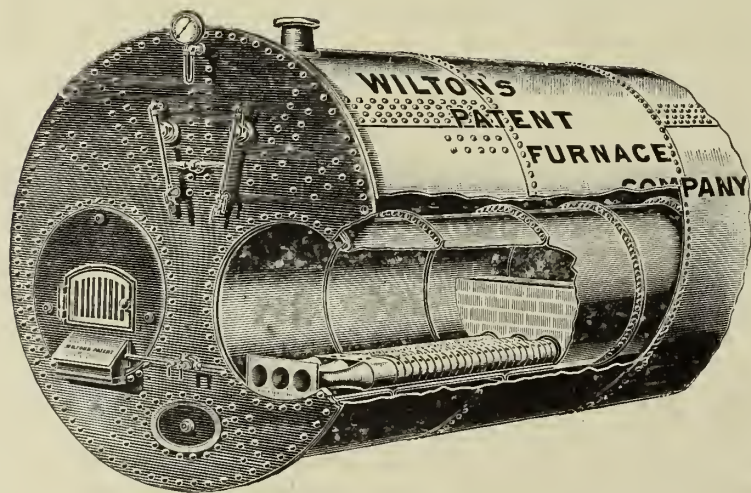
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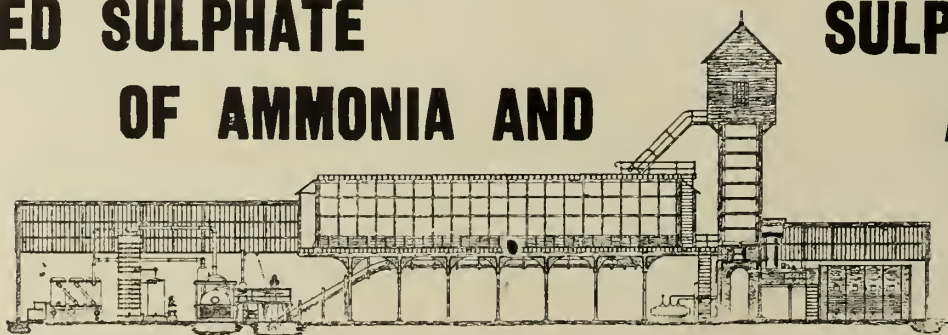


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Complete Plants for Tar Distillation, Pure Benzol, Toluol, Solvent Naphtha, Pyridene, Pure Carbolic Acid, Naphthalene, Anthracene 80 per cent., Cyanide, Prussiates, Blues.

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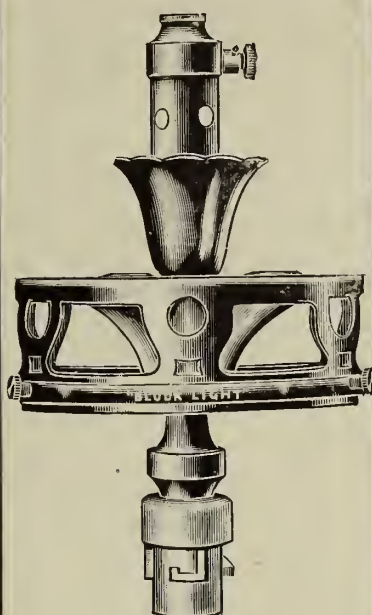
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Retails at 2s. each.

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All Parts Interchangeable.

Takes ANY
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Burns $2\frac{3}{4}$ cubic feet
Gas per hour.

Agencies now appointed for the Sale of

"BLOCK LIGHTS," INVERTED
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Before Buying Block Goods anywhere write —

BLOCK LIGHT CO., LTD.,
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GAS FITTINGS

of every description for Inverted
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BURNERS, MANTLES, GLOBES, AND ALL ACCESSORIES.

OUTSIDE GAS LAMPS, ARC LAMPS, METERS, COLUMNS, &c.

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THE SILICA FIRE-BRICK COMPANY,
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RADIATE MORE HEAT

BY USING

SILCO BRICK RETORTS.

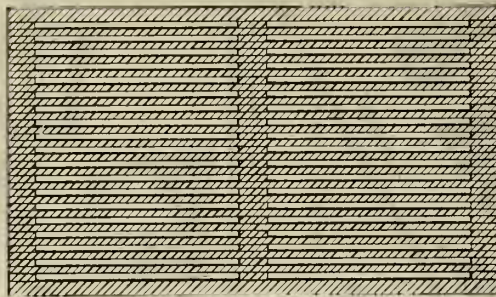
SILCO BRICKS prevent all settling of setting.

SILICA BRICKS for Combustion Chambers, any shape.

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Manufacturers of **WOOD SIEVES FOR GAS PURIFIERS,**
WITH PATENT SQUARE IRON BOLTS.

MADE BY
SPECIAL
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BOARD FILLING
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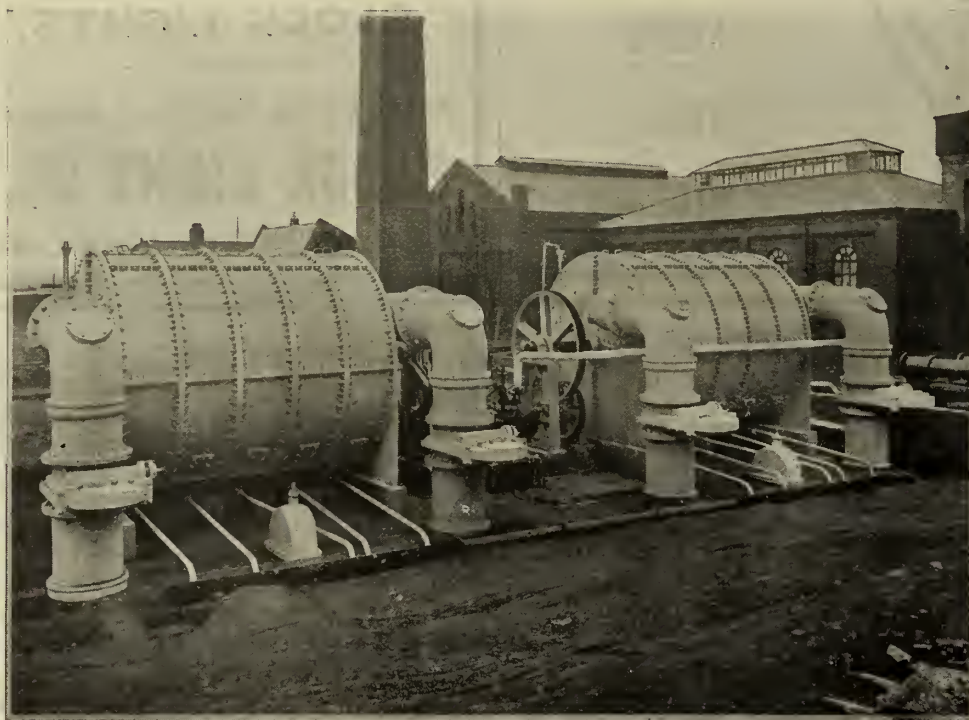
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PRICES ON APPLICATION.

THE WHESOE FOUNDRY CO., LTD.

Works: DARLINGTON.

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OF WASHING
SURFACE.

REMOVAL OF
THE WHOLE
OF THE
AMMONIA
AND A LARGE
PERCENTAGE
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SLIP OF GAS
IMPOSSIBLE
OWING TO
OUR PATENT
TELESCOPIC
SLIDING JOINT
BUNDLES
EASILY
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CLEANING.

"Whessoe" Twin Rotary Washer-Scrubber (Patent No. 24,110 of 1903). Combined capacity 3,000,000 cub. ft. per diem, as supplied to The Walker and Wallsend Gas Company, Newcastle-on-Tyne.

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Gas Engineers of the most important Works are high in
their praises of the Fire-Clay Goods supplied by

MOBBERLEY & PERRY OF STOURBRIDGE.

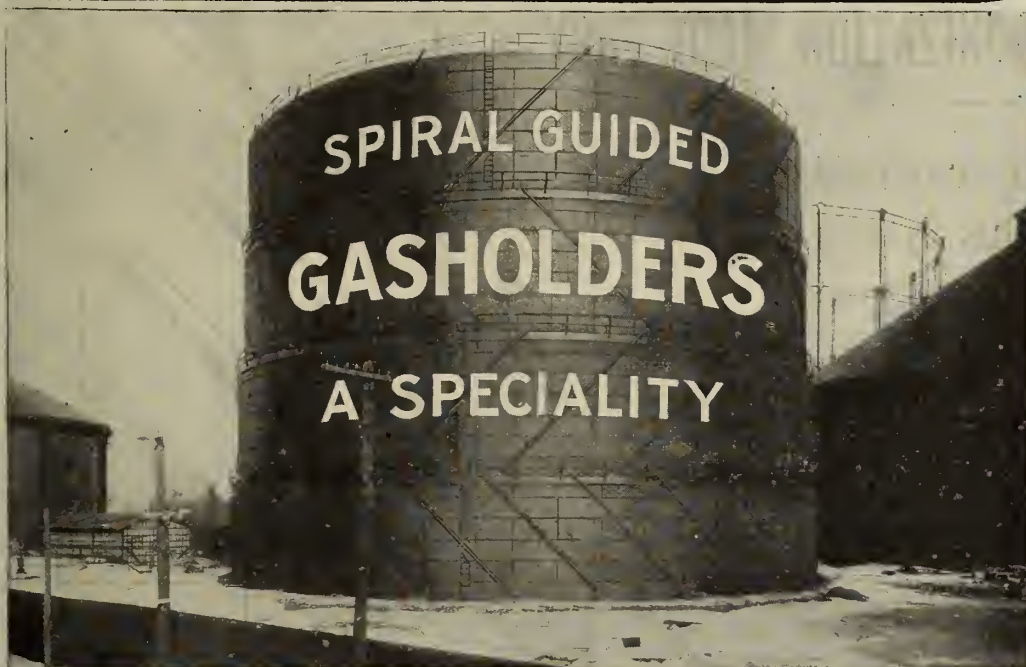
LIMITED,

GAS-RETORTS A SPECIALITÉ.

CLAYTON SON & CO., LTD.

HUNSLET, LEEDS.

Makers of the first successful
SPIRAL GUIDED HOLDER (1889)

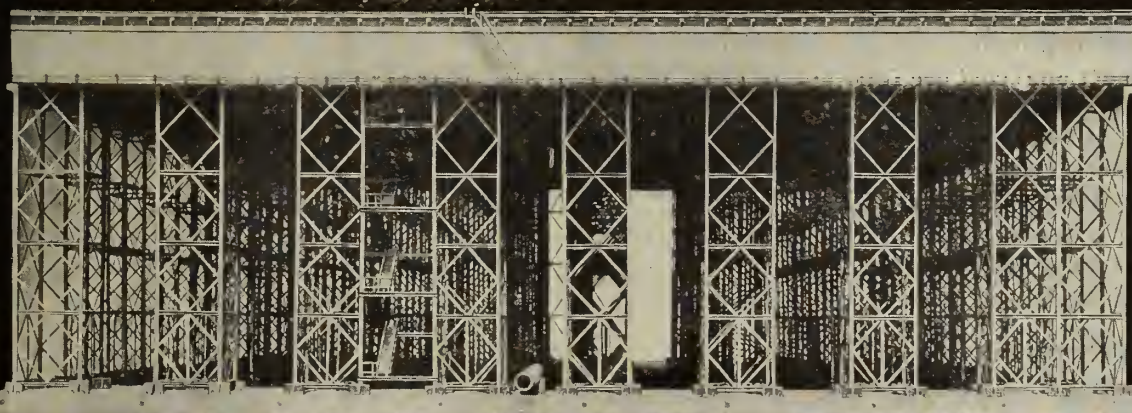


An up-to-date Success in the Spiral Guiding of Gasholders (1908).

Four-Lift Spiral Guided Gasholder, erected at Montreal (Canada), capacity 1,000,000 cubic feet, fitted with "Clayton and Pickering's" Patent Guides.—The strongest ever invented. The above Holder was completed in October, 1908, and has worked with perfect satisfaction, amid the trying conditions of a Canadian Winter.

PHOTOGRAPH OF THE MODEL OF THE ELEVATED RESERVOIR

To be made and erected by CLAYTON, SON & CO. LTD., for the
CORPORATION OF CALCUTTA, at their TALLAH WATERWORKS.
To the Designs of W. B. MacCABE, Esq., M.Inst.C.E., F.I.C., Chief Engineer to the Corporation.



The Reservoir will consist of a Steel Tank, 16 feet deep, 321 feet square, supported on Steel Stanchions, the height from the top of tank to ground level being 110 feet. The tank will have a capacity of 9,000,000 gallons, weighing about 40,000 tons. The tank will be divided into four compartments which can be used independently of each other. The steel comprised in this huge structure will amount approximately to 7,000 tons.

Telegrams, "GAS, LEEDS." London Office, 60, QUEEN VICTORIA ST., E.C.

GEO. R. LOVE'S INCLINES AT 45 DEGREES.

CARBONIZATION MADE EASY.

A few recommendations for this System:—

Simplicity of design.

No **Machinery** to get out of order.

Carbonizing charges **40 per cent. less** than with Horizontals.

No skilled Stokers necessary.

Yield of Gas per ton guaranteed about 1000 cubic feet more than under present conditions, of guaranteed candle power.

Heats under absolute control throughout the whole length of the Retorts.

Saleable value of Coke greatly increased.

25 per cent. greater yield of Ammonia.

More Liquid Tar.

Stopped Pipes unknown.

Naphthalene always in Solution.

45 per cent. less ground space required.

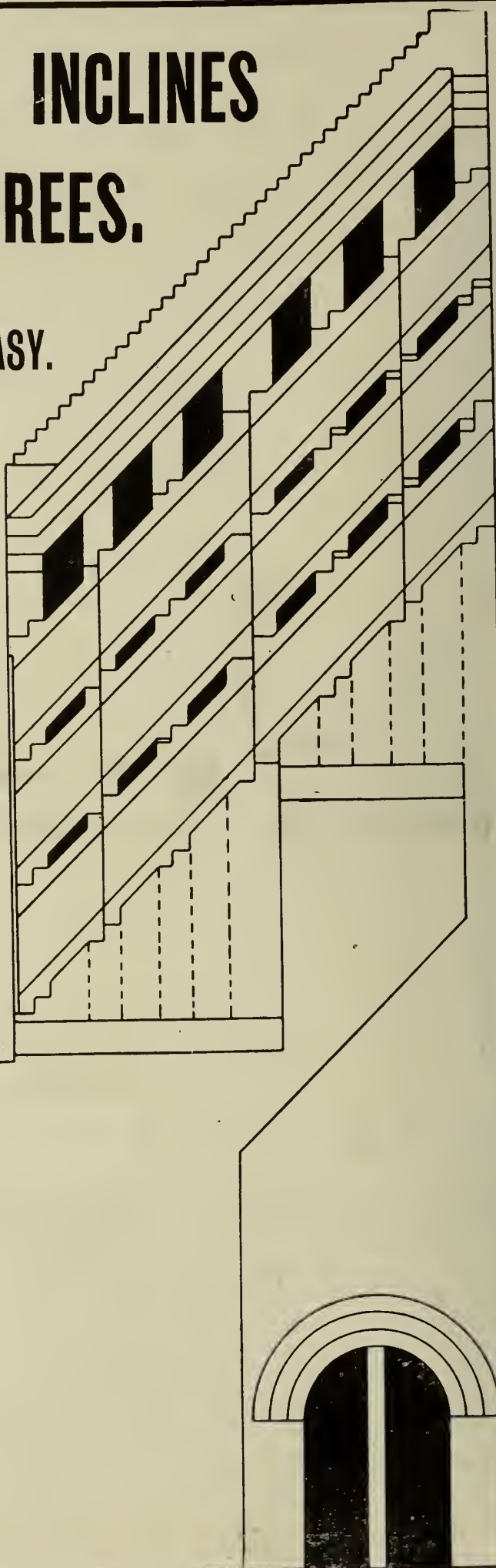
Constructional cost per Ton carbonized considerably less than with Horizontal or Ordinary Inclined Retorts.

Several Installations in course of construction or completed.

Fulllest Inquiries
Invited.

Sole Agents:—

WINSTANLEY & CO., MURDOCH WORKS, KING'S NORTON.



Three Strong Favourites for Public Lighting.

Welsbach

Fig. 35. Welsbach Cylindrical Lantern, Shadowless and Wind-proof. Suitable for One or Two Burners. Lighting Capacity with One Mantle, 100 Candle Power.



Fig. 55. Long Body Lantern, with Copper Ornament, Square Reflector, Porcelain or Enamelled Iron, Painted Three Coats and Glazed, with Cast-Iron Base, with Special Lamp Cock fitted, and Brass Roller Trap for "Torch Lighting."

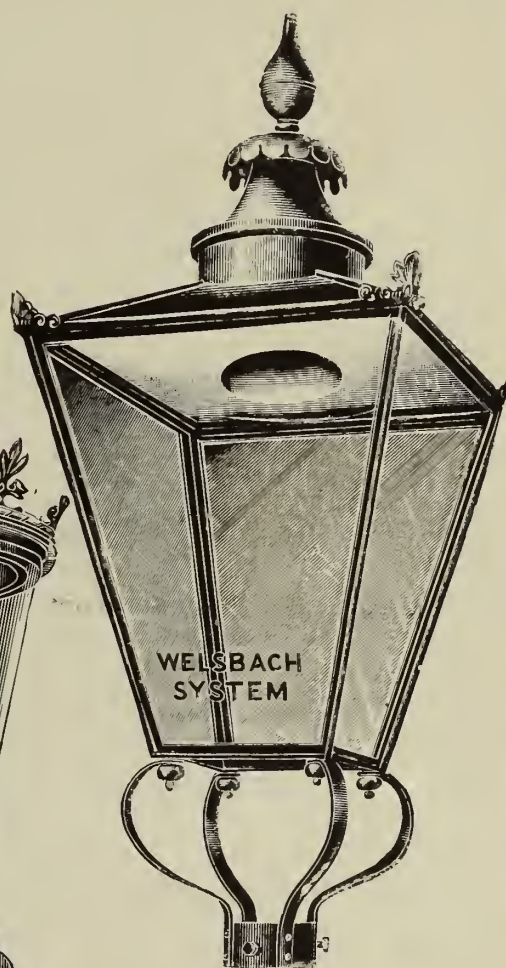
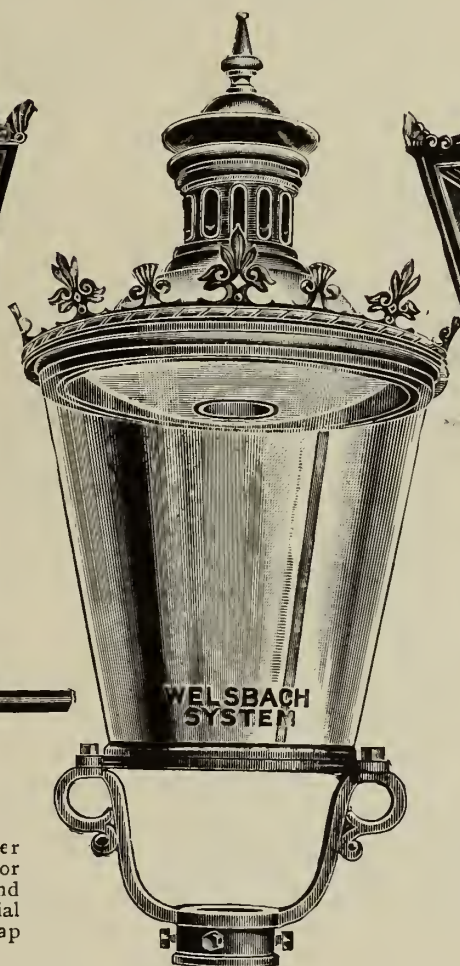


Fig. 54. Seventeen inch Long Body Street Lantern, fitted with Copper Top, and Enamelled or Porcelain Reflector. The finest inexpensive Street Lamp obtainable.

The Welsbach Company hold the largest and most varied Stock of Arc Lamps, Self-Intensifying Lamps, and Street Lanterns in Square, Circular, Hexagon, &c., Patterns, to give light from 60 to 600 Candle Power from a single Welsbach Mantle.

The Welsbach Company invite Inquiries from Officials and Public Bodies as to their Improved System of Street Lighting, both Upright and Inverted. Comparative details and details of the Lighting Costs provided. Special Prices.

Every Lamp and Mantle is guaranteed by the Company.

The Welsbach Mantles are "C," "CX," and "Plaissetty," Price 4½d., each subject.

THE WELSBACH INCANDESCENT GAS LIGHT COMPANY, LTD.,

Public Lighting Show-Room:— 344-354, Gray's Inn Road, King's Cross, London, W.C.

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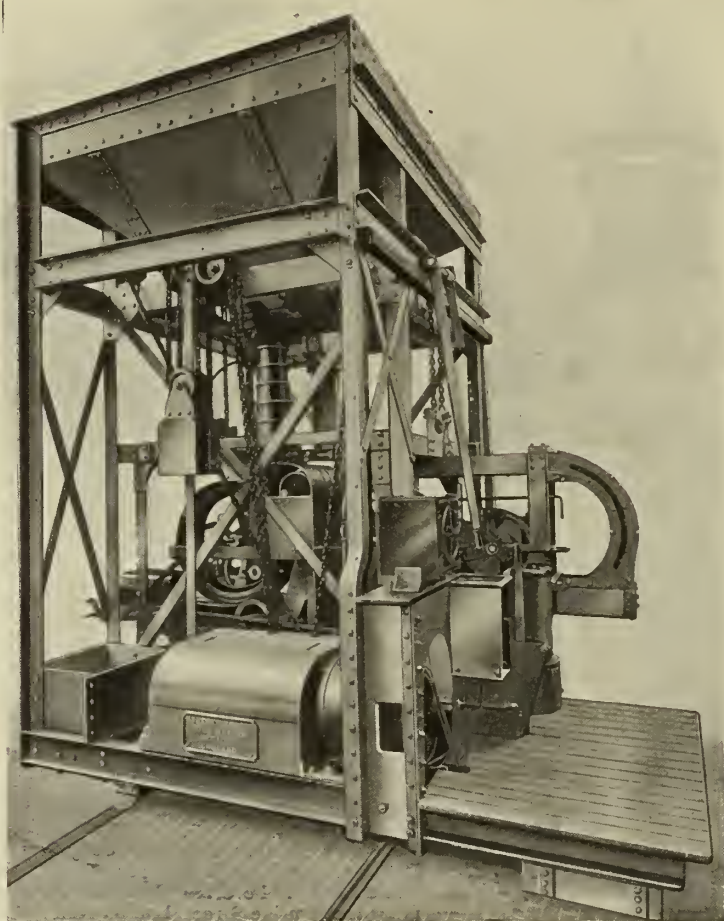
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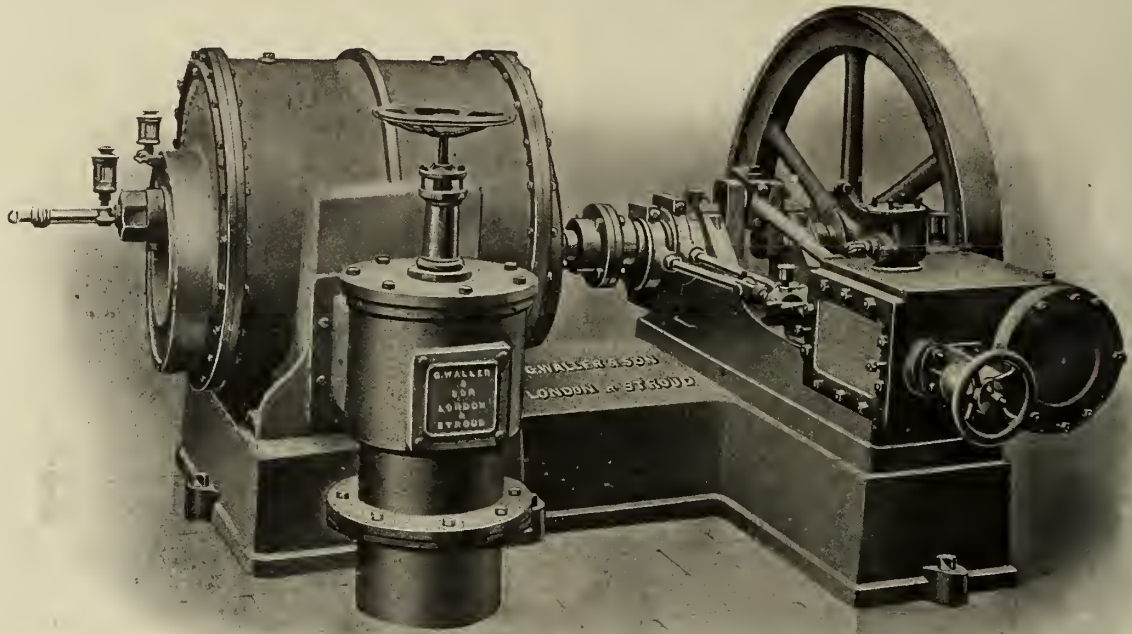
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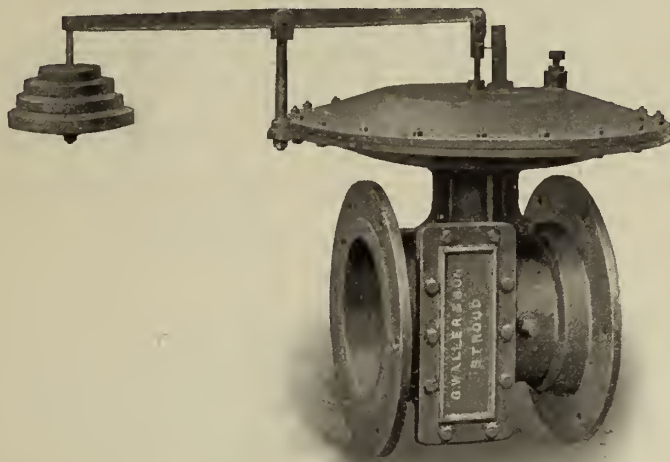
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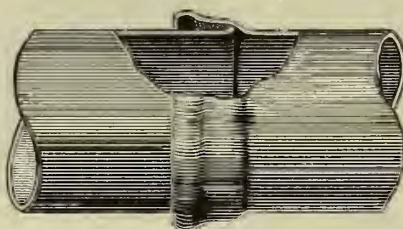
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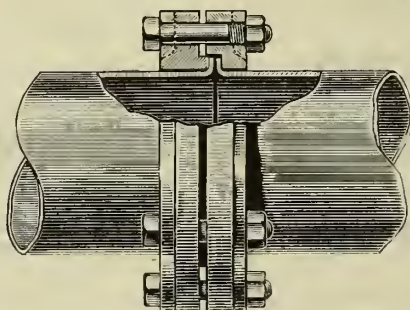
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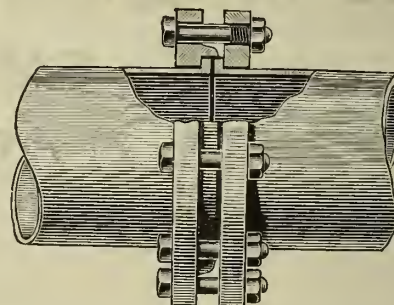
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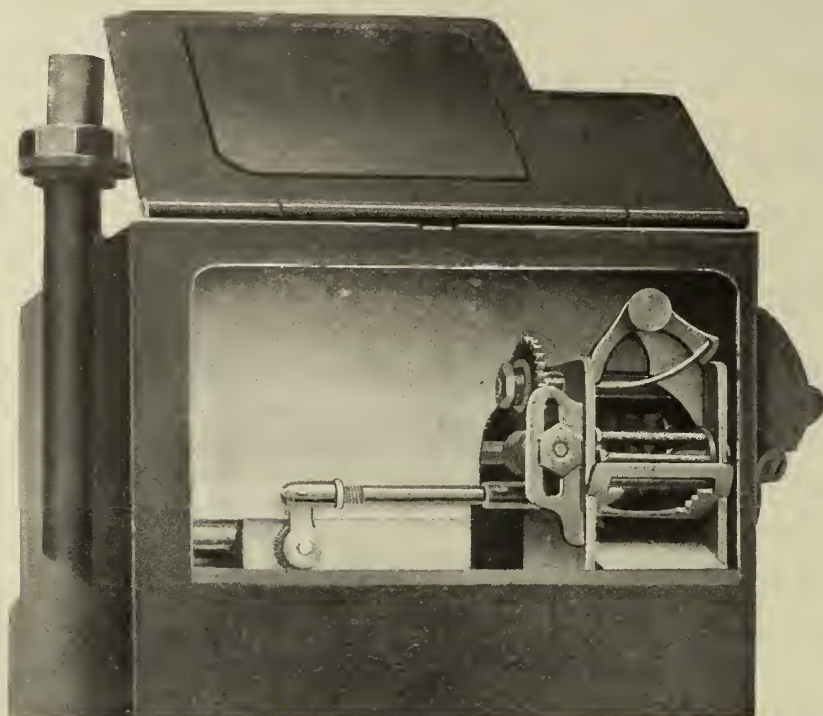
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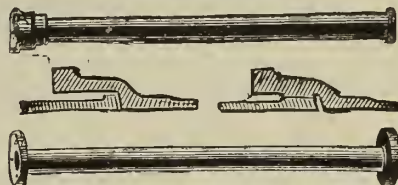
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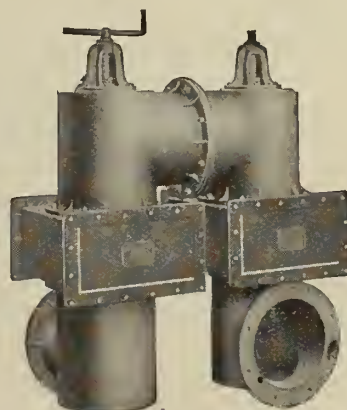
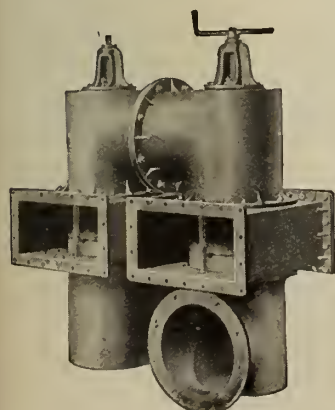
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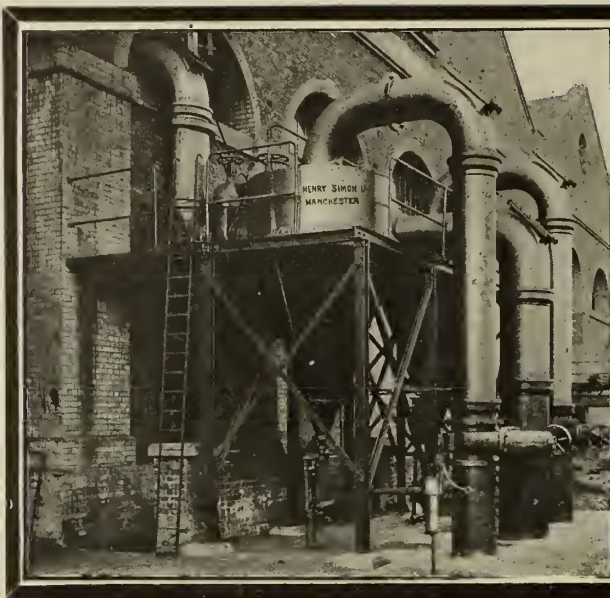
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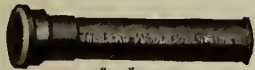
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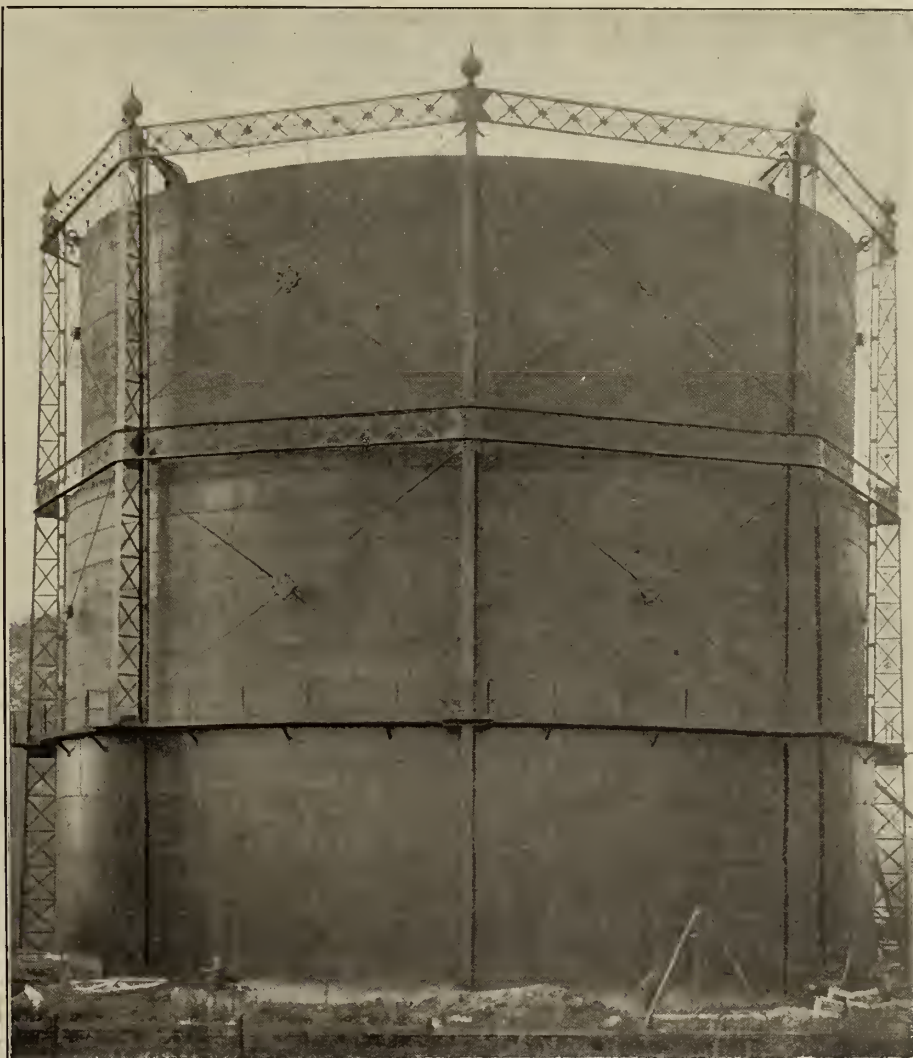
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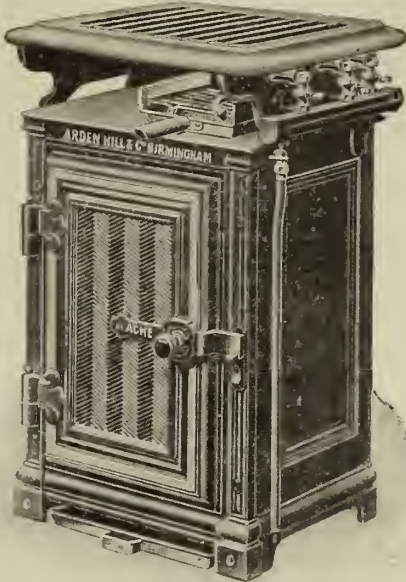
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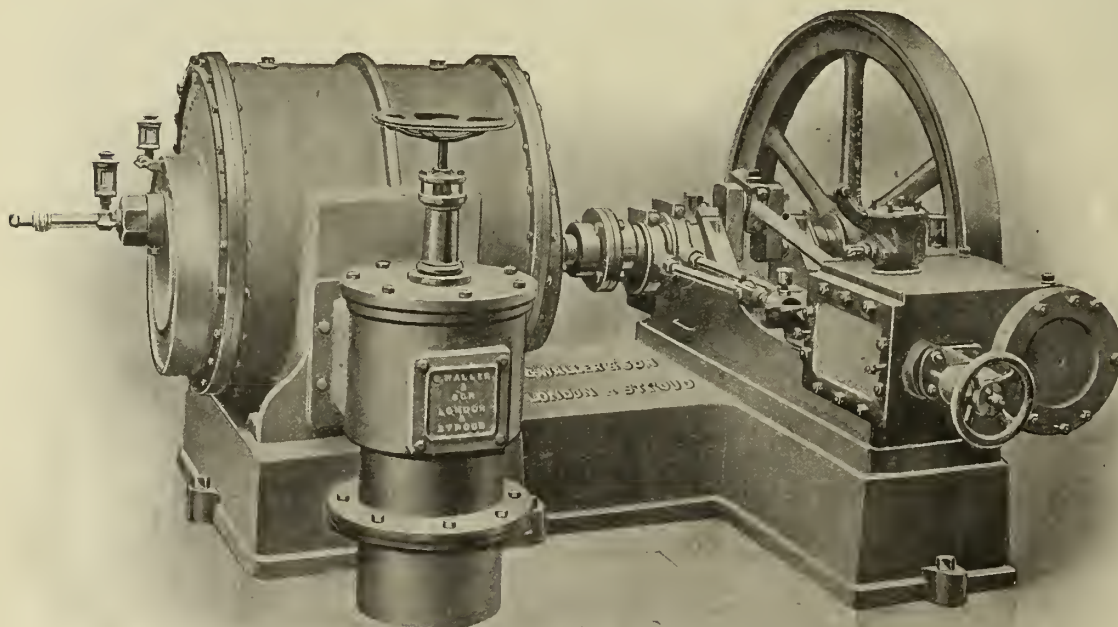
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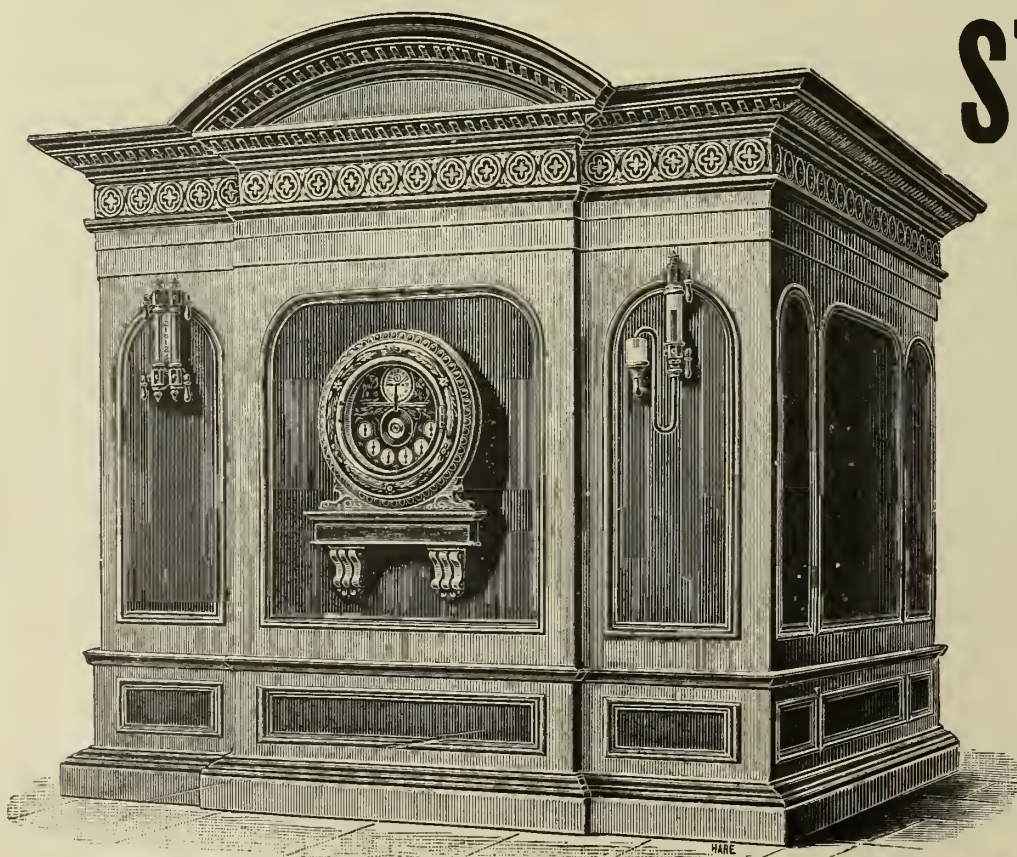
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EDITORIAL NOTES—GAS, &c.

The Meeting of the Société Technique.

In another part of the "JOURNAL" will be found a review of the proceedings and abstracts of some of the papers read at the annual congress of the Société Technique, which was held from Tuesday to Friday last in Lyons, under the presidency of M. Godinet, the General Manager of the group of gas undertakings in the hands of MM. P. de Lachomette, Villiers, et Cie., whose headquarters are in the city. Though a score of papers were presented, only about half of them were of much importance; and some of the chief of these are noticed elsewhere. There was no paper embodying research, such as the valuable contribution of M. Marquisan of last year; nor was there one of a constructional character. Retort-house work was dealt with by M. Parsy, in his short paper on factors bearing upon the net cost of gas; by M. Grebel, in his description of the Parsy furnace, which was noticed in our columns a few weeks ago; by M. Bitard in a paper on the Villain charging and discharging machine; and by M. Teulon on quenching coke as carried on at Marseilles. These are all papers of special interest mainly to managers of small works. More important, perhaps, as touching a good many managers very closely, were the papers dealing with the utilization of tar. How can it be disposed of to the best advantage? This is the problem which M. Godinet discoursed upon in his opening address, and was dealt with by MM. Echinard, Hovine, and Ménard in their papers on the utilization of tar for heating. M. François, the General Secretary of the Lyons Gas Company, came before the members on the closing day, and told them all about the treatment of road surfaces by means of the residual that has dropped so much in price. They will consequently be able to go home and ponder over all they have heard on this matter, and possibly be prepared to deal with it in some definite way next year. Next to the tar question came that of distance lighting, about which M. Lhomme, who has the Alder and Mackay and Gunning systems in operation at Rueil, had something further to say by way of supplement to his remarks at the Paris meeting last year; while MM. Badon-Pascal, Aubert, Aublant, and Gaulis brought under notice the Rostin and other systems.

If the Lyons congress will not be conspicuous for the number and importance of the technical matters submitted to those who attended it (who in some cases had to undertake a long journey for the purpose), it will be remembered for the cordiality of the welcome they received from the Chairman—M. Ancel, one of their Past-Presidents—and the Directors and Engineers of the Lyons Gas Company. The Company fill a dual position as suppliers of both gas and electricity; and their works in each department were thrown open to the inspection of the members. That the extent of their undertakings might be more easily realized, they went to the expense of having specially printed a booklet containing illustrated descriptions of the works, accompanied by maps and plans, and preceded by an interesting guide for those who were able to absent themselves occasionally from the meetings in order to inspect some of the historic features of the second city of France. The Company's hospitality was conspicuously displayed at the banquet given to the members on Tuesday night, at which everybody who was anybody—to use Gilbertian language—in Lyons was present. It was pleasant to learn from the speeches that the relations between the Company and the Municipality are of the most cordial character; and the booklet referred to shows that those between the Directors and employees are in all respects satisfactory. The question of the relations of capital and labour has been before the Committee of the Société Technique; and there are indications

that their investigations have not been concluded. Whatever it is possible to do to ensure contented service on the part of the men in gas-works should not be left undone. To return, however, to the hospitality of the Lyons Gas Company, it was conspicuous to the last, when an excursion into the suburbs brought to a close what had, on the whole, been an interesting and pleasant gathering—interesting from the fact that in the works visited the members were brought face to face with the ancient and the modern; and pleasant because both meetings and visits allowed of the renewing of old and the making of new friendships.

Jubilee Meeting of the German Gas Association.

THE review of the proceedings at this year's meeting of the German Association of Gas and Water Engineers, which is given by our special representative in another column of to-day's "JOURNAL," shows that the meeting was carried through with the success which now always marks these immense technical gatherings in Germany. Special interest attaches to the present meeting on account of the fact that it commemorates the Jubilee of the German Association, who held their first meeting in Frankfort in 1859. Appropriately enough, therefore, Frankfort was again selected for this year's meeting.

The technical communications were not, perhaps, up to the high level to which we are accustomed at these meetings; and this year, in particular, discussion of their contents was reduced to an almost negligible quantity for several reasons. One is that a tolerably full programme is provided, so that if it is to be carried through there is not much time available for discussions. But some time could be gained by commencing the proceedings more punctually on each day than was done at Frankfort this year. The chief reason, however, why there is no adequate debate on the contents of the papers is that they are not accessible in printed form to members either before or at the meeting. When, moreover, as in the present instance, the acoustic properties of the room in which the meetings are held are such that only perhaps 10 per cent. of those attending can follow the words of the reader of the paper, it is obvious that there is no possibility of the discussion being representative of the whole meeting. Hence last week's proceedings at Frankfort resolved themselves largely into readings of papers by authors who were unable to make themselves heard by the majority of those present, and into a few perfunctory words of comment and thanks by one or two members sitting in the immediate vicinity of the reader. The prime mistake made is the failure to provide a print of each paper *in extenso*, or, failing that, in abstract, so that in any case members shall be in a position to contribute to the discussion, and, with advantage to the latter, to prepare beforehand a concise statement of their views. Much time was wasted at Frankfort by speakers who had not had the opportunity to frame their speeches beforehand.

It will be remembered that membership of the German Association is open to manufacturers and agents, as well as to gas managers and engineers. Speaking generally, the mixed membership has proved a great advantage to the proceedings of the Association; but it was a matter of common observation at this year's meeting that the agents of some of the commercial firms were abusing their opportunities of meeting gas managers much in the same way that similar abuse cropped up in the English Gas Institute some time since. A few years ago this matter was not pressing; but now it urgently calls for some notice at the hands of the Council of the German Association. We do not believe that any such step need be taken as that which led ultimately to the exclusion of the manufacturing and trading element from the English gas meetings. Probably all that is necessary is that the Council of the German Association should make an announcement that individuals guilty of

touting, and the firms responsible for them, will be excluded from participation in future meetings.

Regarding the technical proceedings, it is a great pity the views put forward by Professor H. Bunte, of Carlsruhe, and criticized by Professor H. Strache, of Vienna, on the relation of calorific power to mantle lighting efficiency, could not be discussed in conjunction with the conclusions to which Mr. Forshaw's researches have led him on the illuminating efficiencies of carbon monoxide and hydrogen in the incandescent burner. Apparently, however, none of those who spoke at Frankfort on the question of the quality of gas most suited for present-day requirements, had seen so far Mr. Forshaw's report, some of the results in which directly contradict views put forward by Professor Bunte. We are, however, entirely in sympathy with Professor Strache's remarks as to the undesirability of hampering the gas industry in any country with the limitation of a minimum calorific value for the gas supplied, for the very good reason that it is by no means settled what is the most desirable standard quality of gas for incandescent lighting, and that such standard, even if now just and determinate, would be liable to change from time to time with improvements in the construction of appliances for incandescent lighting.

One very pleasing feature of the meeting was the opportunity it offered for the scattered members of the technical staffs of such bodies as the Imperial Continental Gas Association and the German Continental Gas Company to meet together and discuss the problems with which they are confronted in the very varied conditions of supply which the different works of these concerns have to fulfil. It is especially an advantage to the younger members of the staffs of such bodies to talk with older men from other places who may previously have been in charge of the works where the former now are. We believe that it is the custom of Dr. W. von Oechelhaeuser, the accomplished Engineer and Managing-Director of the German Continental Gas Company, always to bring together on one evening, in the course of these annual meetings, those members of the staff of his Company who have been able to leave their works to attend. To these gatherings also several members of the staff of the Imperial Continental Gas Association are not infrequently invited; and it is pleasing to note the great cordiality which prevails between the technical men of these two kindred Companies who supply gas in so many Continental towns. Dr. von Oechelhaeuser assuredly deserves the thanks of many outside his own Company for the opportunity for intercourse between the leading technical men of these two bodies, and some others, which he has the foresight and liberality to provide.

The meeting at Frankfort was of the customary cosmopolitan character, and was attended by about the usual number. Among those reported as coming directly from London may be mentioned Mr. R. W. Wilson, the Secretary of the Imperial Continental Gas Association, Mr. W. J. Atkinson Butterfield, and Mr. Simmelkjoer.

Coalite Reanimation.

EVER and again, there is a spurt of life on the part of our Coalite friends; and these periodical reanimations seem to coincide with the times when the spirits of shareholders are drooping, or when it would be a good thing, from the point of view of those at the central seat of activity, if the public could be induced to come along with supplementary financial aid. But there has been too much prophecy of untold wealth in the Coalite system, and too much disappointment over realizing a part of that wealth, for the public to again be readily brought to a responsive state of mind in respect of capital or even of belief. Just lately, there has been a shrinkage in the market value of the shares both of Coalite Limited and of the British Coalite Company, Limited; and this seems to indicate that people are tiring of waiting for those halcyon days when dividends will roll in as surely and regularly as day follows the night from the sale of coalite and the recovery of the treasures that lie hidden in the liquid products of coal distillation at low temperatures. Working statements and estimates now without number have been published; but not one that has yet seen the light of day tells the whole tale. Though the estimates have revived the hope of shareholders and encouraged speculators, the effect has been but transitory. The time has come when the Chairmen of the British Coalite Company, Limited (Sir W. H. Preece) and of Coalite Limited (Mr. J. H. Smith) have felt constrained to forward "important com-

munications," containing statements and information of "vital importance" to the shareholders, ostensibly to put more heart into them. We doubt whether they will do much in operating to that end.

Before briefly dealing with this "important" circular—of such "vital" concern to the shareholders—readers will be interested in ascertaining how matters stand at the Plymouth Gas-Works. At the meeting of the shareholders last week, Sir Joseph Bellamy made some references to the subject; and he exercised admirable caution in what he said. But generally it may be gathered that the whole of the expected benefits from the agreement still lie in the future. Neither the Coalite people nor the Gas Company have gained much as yet. Some coalite has been made, and some gas has been supplied to the Company. But for the present coalite does not appear to be in great demand; and the Coalite people have, to quote Sir Joseph Bellamy, "availed themselves of this slack period to carry out certain 'improvements in the coalite plant.'" The actual state of things appears to be that two-thirds of the plant is just now inoperative. On the occasion of the visit of the Cornish Gas Managers in April, the erection of one of the three batteries had not been completed; and some other parts of the plant connected with the screening and conveying of the coalite were not fully installed. That was some two months ago. Now one of the batteries is standing idle, and another has been taken down in order that it may be rebuilt, presumably with the "certain improvements" which experience has shown to be necessary. It is not, of course, an uncommon thing with new inventions, nor indeed with old processes, to discover that appliances and plant are capable of some improvement. But the Coalite people are exceptionally fortunate (or otherwise) with regard to such discoveries. The plant erected at Plymouth was a very wide departure from the original idea; and we freely admit that, for the purpose of producing coalite, the castings of small tubes are a definite advance on the primitive vessels that had to be scrapped at Wednesfield. Yet the new plant at Plymouth has hardly been in use as many weeks as it took months to put up, when it is found necessary to pull it to pieces and reconstruct it. It is fortunate that this has happened in a slack time; and it is to be hoped, for the sake of the expectations which are based on it, that an end will shortly be put to the experimental stage of the Coalite Company's operations. What is wrong this time is not altogether clear; but the apparatus must have serious defects if it was necessary to reconstruct it so soon after its erection. As to coalite itself, the tenour of Sir Joseph Bellamy's remarks suggests that it is not in great demand in Plymouth. Some thousands of tons have, he says, been made and sold; but its sale is clearly not satisfactory in quantity, or he would not have thought it necessary to devote so many words to puffing it. One point upon which enlightenment might have been given is the effect that coalite has had, if any, on the local market for coke. Perhaps, however, the thing has hardly been long enough in operation—in spite of the "thousands of tons" sold—to make any appreciable difference in the local coke market. Still less, it would seem, is it likely that what is going on at Plymouth will contribute in the near future to the payment of dividends to the shareholders of the British Coalite Company, or to revolutionize the gas industry.

Quite naturally that is not the view delineated in the circulars of Sir W. H. Preece and Mr. J. H. Smith, both of whom make reference to the remarks on smokeless fuel in the address of this year's President of the Institution of Gas Engineers (Mr. Thomas Glover), in which remarks he generously suggested that the claims of the coalite promoters should not be discarded without due examination. Just so. But there was no acceptance, recommendation, or benison in what Mr. Glover said for low-temperature carbonization as practised in the coalite system. The active spirits of the Coalite Syndicate and Company would, however, be false to their reputations if they did not make the utmost use of Mr. Glover's amiable phrases, and construe them as offering "the strongest confirmation of the claims 'that were originally put forward as to the advantages of 'the coalite process.'" Those "claims" which, at the time, we asserted were purely speculative are now admitted to have been such by Sir William Preece. Not only were they speculations originally, but even now some of them have never yet been scientifically investigated. Says Sir William: "We are dealing with entirely new technical conditions, some of which have never been investigated, even

"scientifically. Hence we have to advance with great care "and caution." This is a sensible declaration on the part of Sir William; and it admits that the Company are not yet by any means out of the wood and that "great care and "caution" are still desirable. If, at the outset, those astute gentry who were responsible for those thrilling fairy tales that (before the British Company's prospectus was circulated) were published as advertisement articles in "The "Times" had spoken as Sir William has spoken now, and confessed that their claims were at the time purely theoretical, and that nothing had really been substantiated, this would have cut the ground from under much of the technical criticism that was levelled at the process at the time. Now we are told that every trouble that has arisen has been either mechanical or personal. The changes that have been made in the form of the carbonizing plant we regard as being something more than mechanical. That all the troubles have been "easily" remedied is a statement that does not tally with the time consumed in remedying them; and, as has been shown above, the process of remedying defects is still proceeding at Plymouth. The explanation given in the circular concerning the repairing or reconstruction work at Plymouth is that six of the retorts failed through a leakage of air into the tubes; and there was internal combustion of coalite. "The temperature was, in consequence, raised too "high, and the six retorts were damaged." The circular tries to belittle this by saying "six out of the 384 retorts in "Plymouth failed." The six are thus made to appear to be a small proportion of the whole. It would be interesting to know if the six faulty tubes were found all in one casting, or were distributed. Anyway, their renewal has meant the disabling of the entire battery.

To sum up the progress in putting down plant. There is one unit in operation at Barking (a unit comprising 32 bunched stills, each containing twelve tubes); and four more units, it is hoped, will soon be at work. We gather that, as each bench is equal to a production of 33 tons of coalite per day, the five benches will only turn out 165 tons a day. There is not a fortune in this. But that does not matter. A tar distillery is also to go up here; and this is going to do the trick. It would now appear (this is not the original notion) that it is not from coalite that the bulk of the profits of the Company is to be derived, but the chief profits will be yielded by the distillation of tar. Very good; we will bear this in mind later on. From coalite many blessings are, so it has been predicted, to accrue. But a new one has been found: "Cheap [electric] power on the Thames at "Barking will be the means of forming a new populous town "of great rateable value, and a new industrial centre employ- "ing a large population." Then, in addition to Barking, there are the three benches at Plymouth, one of which is already down for repair; and we believe only one unit is working to-day. At Wednesfield, there is one little experimental bench, and only one ordinary bench, and a second bench is now nearing completion. At Hythe, two benches are being erected, and are expected to be in operation during August. The gas is to be supplied to the Hythe and Folkestone Gas Companies; and the tar is to be conveyed to Barking for distillation. This is the sum of the advance accomplished and immediately in prospect; but there will be many shareholders who will with us still fail to see, from what has been done so far, that the "economic claims of the process have "been established." As a matter of fact, we may say in few words (unless compelled later to go into details) that the Coalite Company have done their best to keep us at arm's length in investigating their "economic claims." One other point. We hope the Coalite Syndicate shareholders will not hang too much faith upon securing the St. Petersburg contract. The protraction of the period of investigation by the authorities there has not strengthened the chances of coalite in that direction.

Sinking Funds and New Capital Expenditure.

THE great enlargement of the financial commitments of local authorities—to a considerable extent brought about by entering into trading on a large scale (including many an ill-considered scheme)—has, together with the growth of the rates, brought the question of local finance under a much more minute inspection during recent years than erstwhile obtained. But we do not, as a result, get much nearer a more rigid and effectual control. It is true that, in respect of one small part of local trading in which the municipal body falls foul of the individual private trader, the authori-

ties of the House have decreed that henceforth new powers in respect of such trading shall be subject to the stipulation that the revenue shall be on a basis that will cause it to meet outgoings; and there is also the new-born desire upon the part of Parliament, in respect of productive undertakings, to restrain to prescribed limits the amount of appropriation from profits in aid of rates. But beyond this the control exercised over the funds of local authorities is lax to a disquieting degree; and it would be a most wholesome thing if greater safeguards were imposed in order to prevent as much as possible the incontinence, the intemperate speculation, and the spendings on objects that are only to serve some vainglorious end (rather than one of merit and credit), all too generally seen in municipal administration. This is not the time for the mere patching of the conditions of municipal finance, nor for dealing piecemeal with the questions of control and liberty. The whole system of municipal fiscal administration, through the great growth of municipal trading, requires overhauling.

It is for this reason that one, almost unconsciously, approaches with suspicion the consideration of any proposition that merely affects a part of the whole large question. There is before us a report of the Select Committee appointed by the House of Commons in February last to consider the question of the availability of municipal sinking funds as a source for the exercise by local bodies of new borrowing powers. The Committee appear to have received much evidence. But looking down the names of the witnesses whose views are quoted by the Committee in the course of their report, it is apparent they have hearkened with open ears to the witnesses—all bearing names respected by us—occupying official positions under county and municipal authorities; but there is little said in the report as to what others of position in the financial world have had to say to the principle (to which encouragement is given by the Committee) of utilizing sinking funds—including loans funds and redemption funds—for purposes for which local authorities are granted borrowing powers. The Committee's finding is that the principle is, if properly safeguarded, financially unobjectionable. The words, "if properly safeguarded," should be heavily underlined; for with proper safeguards, weighing the *pros* and *cons* before us, there is little question that the power of using these funds for new capital purposes should be an economic advantage, owing to it offering a convenient and cheap method of exercising new borrowing powers. But, of course, such powers of borrowing from sinking funds should only be allowed by treating the appropriation as a purely fresh loan, in respect of which again sinking fund and interest have to be provided. Whether, in such circumstances, the appropriation of possessed sinking funds for new capital purposes would be more advantageous than the issue of new loans, would depend entirely on the condition of the Money Market. The evidence on the subject laid before the Committee was by no means uniformly in agreement with the suggested utilization. It cannot, however, be seen that such utilization would transgress any sound financial principles. Examination does not readily divulge any way in which it would adversely affect the credit of the local authority; if it promotes economy, it should have the opposite effect. It is quite obvious, too, that if the sinking fund is utilized by (before any fixed date of loan repayment) purchasing and extinguishing stock in the open market, this might be the means of unduly appreciating the value of the stock; and therefore the alternative of utilization for new capital requirements would, from this point of view, be an undoubted advantage, as well as save expense.

On the other hand, it must depend upon the safeguards applied whether or not the power to utilize sinking funds in this fashion is likely to encourage reckless finance, owing to the ease with which money can be obtained by these means, and to the fact that the ratepayers are not adequately warned that new expenditure is about to be incurred. The opportunity for surreptitiously embarking into fresh capital expenditure should be very carefully averted by stringent rule, both for the protection of those town councillors who are antagonistic to irrational projects and expenditure, and for keeping within bounds those councillors who have a *penchant* for spending money that is not their own. We do not think the Committee take a sufficiently serious view of this consideration. They say, in support of their conclusion, that the objection to the suggested utilization on the ground of encouraging reckless finance is untenable, inasmuch as "local authorities "can only borrow money for purposes for which they are

"authorized to borrow by Parliament or by a Government Department." But unfortunately many local authorities spend money, and more particularly in connection with the newest of their trading ventures, before securing the sanction of Parliament or the Local Government Board. How many local authorities possessing electricity undertakings have largely exceeded in their spendings the sanctions obtained? The number is not properly expressed by the words "very few." The money representing expenditure in excess of sanction comes from somewhere; but from where—as in the case of the £43,423 over-expenditure on the West Ham electricity undertaking—the authorities will not always disclose. That is the direction in which the hands of the Local Government Board badly want strengthening, so as to prevent (with limited liberty in the case of an emergency) the borrowing of money, from any source whatsoever, until sanction has been obtained. Therefore, while agreeing that local authorities, in the interest of the communities, should be allowed to raise money for capital purposes in the most convenient and economical manner, there must be full assurance that the privileges conferred are conditioned in such manner that the first convenience and economy cannot be cancelled by reckless application through insufficient surveillance. It is also important that a scrupulously exact and clear statement should be kept of all such dealings with the sinking and such-like funds, and that there should be an annual return to the Local Government Board. If, too, any general granting of power to local authorities in accordance with the Committee's findings should ensue, it will be a matter of much regret if proper measures are not simultaneously taken to ensure that the money is not spent until sanction is obtained. That is a safeguard the ratepayers and investors have a right to expect. The process of securing sanction also requires expediting; but that at present there is frequently so much delay, is largely attributable to the loose financial methods of many local authorities. The Committee likewise consider the question of the utilization for capital purposes of loan funds and redemption funds under the various circumstances of their formation and application; and in regard to these they suggest one or two restrictions. But beyond the points of general principle and adequate control, there is no necessity to go here.

The Industry's Progress.

THE department of the Board of Trade responsible for the issue of the Gas Undertakings Returns are to be congratulated upon the expedition they have shown in producing those for, in the case of companies, the year 1907 and, in the case of the local authorities, the year ending on March 31, 1908 (not March 25 as heretofore). Looking at these dates, our congratulation needs some explanation. Last year the returns fell considerably in arrear; for it was not till September 8 that we had an opportunity, through belated publication, of reviewing them in the "JOURNAL." This year there is a gain on last year's performance of upwards of two months—in other words, less than ten months have elapsed since the returns were last issued. This shows what can be done; and if the preparation of the returns is accelerated in similar manner over the next two or three years, we shall be back at the normal period of publication, and that was sufficiently late to detract somewhat from the value of the returns.

The periods covered by the respective returns will be at once recognized as those in which the price of coal and oil ruled high, and in which, in consequence, in not a few places, the price of gas had to be raised. But the disadvantages thus imposed on the gas business did not prevent its expansion in a very material manner, for a few millions additional consumption would have made the quantity of gas actually paid for 5000 million cubic feet in excess of that in the preceding company and municipal years. This is a healthy condition in times of what were exorbitant fuel prices, and during which times the continuous adoption of the higher efficiency lamps went on apace. Let us deal with the total figures in order. The returns, of course, only incorporate statutory concerns; and the company undertakings on this occasion rendering returns number 495, and the local authority concerns 276—an addition of four in each class. In considering the table of totals at the end of the returns, or in making comparisons, care must be exercised, as for some reason that is not apparent or intelligible, the companies' loan capital has not been included; and we were at first rather startled to find the capital authorized and issued had declined by several million pounds. The total capital autho-

rized as shown in the table is £129,702,385, of which £84,363,857 represents the companies' capital-raising power, and £45,338,528 that of the local authorities. But if we add the omitted £21,204,926 loan authorization of the companies, a total of £150,907,311 is seen, or an increase of £2,451,863. The total amount of capital issued (as shown in the table) is £113,865,050; but adding the companies' loan capital issued (£14,645,271), a sum of £128,510,321 is obtained—being an increase of £1,945,861 on the amount in the preceding returns, of which the (495) companies were responsible for £1,321,869, and the (276) local authorities for £623,992.

Next, from capital to business done. With total receipts amounting to £30,067,752, there is an increase of £2,058,422, of which the companies produced £1,401,249, and the local authorities £657,173. The large increase in the cost of coal and oil notwithstanding, the advance in the total receipts more than counterbalanced the increase in the expenditure. The total outlay of £22,724,104, represented an addition of £1,840,748, of which £1,213,613 is chargeable to the companies, and £627,135 to the local authorities. Receipts, expenditure, and working results have propinquity. The quantity of coal carbonized during the year was 15,406,753 tons, which augment the previous figures by 560,496 tons. The total amount of gas made last year was 188,486,693,000 cubic feet, being an increase of 6,627,617,000 cubic feet, which, regarded in relation to the larger quantity of coal used, stands very well. Of the increase, to the companies are due 4,170,782,000 cubic feet, and to the local authorities 2,474,835,000 cubic feet. The volume of gas sold amounted to 172,889,147,000 cubic feet—an increase of 4,943,941,000 cubic feet, of which the companies may claim 3,020,767,000 cubic feet, and the local authorities 1,923,174,000 cubic feet. The 33,536 miles of mains represents an extension of 846 miles. Numerically, consumers have grown to 5,665,176, or an enlargement in the year of 301,643, of which 207,374 are new connections for the companies, and 94,269 for the local authorities. The total number of public gas-lamps has never stood higher than now—700,264. It was brought to this total during the year by 22,284 fresh connections, of which companies booked 16,916, and local authority undertakings 5368.

Looking at all of these figures, it is seen that the gas industry's tale of prosperity shows no signs of abatement in interest. Despite the severest competition ever brought upon it, never has the magnitude of its business been so great as now. It is well.

Plymouth Gas and Naval Policy.

Several matters of interest were touched upon in the course of Sir Joseph Bellamy's speech at the annual meeting of the Plymouth Gas Company last week. It has been a busy and an important year in the history of the undertaking, notwithstanding the check that has been given to the period of marvellous expansion which has marked its recent course. Plymouth has grown rapidly in the past decade; but the growth has been arrested lately, and instead of houses being at a premium, as they were ten or fifteen years ago, there is now a considerable amount of empty property. Probably this is only one of the symptoms of the general stagnation of trade throughout the country, though it is partly to be accounted for by the special circumstances governing the life of Plymouth in its dependence upon the neighbouring Government Dockyard. Changes in naval and military policy, which occupy a good deal of the attention of statesmen and politicians, make themselves felt in places like Plymouth and Woolwich, where stagnation and distress follow quickly upon the heels of a determination towards retrenchment on the part of the Government of the day. The Plymouth Gas Company are experiencing their share of the effect of the recent tendency to economize in naval expenditure. They are also suffering, no doubt, from the effect of the keen and not over-scrupulous competition of the municipal electricity undertaking.

Municipal Opposition, and Reduction of Price.

Attention has already been directed in the "JOURNAL" to the manner in which the Plymouth Town Council have ignored what appeared to be the obvious interests of the ratepayers, in order to divert business to their electricity works. For this kind of thing there is unhappily no remedy, or, at least, none which seems likely

to be immediately effective. It is perfectly true, as Sir Joseph Bellamy said at the meeting referred to in the preceding paragraph, that the preference given to the municipal undertaking really hits the ratepayer in his capacity as a gas consumer harder than it hits the man who happens to have shares in the Gas Company. The ratepayer contributes more for the lighting of the streets and public buildings when electricity replaces gas; and at the same time he pays more for the gas which he himself consumes, because the diversion of that amount of business has checked the expansion of the gas undertaking. But the ratepayer submits either through ignorance or apathy, and complaint is not of much avail. Another matter touching the relationship of the Plymouth Gas Company and the Local Authority is the announcement of the increase of the assessment of the Company's undertaking by no less than 100 per cent. Against this monstrous imposition, the Company are very rightly appealing; and an opportunity will be afforded of learning what are the grounds which are supposed to justify so large an addition to the valuation of a business which, however progressive and well managed, seems to have arrived at a period of what, in connection with other institutions, is called arrested development. In spite of these not altogether satisfactory associations with the public authorities, the Company are to be congratulated on being able to announce a reduction in the price of gas to the old rate of 1s. 9d. per 1000 cubic feet. Plymouth gas was for years sold at this figure, and was at one time among the cheapest (if not actually the cheapest) in the country. In recent years disturbances in the coal market and other events have caused some fluctuation in the price, and have postponed the realization of the hope of selling gas at 1s. 6d., at which the Company once aimed. Whether this price will ever be touched seems doubtful just now; but a return to the old rate is a distinct gain, and may give a fillip to the consumption this year. Another matter on which the Engineer (Mr. Percy Hoyte) and his staff are to be particularly congratulated is the excellent working result indicated by an output (with his ordinary carbonizing plant) of 11,756 cubic feet of gas per ton of coal. This is the best yet achieved at Plymouth, and is a legitimate subject for commendation. The references made by Sir Joseph Bellamy to coalite are dealt with elsewhere in our editorial columns.

West Ham Proprietors Approve.

It was quite a quiet little family gathering of the proprietors of the West Ham Gas Company over which Mr. J. Lister Godlee presided last Tuesday, when approval was given to the Bill for the amalgamation of the Company with the Gaslight and Coke Company. The fears and forebodings that (so to speak) a handful of the proprietors of the smaller Company appeared to entertain some four months since have been lulled. Time has brought conviction that a good deal of misconception had possession of a few minds. The result was that on Tuesday there was only one voice raised in opposition with the object of showing a consistent attitude, but there was not a single hostile vote to register. The anticipation of the local proprietors, that amalgamation would do some injury to West Ham by the closing down of the works, has also been proved to be groundless by the willingness with which the Gaslight and Coke Company consented to be bound to keep the works running for a further decade on substantially the same scale as just anterior to the introduction of the Bill. This agreement should give assurance to all concerned that the Directors of the larger Company do not anticipate that the West Ham electricity undertaking is going to make such inroads into the gas business that they will be unable to fulfil their part of the arrangement. The proprietors of the West Ham Company were also well satisfied with the way the Directors had protected their interests in connection with the concessions by the Gaslight and Coke Company to the London County Council and the City Corporation, by ensuring their dividend on the same scale as at present through an addition of £3 of stock to the £118 per cent. previously agreed upon. In the Stock Market, and among investors, the amalgamation is well regarded. Since the promotion of the Bill, the Gaslight and Coke stock has gained in price; and there has been the remarkable appreciation in the price of the West Ham ordinary stock of about 20 per cent., representing something like £180,000 since the proposal was first made public. There does not appear to be anything now in the way of an easy run for the Bill through its final stages.

Inharmonious Relations.

The account published last week of the proceedings on the Fermoy Provisional Order, before the House of Commons Committee, suggests that, in considering their decision, Mr. Mooney and his colleagues did not give sufficient weight to the whole history of the attitude of the Local Authority towards this small struggling concern. The report reads a bit romantic; but, on the authority of Mr. C. C. Hutchinson, it is quite true. There is not the slightest doubt that the hostility and oppression of the local authority in times past have been the means of greatly retarding the development of the undertaking, and keeping it back in a position in which it has been impossible to serve the district to the best advantage. There appears (according to the statements made) to have been no expedient within reach that the past "governors" of the local interests of Fermoy have not adopted in an obvious attempt to cripple the undertaking. They do not seem to want to purchase it; but, as Mr. Vesey Knox said, they did want a reasonable capital, a reasonable price, and a reasonable dividend fixed. They look for much that they consider "reasonable" in others; while they or their predecessors have treated those others to all that is unreasonable. It is their unreasonable conduct that has largely deterred the owners of the gas undertaking from working up the business, so as to put themselves in the position to be of greatest possible service to the district. Had the Fermoy Council worked on harmonious lines with those owners, there might not have been the same amount of reason that there is to-day for the assertion that the decision of the Committee as reported last week is grossly unfair to the promoters of the Fermoy Provisional Order.

The Value of the Correspondence Column.

A difficulty which gas companies might otherwise sometimes experience in bringing their side of a question properly before the ratepayers in the particular district which they may happen to serve, can be effectively met by having recourse to the correspondence columns of the local newspapers—which are probably as widely read as any other section of the matter published. The opportunity that is thus offered of putting readers in possession of facts which it may be desirable should be brought to their notice is, we are pleased to see, being extensively taken advantage of by gas undertakings; more than one instance of the adoption of such a course being recorded in our news columns to-day. In the first place, there may be fairly put within this category a letter to the Mayor of Maidstone (which the author forwarded to the Press) written by the Chairman of the Gas Company—who are naturally among the largest ratepayers of the borough—to protest against a proposal to convert some more of the gas-lamps to electricity. The extravagance of such a course is clearly set forth; and the figures quoted should give rise to very serious consideration on the part of the ratepayers. The next case is that of the Secretary and Manager of the Taunton Gas Company, who has publicly set the Town Council right with regard to a statement made in a report by the Lighting Committee to the effect that they had failed to come to terms with the Company to replace flat-flame burners by the incandescent system in the street-lamps, on account of the exorbitant charge. The citizens are now put in full possession of the facts of the case, and shown how the lighting of the town can be improved at a very large saving in cost. At Chichester, also, the Engineer to the Gas Company has taken full advantage of an excellent opportunity of setting forth the good qualities possessed by gas, when used in the latest types of burners. We welcome all manifestations on the part of those connected with the gas industry of their determination not to "lie down" so long as any reasonable possibility exists of misapprehension on the part of the public as to the superior merits of gas, judged from the standpoints of either cost or efficiency.

Financial Administration of Municipalities.

It was natural to expect an interesting address from Mr. H. E. Haward, the Comptroller to the London County Council, in his capacity as President of the Institute of Municipal Treasurers and Accountants; and those who heard him deliver it at the recent annual meeting were not disappointed. A number of the most pressing questions as affecting municipalities were discussed by him at more or less length; and, of course, it was, under these circumstances, impossible to altogether leave the subject of

trading out of consideration. Mr. Haward, looking back over last year, notes as a satisfactory feature the diminution of hostile criticism "of the finance of what is termed municipal trading;" and he thinks the explanation is largely to be found in the fact that the financial results shown in the balance-sheets of these undertakings are now better understood, and it is realized that such enterprises may be carried on at a profit in a commercial sense, though there may be no profits available for the relief of the rates. The statutory sinking fund for the repayment of the capital outlay is, he remarks, the "financial sheet-anchor" of municipalities; and where adequate provision is made by charges to revenue for the renewal of all wasting assets in addition to the sinking fund provision, the moneys set aside for the latter purpose represent clear profit, which inures to the benefit of a future generation, though the present generation has to pay income-tax upon it. There will be hearty agreement with his emphatic assertion that "it is of the utmost importance that the public should be satisfied as to the soundness of the basis on which these undertakings are carried on, having regard to the enormous amount of capital already invested in them, and their effect upon municipal credit generally." Some people, however, may be able to recall, without much difficulty, instances in which such satisfaction has not been forthcoming. Another point of importance to which Mr. Haward referred was the question of the allocation of profits for municipal trading undertakings, which he remarked, the recent decisions of Parliamentary Committees in the cases of the Salford Bill and the Potteries Federation Order had brought into special prominence. The subject had not, he said, been thoroughly discussed by the Institute; and he suggested that the Executive Council should take up the matter, and endeavour to formulate the principles which should determine the allocation of trading surpluses. This should prove a useful, if somewhat arduous, task.

Workmen's Compensation Law.

There have not recently been many cases argued under the Workmen's Compensation Act; but one which was decided by the House of Lords a few days ago is worthy of note, in consequence of its general application, though it deals with a point that might not often arise. The question was whether the right of a dependant of a deceased workman to make a claim under the 1906 Act passes to an executrix of a dependant who dies without making a claim. The action arose in Scotland; and the Court of Session determined it in favour of the executrix—which judgment has now been affirmed by the House of Lords. The facts were that a workman in the employ of the United Collieries Company met his death by being knocked down by a waggon; and his mother, who had stated that she was dependent upon him, died some three months later, without having made any claim upon the Company. Shortly afterwards, her executrix did make a claim, as the representative of the mother; and the point was whether such claim could be admitted in law. In the course of his judgment, which answered this question in the affirmative, the Lord Chancellor remarked that the Act made employers liable to pay compensation in accordance with a schedule which definitely set forth the amount of compensation to be given to those wholly dependent upon the earnings of a man who might be killed. This amount was not calculated with reference to the expectation of life of the dependant; and it certainly looked like a debt arising on a man's death from the employers to his dependants—a conclusion with which the other provisions of the schedule fitted in. The Act did not proceed upon any other view than that there was a definite right to the money on the part of dependants as a class. The Statute treated this right as arising because of the workman's death; and it seemed to follow that it arose on the man's death, unless some other event was fixed. It was true that the Act declared that proceedings for the recovery of compensation should not be maintainable unless notice had been given as soon as practicable, and the claim for compensation made within six months. But his Lordship could not see why the claim, instead of the death, was to be regarded as the signal for the right to compensation vesting, and, even if it were so, he said the Act did not require that the actual dependant should make the claim. It seemed to him therefore that, as the person represented by the executrix was the only dependant, her representative might properly claim all that she was entitled to. Reviewing the principle of the Act, his Lordship (while admitting that it could not affect the judgment of a Court of Law) pointed out that it

did seem anomalous to enforce payment when no dependant was still living to require support; and he ventured the opinion that perhaps if this result had been foreseen it might have been guarded against. The case is rather a hard one from the employers' point of view; and "compensation" really seems to be a misnomer for the sum of money they will have to hand over to a claimant who has suffered no direct injury.

Compromise Proposals Rejected.

Negotiations have not been broken off; but both sides are preparing for a struggle. This sentence appears to sum up the present situation in the South Wales coalfield. During the past few weeks, as the dispute has entered on different phases, there has been no lack of assurances that a way would be found out of all the difficulties; but at last no attempt whatever is being made to conceal the gravity of the position. Of course, the fact that negotiations have not yet been broken off shows it is not time to abandon all hope of peace. The sands are running low; but even at this eleventh hour, it seems impossible to believe that no means will be found of avoiding so suicidal a conflict as is now threatened. It is true that the owners have formulated what they designate as an "irreducible minimum;" that this has been rejected by the men, whose representatives announce themselves as unable to recede in the slightest from the position they have already taken up; and that the Conciliation Board on Friday spent another abortive day in their attempt to find a solution, or to narrow down the differences still existing between the parties. But further efforts—which we trust will be successful—were, it was stated on Saturday, to be made during the short time remaining before the notices expire—namely, to-morrow (Wednesday). The South Wales Miners were to hold a general conference on Monday (yesterday); the Miners' Federation of Great Britain are to meet in London to-day; and the Conciliation Board will once more endeavour to-morrow—literally at the twelfth hour—when they will have the decisions of these two conferences before them, to arrive at a settlement. The owners have already declined a suggestion that the notices should be suspended for a month, in order to allow a longer period for negotiation; and the men have similarly treated a counter-suggestion by the employers that they and the workmen should join in a mutual application to the Home Secretary to postpone the operation of the Eight Hours Act for six months. Attention is therefore concentrated now on the two obstacles to agreement—the owners' demands that they shall have the right to establish, where practicable, a double-shift system, and to inaugurate under clause 3 of the Act one nine-hours day per week. Almost by the time these lines are read, it is to be hoped the information will have been published far and wide that the gulf has been bridged, and that all talk of a lock-out and strike is at an end.

OBITUARY.

The friends of Mr. E. H. HUDSON, Engineer and Manager of the Normanton Gas-Works, will regret to hear of the sad loss he has sustained in the death of his wife last Friday.

We are sorry to have to record the death, at Llandudno last Wednesday, of Mr. JAMES PYE, who for a little more than half-a-century filled the office of Secretary of the Chester United Gas Company—taking up the position in 1854, and retiring in 1904. During the fifty years Mr. Pye served the Company, its progress and prosperity made amazing advance; and it is largely through his efficient and energetic labours that the Company holds the position it does at present. On the retirement of Mr. Pye in 1904, there were many manifestations of the esteem in which he was held, not only by the Directors and shareholders of the Company, but by his staff at the gas offices and at the works, among whom he had always been held in great affection. A joint presentation from the Directors and employees of the Company in all grades was made to Mr. Pye by the then Chairman of the Directors (the late Mr. John Gamon). When Mr. Pye retired, his position was taken by his son, Mr. F. A. Pye, who became both Secretary and General Manager. After his retirement, Mr. Pye went to reside at Llandudno. For some time he had not enjoyed good health; and his death was not unexpected. He had attained the age of 81; and he leaves a widow and a family of four sons and five daughters. Of his sons, two—Messrs. T. E. Pye and J. H. Pye—are Engineers to Gas Companies; the former at Chichester, and the latter at Clevedon. Mr. F. A. Pye is Secretary and General Manager of the Chester Gas Company; and Mr. James Pye is a professor of music. The funeral was arranged to take place at Chester Cemetery on Saturday.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 995.)

THE Stock Exchange did not have a very enjoyable time last week, for the dominant business was the fortnightly settlement; and a heavy one it was in the speculative mining markets and the South African. For some parties the difficulties proved insuperable; for others assistance came to the rescue. This depressing influence caused more or less general flatness. The opening day was fair; and Railways and some other lines took a firmer stand. But the gilt-edged group held aloof. On Tuesday, the tendency became much heavier, with a general shrinkage in pretty well all lines. Consols did not move. On Wednesday, there was a rally for the better in the more active markets, and, with the situation getting clearer, a slight general improvement was effected. This tone held on fairly well through Thursday in the markets generally, and Consols rose fractionally. On Friday, the settlement was completed, involving much realization and dulling the brighter outlook. Consols lost their little gain. This state of things continued on Saturday. Consols dropped another $\frac{1}{16}$; and the prevailing tendency was really dull. In the Money Market, rates for short loans stiffened in face of a good demand from the Stock Exchange; but discount terms became lighter as the week progressed. Business in the Gas Market showed a further falling off in point of volume, approaching towards stagnation on one or two days. However, this had no weakening effect, for the market held very firm; and wherever a change in quotation was made at all, it was in the upward direction. In Gaslight and Coke issues, the ordinary was quieter but very steady, transactions marking from 103 to 104. The secured issues only showed half-a-dozen bargains between them; the maximum being done at 89, the preference at 105 $\frac{1}{8}$ and 106, and the debenture at 85 $\frac{1}{2}$ and 85 $\frac{3}{4}$ (a rise of $\frac{1}{2}$). South Metropolitan had also half-a-dozen transactions, at prices ranging from 122 to 122 $\frac{3}{4}$. The debenture was done at 85 $\frac{1}{8}$. In Commercials, there were two transactions in the 4 per cent. at 109 $\frac{3}{8}$ and 109 $\frac{3}{4}$, and one in the debenture at 82 $\frac{1}{4}$. The Suburban and Provincial group was as quiet as ever. Brentford new changed hands at 196, British 43 $\frac{1}{2}$, Wandsworth debenture at 75 and 75 $\frac{1}{2}$ *cum div.*, and West Ham at 121. In the local Exchanges, Sheffield "C" fell 1, and Newcastle debenture rose $\frac{1}{2}$. In the Continental companies, Imperial was more active, but inclined to be easier. Transactions were from 180 down to 178 $\frac{1}{2}$, but the quotation was not varied. The debenture made 96 and 97. Union was done at from 97 to 97 $\frac{1}{4}$; and business in the preference at 138 and 138 $\frac{1}{2}$ sent the quotation up 2. European part-paid marked 18 $\frac{3}{4}$ —a rise of $\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres made from 13 $\frac{15}{16}$ to 14 $\frac{1}{2}$, Primitiva 6 $\frac{1}{4}$, River Plate 15, and San Paulo 14 $\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Metallic Filament Prices—The House of Darkness—Assumptions—Spring Cleaning and Radiators—Frivolity or Parsimony—Serious Lapses of Memory—Another Comparison of the Ancient and Modern—Anomalous Treatment.

COMPETITION between manufacturers and the reduced rate of demand are between them playing sad havoc with the business in metallic filament lamps. Fresh makers have dropped into the market; and it seems impossible to get all the producers under one hat in respect of prices. There is an understanding between a number of them to maintain uniform prices; but there are certain important firms who decline to bind themselves by undertakings of any description in this way. Therefore, such understanding as does exist is not worth much to the parties concerned. During the past lighting season, there have been no fewer than four reductions in price, so keen has been the scramble for the business to be done. The writer of "Installation Topics" in the "Electrical Times" takes the part of the candid friend. He says: "If manufacturers, instead of expending misplaced energy in cutting one another's prices, would devote their efforts to improve the lamps themselves, it would be more to the interest of the trade and of the user. The tungsten lamp in its present form is by no means ideal; and the actual price at which it is sold is quite a secondary matter compared with its efficiency, life, and mechanical strength." It is observed that the prices now range from 2s. 3d. for 5, 8, and 10 Hefner unit lamps for 25 volts up to 4s. 3d. for 32 and 50 Hefner unit lamps for 200-260 voltages. This rapid price-cutting is significant.

Irresponsible Maud! The "Electrical Review" has opened its columns to an article by "Maud" on "Electricity in the Home." "Maud," we are assured, is a lady; and so we will be as gentle and as chivalrous as possible. But, Maud, we must accuse you of telling little (may we venture to use the word?) untruths, of jumping at data, and of being fond of the darkness that men are supposed to love, because—better let that pass. Maud says she has had considerable experience of both gas and electricity for lighting and heating purposes in the home. This being so, she will without any hesitation be able to answer a few questions that we should like to put to her. She takes an eight-roomed house. The dining-room is lighted by a 50-candle lamp; and "it gives 16 $\frac{1}{2}$ hours' lighting for 3d., as against incandescent gas, for the same amount

of light, 3 $\frac{1}{2}$ d. per 16 $\frac{1}{2}$ hours, to say nothing of the gas wasted by the bye-pass jet, which is on continually." We find that a 50 Hefner unit (45-candle) metallic filament lamp uses just over a unit of electricity in 16 $\frac{1}{2}$ hours; so that Maud only charges her electricity up for lighting at 3d. per unit. This being so, gas will probably be obtainable in her district at 2s. 6d. per 1000 cubic feet. A modern 50-candle power inverted incandescent lamp only consumes 2 $\frac{1}{2}$ cubic feet of gas an hour, or in 16 $\frac{1}{2}$ hours 41 $\frac{1}{2}$ cubic feet, which, at 2s. 6d. per 1000 cubic feet, would not cost more than 1 $\frac{1}{2}$ d. We ask Maud to justify her 3 $\frac{1}{2}$ d. We hope it does not turn out to be the amount of the last draper's bill that this economical lady contracted. But the 3 $\frac{1}{2}$ d. includes "nothing for the gas wasted by the bye-pass jet, which is on continually." The second question is, how did Maud manage to separately measure that 3 $\frac{1}{2}$ d. worth of gas from the consumption of the bye-pass jet, which is continually on. Bye-pass jets are not commonly used now; and their consumption is not usually metered apart from the burner. Maud will tell us how she managed it.

The bogey of spring cleaning is sprung upon us again. Most ladies love spring cleaning; Maud is the exception to the rule. The lady claims that wall papers will last twice as long with electric light as with gas. She ignores the inverted gas-burner, using the bijou form of which enables us to show ceilings that have not been cleaned for years, nor do they require cleaning now. About those curtains, too. It would be interesting if Maud would tell us a little more as to how it is that a bunsen flame has such a deteriorating effect upon curtains. It is a mere man who is writing now. But he is told by the powers that be that, when more gas was used in flat-flame burners, and curtains were hand-washed, they lasted infinitely longer than they do now that much less gas is used, and the laundryman has gone in for new-fangled mechanical assistance. In the drawing-room, Maud reckons for two 50-candle power electric lamps; but it is her comparison between a 1-unit-per-hour radiator and a gas-fire we want to particularly chat over with her, in order to obtain a little more information. She finds that the radiator full on costs per day of twelve hours 1s., against 1s. 6d. for a gas-fire. Now we suggest that Maud should tell us the basis on which her calculations are made, because in the 18d. of gas, she has allowed just about enough to roast an ox; and that is not what gas is used for in a drawing-room. We allow a price of 2s. 6d. per 1000 cubic feet of gas; Maud for electricity 1d. per unit. A penny will purchase 33 cubic feet of gas; and 1s. 6d. about 600 cubic feet! A cubic foot of coal gas is equal to about 600 B.Th.U.; therefore, a pennyworth of gas will be equal to 19,800 B.Th.U., against 3437 B.Th.U. per unit of electricity, sold at a penny. Now 19,800 B.Th.U., multiplied by the 18d., gives 356,400 B.Th.U.; the 3437, by 12d., gives 41,244 B.Th.U. If merely one-third of the heat from the combustion of the gas is radiated into the room, we only get down to 118,800 B.Th.U. With gas at 2s. 6d., Maud wants a gas-fire that will use 1 $\frac{1}{2}$ d. of gas, or about 50 cubic feet an hour, representing about 30,000 B.Th.U. A gas-fire using, when full on, one-third of this gas in the first hour, should be sufficient for the drawing-room of this little residence; and after the first hour, the consumption could be, and would be on account of the heat, much reduced. Maud is asked for the basis of her calculation. We happen to have a little practical knowledge about electric radiators and their heating capabilities. Later on in the article, a portable radiator is recommended for the people in the house to use in turns in their bed-rooms. What is that "unpleasant odour" that Maud says arises from this type of bed-room fire, and what dirt is it that it creates? There ought not to be odour or dirt. Explanation is needed.

Let us now get back to the so-called lighting of this dismal house, managed by the parsimonious Maud. "The lighting of the kitchen should be not more than 16-candle power, with 8-candle power in the scullery and back passage." How we sympathize with the occupant of the kitchen! With only a 16-candle light, Maud's experience is that "great care should be taken to economize the use of electric light in the kitchen and all servants' quarters" (there are a lot of servants' quarters in an eight-roomed house!) "as in the majority of cases, this is where the greater part of the light is used." Surely there is not much chance of waste with only a 16-candle light installed! Heavens! what is this? The hall is "lighted" by a single 8-candle power lamp. This lamp can be switched off, except when visitors are in the house; the maid simply switching on the light to answer the door or lay meals, and cutting it off again when not wanted." The landing is lighted by an 8-candle lamp; and the bath-room by one ditto, "which makes shaving a luxury." Maud does not know. We do; and there is no desire to go to the City day by day disfigured by court plaster. In the bed-rooms only 16-candle electric lamps are allowed. Does this make hair-dressing a luxury? Maud, you are awfully humorous, or frightfully stingy. If, through using the electric light one has to live in a house of darkness, then we prefer to be left in happiness in our house of light, which can be enjoyed at a cost much below anything electricity can do on the basis of equal illumination and heating. Life is too short, and provides so much to do, that we have no desire to be compelled to be always on the watch and worry to economize in the matter of artificial light.

After a long delay, Mr. H. Ross Hooper has resumed his inquiry, on behalf of the Local Government Board, into the question of a fresh loan at West Ham. The sum originally asked for was £51,600; but the Borough Council are now requesting an additional £23,000. A deadlock, it will be remembered, was

created by the Electricity Department declining to divulge the prices at which electricity is being supplied for power purposes. There has been a heap of loss on the undertaking; and it has been asserted, and with some reason, that this is due to the absurdly low prices at which electricity has been sold for industrial use. One consumer is supplied at 0.37d. per unit; but with all the ingenuity brought to bear upon him, Mr. Seabrook, the Electrical Engineer, would not divulge how he arrived at the conclusion that this figure is a paying one, or what items of cost it contains. The officials of the department suffer from bad memories when before the Inspector of the Local Government Board, and when their actions, or those of their Committee, are exposed to public scrutiny. Mr. Seabrook could not recollect anything about the composition of the 0.37d.; and our old friend Mr. Holmes, the Sales Manager of the department, could not recollect, even had it been necessary to do so to save his life, how many new consumers were connected during the past year. Nor had anybody got stored in mind whether or not the fittings department has been carried on at a loss. Mr. Holmes was asked to strain his memory on one or two points; but with all the gentle persuasion that was applied, his mind remained an absolute blank in regard to these particular matters. Of course, "theoretical and hypothetical" figures would not do. The capital expenditure on the undertaking amounts to £472,364; while the amount sanctioned is short of this by £54,781. A sum of £11,358 has been appropriated from the revenue account towards this deficiency of loan; but it still leaves £43,423 owing. Mr. Hooper was curious as to how this amount had been provided for; but the representatives of the Corporation declined to go into the matter. The department has been flaunting about a net surplus of £3553 on the past year's trading. Is this really profit? Among other things brought out at the inquiry is this, that the electricity undertaking only pays £114 in rates. The concern has contributed nothing to the rates; but it has absorbed no less than £25,863 of hard cash from the ratepayers' pockets. Another trading concern in the locality, with about the same capital as the electricity undertaking, pays £7000 a year in rates; so that if the electricity undertaking had been a private venture, and paid rates on a fair assessment, the people of West Ham would have been much better off. They would have a few thousand pounds in rates annually, and would not have had to pay nearly £26,000 in support of the concern. There is much sympathy between the assessing authorities and the undertaking. It was stated at the inquiry that the overseers responsible for the valuation lists are members of the Electricity Committee. This is most convenient. But their very action in under-assessing the concern shows that the £3553 cannot truly be called a surplus. The department has a reserve, we believe, of about £2000; and this seems all there is in hand, though the capital is something like half-a-million.

The question of lighting a poorhouse and asylum at Greenock has had about a column and a quarter devoted to it in the "Electrical Times." For most part, the article consists of a comparison of the cost of lighting the establishment by gas and electricity. It is a sorry position in which the electricians find themselves. They can only contrast on a level financial basis by taking the worst gas can do, and the best that electricity can accomplish. In this case we have 903 flat-flame burners, and only 20 incandescent gas-lamps, in the year ending May, 1907, pitted against some 528 30-Hefner unit (27-candle power) Osrams and 252 mixed (2½, 5, 8, and 16) candle power carbon lamps. What straits in making a showing the electricians are in to be compelled to stoop to this sort of thing. The electricity is supplied at 4d. and 1½d. per unit, and £63 5s. 2d. had to be added to the cost in 1908 to make up the minimum guarantee; and in the end electricity cost £255 1s. 8d., as against £254 7s. 11d. with 903 flat-flame burners, and only 20 incandescent burners, and the price per 1000 cubic feet of gas at 2s. 8½d. The poorhouse and asylum authorities tried these twenty incandescents, but did not find them a success. Did they want to find them a success? If so, we know of no reason why incandescent burners should not be the same success in the Greenock poorhouse and asylum that they are in millions of other situations in Great Britain and Ireland, and in millions of other situations in other civilized quarters of the globe. It will be interesting if the Governor will explain what was the difficulty. Has it occurred to the poorhouse and asylum authorities that, with inverted incandescent burners, a light equal to that of the 30 Hefner unit Osrams can be obtained for the consumption of a foot (or a shade over) of gas of the illuminating power supplied at Greenock? This means that there would have been an immense saving upon the old gas bill, and therefore on the present electricity account, with a tremendous addition to the illumination, by adopting modern incandescent gas-burners. The publication in our contemporary is a distinct advertisement for gas, in that it shows that in Greenock poorhouse and asylum modern means of using electricity can only compete with antiquated means of using gas.

While on the subject of Greenock, is it a fact that there are guarantees exacted from the electricity consumers there? Is it, too, a fact that the Electricity Department insists on consumers who adopt electricity pulling out all their gas-fittings? If it is true, by what authority does the Electricity Department do this? A householder under the General Electric Lighting Acts can compel the department to afford him a supply; and the General Electric Lighting Acts give the supplier no rights to enforce the abandonment of any other system of illumination. So that those householders who desire electricity can have it without being dictated to by the Electricity Department. If the department still

declines to supply, then it appears to us the refusal would be illegal. By section 36, the Electric Lighting Act, 1882, is made to apply to Scotland; and by sections 19, 20, and 27 of the Act the suppliers are bound, upon request of any person occupying premises within 50 yards of any distributing main, to furnish a supply, without showing any undue preference. No householder, or occupier of premises of any kind, requiring electricity need be coerced into pulling out his gas-fittings. We have also observed that there is a tendency on the part of certain people in Greenock to foster electricity at the expense of the gas consumer. If there is a deficit in the Gas Department, as was the case last year, 2d. is put on to the price of gas. If there is a deficit in the electricity accounts, it comes out of the rates, which, in large measure, are paid by the gas consumers who number upwards of 14,000, against under 800 electricity users. Until the 14,000 gas consumers take common action against this disparity in treatment, it will be continued to their detriment.

GAS UNDERTAKINGS RETURNS.

Official Figures as to Gas Supply.

THE returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1907, in the case of the Companies, and March 31, 1908, for the Local Authorities, were issued last Thursday—which, in point of time, is a considerable improvement upon last year's issue. They were ordered to be printed on the 11th inst. It will be noticed that, in the case of the Local Authorities, the return year is made to end at March 31, instead of, as previously, March 25, which must have been generally a less convenient date. The particulars contained in the returns are unchanged in character; and they occupy in each case the same number of pages as last year.

Information is furnished this year in reference to 771 undertakings, or some seven or eight more than in the preceding year. The new-comers among the 495 companies are Boston Spa, Bude, Llandrindod Wells, North Sussex, and Twyford (Berks.); while Pontefract and Woodhall Spa come out. The total number of local authorities is 276; the new entries among the latter being Huthwaite, Neyland, Pontefract, and Thornton. The capital authorized for the 771 undertakings (including other purposes than gas supply in certain cases) is given as £129,702,385, of which £113,865,050 has been paid up and borrowed. For the local authorities, the capital authorized is £45,338,528, and the amount borrowed £40,712,159. In the case of the companies, the capital authorized is stated as £84,363,857; but in addition to this, there is a total authorized loan capital of £21,204,926. In the preceding returns both these amounts were included in the capital authorized, making the total for companies and local authorities (£148,455,448), of course, very much larger than the £129,702,385 mentioned on the present occasion. The total receipts are: Gas Companies, £19,567,336; Local Authorities, £10,500,416—making the total, £30,067,752.

The statistics relating to working show that 15,406,753 tons of coal were carbonized; the quantity of gas produced being 188,486,693,000 cubic feet, of which 172,889,147,000 cubic feet were sold. The total make is inclusive of 20,259,883,000 cubic feet of water gas and 94,080 cubic feet of acetylene gas. The totals in the preceding returns were: Coals, 14,846,257 tons; gas made, 181,841,076,000 cubic feet, of which 167,945,206,000 cubic feet were sold; the make being inclusive of 20,078,273,000 cubic feet of water gas and 90,000 cubic feet of acetylene gas. The extended use of water gas is shown by the following figures in the totals for the companies in the past eight years. In 1900, the quantity supplied was 8,945,670,000 cubic feet; in 1901, 11,410,279,000 cubic feet; in 1902, 12,407,734,000 cubic feet; and in 1903, 13,056,741,000 cubic feet; in 1904, the make was 13,718,857,000 cubic feet; in 1905, 14,762,584,000 cubic feet; in 1906, 14,930,653,000 cubic feet; and in 1907, 15,250,627,000 cubic feet (the sales in these four years not being given). The figures for the local authorities are: In 1900-1, 3,162,782,000 cubic feet; in 1901-2, 3,955,621,000 cubic feet; in 1902-3, 4,459,916,000 cubic feet; in 1903-4, 4,850,007,000 cubic feet; in 1904-5, 5,033,643,000 cubic feet (make); in 1905-6, 4,974,275,000 cubic feet (make); and in 1906-7, 5,147,620,000 cubic feet (make). In 1907-8, there is a slight falling off in the make to 5,009,256,000 cubic feet.

At the date to which the latest returns were made up, there were 33,536 miles of mains in use to supply 5,665,176 consumers and 700,264 public lamps. The preceding figures were: Miles of mains, 32,690; consumers, 5,363,533; public lamps, 677,980.

With regard to carburetted water gas, the returns show that when they were made up it was being supplied by the following companies and local authorities; the maximum proportions of its admixture with coal gas (except where averages are stated) being given in parentheses.

Companies.

Alliance and Dublin (48).	Bognor (30).	Cleethorpes (15).
Aylesbury (15).	Bournemouth (38*1).	Colchester (27).
Barking (17).	Brentford (35*7).	Commercial (51*71).
Bath (50).	Bridgwater (50*).	Croydon (45*1, av. 28).
Bexhill (33*63).	Bridlington (33).	Dartford (21).
Bilston (about 10).	Brighton (42*79).	Dorking (50).
Bishop's Stortford (23).	Chigwell (30).	Durham (20 estimated).

Eastbourne (43).
Epsom (37).
Falmouth (20).
Faversham (not stated).
Folkestone (33½).
Gaslight and Coke (†).
Gosport (33).
Gravesend (40).
Guildford (25 to 33½).
Hampton Court (36).
Harrow (37).
Hartlepool (§).
Hastings (36'25").
Hornsey (42).
Horsham (33).
Hull—British (34).
Hythe and Sandgate (40).
Ilford (14'82).
Ilfracombe (15).
Ipswich (25).
Kingston-on-Thames (25).
Liverpool (50).
Lea Bridge (52, av. 45).
Londonderry (15¼).

Maidenhead (34).
Maidstone (25).
Malton (about 25).
Marlborough (30).
Merthyr Tydfil (16½).
Mitcham (49'7).
Newcastle (11'8 one wk.).
Newport, Mon. (21).
North Middlesex (52).
Norwich—British (39'9).
Nuneaton (0'6).
Plymouth (44'57).
Portsea Island (33).
Prescot (29'28).
Preston (37'4, av. for one week).
Ramsbottom (25).
Reading (41'4).
Redhill (30).
Rochester (33).
Romford (30, av. 26'1).
Rushden and Higham (32).
Ferrers (20'4, av. 14'55).

Scarborough (25'3).
Southampton (34).
Southend (47'61).
Southgate & District (58).
Staines and Egham (25).
Stretford (32'8).
Swansea (22 to 25).
Swindon United (34).
Taunton (39).
Tonbridge (25).
Tottenham (51).
Truro (50).
Tunbridge Wells (25 to 30).
Uxbridge (25).
Waltham Abbey (not stated).
Wandsworth (42).
Watford (34'5).
West Ham (35'85).
Weston-super-Mare (33).
Wexford (20).
Winchester (32).
York (25'75).

* Average not more than 25 per cent. † Average 33½. ‡ Of the total quantity of gas sent out by the Company, 11 per cent. was unmixed with water gas. As regards the remainder, 62 per cent. contained a maximum proportion of 23 per cent. of carburized water gas; 8 per cent., a maximum proportion of 27 per cent.; 11 per cent., a maximum proportion of 36 per cent.; 11 per cent., a maximum proportion of 38 per cent.; and 8 per cent., a maximum proportion of 39 per cent. § About 25 per cent.; average about 16 per cent. || Average for the year, 25'02 per cent. ¶ Average 10 to 12 per cent.

Local Authorities.

Accrington (20).
Ashford (32'3, av. 18).
Barrow - in - Furness (31'24).
Belfast (51'24).
Birkenhead (33'33).
Birmingham (25).
Blackburn (25).
Burnley (34).
Carlisle (26).
Chorley (20).
Coventry (20).
Devizes (34).
Devonport (31'93).
Dundee (25).
Edinburgh (6'3).
Halifax (30).
Hebden Bridge (20 to 30).
Leeds (25).
Leicester (19, av. 2).
Leigh (15).
Lincoln (33'33*).
Linton (about 29).
Loughborough (25).
Manchester (20'14†).
Middlesbrough (no limit).
Nelson (not stated).
Nottingham (7'46).
Oldbury (20).
Oldham (38½).
Paisley (§).
Pontypridd (35'7).
Rochdale (30).
Smethwick (27½).
Southport (37'69).
Stafford (13'5).
Stockport (25).
Stockton-on-Tees (15'8).
Tipton (0'55).
Todmorden (18'8).
West Bromwich (23'31).

* In the daytime; none at night. † On total output. ‡ At one station only, and on one day only. § Oil gas, 1'61 per cent.

Eight new companies appear in this list: Bishop's Stortford, Chigwell, Hythe and Sandgate, Ilfracombe, Maidstone, Truro, Uxbridge, and Waltham Abbey. The new local authorities furnishing returns are those of Ashford, Chorley, Nelson, and Nottingham.

As in previous returns, particulars are furnished regarding the nature and quantity of materials other than coal used for the manufacture of gas. The extent to which oil, petroleum spirit, carburene, or "other material" is being utilized will be seen from the following list of companies and local authorities who make returns:—

Companies.

Alliance and Dublin.
Alton.
Aylesbury.
Barking.
Bath.
Bexhill.
Bishop's Stortford.
Bognor.
Bournemouth.
Brentford.
Bridgwater.
Bridlington.
Brighton and Hove.
Bristol.
Broadstairs.
Canterbury.
Chigwell.
Cleethorpes.
Coatbridge.
Colchester.
Commercial.
Croydon.
Darford.
Derby.
Dorking.
Dover.
Durham.
Eastbourne.
Epsom and Ewell.
Exeter.
Falmouth.
Faversham.
Folkestone.
Gaslight and Coke.
Gosport.
Grantham.
Gravesend.
Guildford.
Hampton Court.
Harrow and Stanmore.
Hartlepool.
Hastings.
Hornsey.
Horsham.
Hull (British Co.).
Huyton and Roby.
Ilford.
Ipswich.
Isle of Thanet.
Kingston-on-Thames.
Lea Bridge.
Littleborough.
Liverpool.
Londonderry.
Maidenhead.
Maidstone.
Malton.
Marlborough.
Merthyr Tydfil. [don.
Mitcham and Wimble.
Newcastle-upon-Tyne.
Newport (Mon.).
Northfleet.
North Middlesex.
Norwich (British Co.).
Plymouth.
Portsea Island.
Prescot.
Preston.
Quorndon and Mount.
Ramsbottom. [sorrel.
Reading.
Redhill.
Richmond.
Rochester.
Romford.
Rushden and Higham.
Scarborough. [Ferrers.
Shrewsbury.
Southampton.
Southend.
Southgate and District.
Staines and Egham.
Stretford.
Swansea.
Swindon.
Taunton.
Tonbridge.
Tottenham.
Truro.
Tunbridge Wells.
Tynemouth.
Uxbridge. [Cheshunt.
Waltham Abbey and
Wandsworth and Putney.
Watford.
West Ham.
Weston-super-Mare.
Wexford.
Winchester.
York.

Local Authorities.

Abertillery.
Accrington.
Airdrie.
Alloa.
Alva.
Arbroath.
Ashburton.
Ashford.
Barrow-in-Furness.
Belfast.
Birkenhead.
Birmingham.
Blackburn.
Blackpool.
Burnley.
Edinburgh and Leith.
Glasgow.
Greenock.
Halifax.
Hebden Bridge.
Helenburgh.
Heywood.
Ilkeston.
Leeds.
Leek.
Dundee.
Dunfermline.
Edinburgh and Leith.
Glasgow.
Greenock.
Halifax.
Hebden Bridge.
Helenburgh.
Heywood.
Ilkeston.
Leeds.
Leek.

Leicester.
Leigh.
Lincoln.
Llandudno.
Longton.
Loughborough.
Manchester.
Middlesbrough.
Middleton.
Mossley.
Nelson.
Nottingham.
Oldbury.
Oldham.
Paisley.
Perth.
Pontypridd.
Portsoy (acetylene gas only).
Rochdale.
St. Helens.
Smethwick.
Southport.
Stafford.
Stalybridge.
Stratford-on-Avon.
Stockport.
Stockton-on-Tees.
Tipton.
Todmorden.
Torquay (St. Mary Ch.).
Walsall.
Warrington.
West Bromwich.
Wigan.

The new names in the above lists are the Bishop's Stortford, Chigwell, Maidstone, Ramsbottom, Truro, and Uxbridge Companies; and the Chorley, Nelson, and Llandudno Local Authorities. On the other hand, the Brentwood, Godalming, Halesowen, Nuneaton, and Sutton and Hooton Gas Companies and the Hereford Corporation drop out.

The Gas Commissioners of Portsoy used 10½ tons of carbide of calcium in the manufacture of 94,080 cubic feet of acetylene gas, of which 67,060 cubic feet were employed for private and 21,080 cubic feet for public lighting—together 88,140 cubic feet, at the price of 5s. per 100 cubic feet—a reduction of 6d. since the issue of the previous returns.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid Up.	Loan Capital Issued.	Receipts.	Expenditure.
1898.	£44,134,488	£9,360,293	£14,092,125	£10,309,948
1899.	57,937,016	11,451,134	15,514,700	11,478,442
1900.	59,638,877	11,775,642	17,638,963	13,864,808
1901.	62,775,845	12,201,533	17,955,187	14,537,797
1902.	64,299,112	12,829,925	17,205,002	13,167,186
1903.	67,417,798	13,451,381	17,756,626	13,214,322
1904.	68,953,306	13,775,734	17,828,872	13,397,727
1905.	70,605,726	14,176,599	17,617,598	13,410,307
1906.	72,008,451	14,467,842	18,166,087	13,671,369
1907.	73,152,891	14,645,271	19,567,336	14,884,982

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1898.	7,958,669	86,705,722,752	1,670,847	319,007
1899.	8,321,187	91,794,898,282	1,817,649	324,166
1900.	8,426,853	94,869,749,232	1,945,825	326,813
1901.	8,580,365	97,386,618,553	2,048,359	326,209
1902.	8,520,004	99,676,048,000	2,197,987	333,308
1903.	8,528,823	101,490,084,000	2,385,348	335,363
1904.	8,673,343	105,311,980,000	2,588,917	343,908
1905.	8,722,145	109,823,682,000	2,813,156	350,113
1906.	8,922,781	114,528,923,000	3,023,619	356,070
1907.	9,240,280	118,699,705,000*	3,230,993	372,986

* Including 15,250,627,000 cubic feet of water gas. Number of cubic feet sold, 108,239,449,000.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1898-99.	£28,614,971	£7,177,670	£5,365,995	£1,219,771	£625,780
1899-00.	29,658,730	8,048,089	6,155,725	1,280,168	663,189
1900-01.	31,509,701	9,121,418	7,463,693	1,353,259	409,802
1901-02.	34,045,442	9,300,567	7,630,856	1,407,232	414,091
1902-03.	35,738,023	9,554,984	7,215,502	1,584,985	793,764
1903-04.	37,103,279	9,819,685	7,182,008	1,700,405	967,194
1904-05.	38,512,295	9,546,682	7,052,474	1,738,682	799,450
1905-06.	39,401,896	9,636,107	7,085,710	1,799,094	798,210
1906-07.	40,089,167	9,843,243	7,211,987	1,843,122	832,341
1907-08.	40,712,159	10,500,416	7,639,122	1,882,427	827,454

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1898-99.	4,883,148	51,441,272,030	1,578,291	247,857
1899-00.	5,289,501	55,360,659,139	1,667,908	257,040
1900-01.	5,479,435	57,138,062,255	1,767,464	278,343
1901-02.	5,522,264	59,300,273,086	1,872,633	287,887
1902-03.	5,589,215	60,902,739,000	1,970,738	294,828
1903-04.	5,673,013	62,717,759,000	1,945,777	301,308
1904-05.	5,622,259	63,335,696,000	2,148,260	310,275
1905-06.	5,758,180	65,081,109,000	2,250,919	315,678
1906-07.	5,923,476	67,312,153,000	2,339,914	321,910
1907-08.	6,166,473	69,786,988,000*	2,434,183	327,278

* Including 5,209,256,000 cubic feet of water gas and 94,080 cubic feet of acetylene gas. Number of cubic feet consumed, 64,649,698,000.

MUNICIPAL ELECTRICITY MANIPULATION.

FURTHER examples have been furnished during the last few days of the scandalous manner in which ratepayers are mulcted for the support of municipal-owned electricity works. A majority of the Plymouth Corporation overruled the decision of the Education Committee, and decided to instal electric light in one of the schools at a cost of £170, as against £54 for gas. Some of the defenders of this piece of extravagance endeavoured to excuse it on the ground that electricity is the more healthy illuminant; but others, with less scruple apparently, admitted that the object was to make "profit" for the electricity undertaking and in this way prevent the Gas Company from benefiting. These latter gentlemen are to be commended for their candour, which, it is to be hoped, will not be lost upon the ratepayers.

Another case in which the interests of the municipal electricity works were allowed to prevail over those of the people who pay the rates comes from the same county of Devon. The Barnstaple Workhouse, it seems, has hitherto been lighted with oil-lamps. The Visiting Committee came to the conclusion that an improvement was desirable, and obtained what were described as "rough estimates" of the cost of installing either electric light or gas. These showed that gas could be put in at a price varying between £63 and £95; while the lowest cost of fitting up electricity was £125, and it might amount to as much as £153. No very definite idea of the cost of the two illuminants was obtained; but it was said that at the Taunton Workhouse the charge for gas lighting worked out at an average of 8s. 5½d. per burner per annum; while in the new portion of the Exeter Workhouse electricity is costing 8s. 2d. per lamp. A comparison of this kind, which does not take into account the cost of gas per 1000 cubic feet or of electricity per unit, and takes no account of the amount or quality of the light provided, does not seem particularly useful. The Guardians, however, do not appear to have questioned it. It was pointed out that, in an institution like the workhouse, gas could be employed for heating and cooking as well as for lighting, and that its installation, while costing less than electricity, might serve more than one useful purpose. Some of the members seem, however, to have been possessed with fear of the dreadful consequences which might result from carelessness in the use of gas, just as though no danger ever attended the use of oil, or as if fires were unknown in buildings in which electric light is installed. Whether the Guardians really dreaded that the inmates of the workhouse might take to blowing out the gas if they had the chance, or whether they merely wished to do the Corporation electric undertaking a good turn is not clear. But in any case the electricity works get a customer, and the ratepayers will pay.

A more flagrant case of judgment being biased in order that the electricity works may make a good appearance on paper comes from Worcester. Some reference has already been made in the "JOURNAL" to the complaint of the Electricity Committee in that city of the loss which they had sustained because the Water Committee ceased to use electricity for pumping, although the loss to the electrical undertaking meant an actual gain of £700 a year to ratepayers. A Committee of the City Council were appointed to adjust matters between the two Committees, with the result which might have been anticipated. Pumping by steam costs about £200, and by electricity £900; but as there is surplus power at the electrical works, the use of the electric power is to be continued at the water-works "until such time as the Electricity Committee can find as good, or better, customers for the electric power." This arrangement was defended in the interest of economy! It is the same kind of economy as prevails in connection with the lighting of the city. We learn on the authority of the High Sheriff of the City that the lighting of public buildings used to cost £150, but now that it is done by electricity the charge is £550; while for the lighting of the comparatively small section of the city in which electric lamps are installed, the cost is £1300 more than it used to be with gas. Under these circumstances, it is little wonder that the Electricity Committee can show a "profit" of £150. It would be interesting to know where the Worcester electrical undertaking, like a good many more of a similar kind, would stand if it were not for the income derived from public sources. One thing certain is that the ratepayers in many towns would be far better off if their rulers had left electricity alone, and confined their municipal trading to other things.

Pending the publication of the list of successful candidates at the last examinations in "Gas Engineering" and "Gas Supply," which is expected to be ready in the course of a week or two, we are pleased to record that Mr. Samuel B. Chandler, son of Mr. Samuel Chandler, has passed for a first-class certificate in the latter of the above-named subjects.

In the House of Commons on the 16th inst., returns were ordered to be prepared relating to all the authorized gas undertakings in the United Kingdom—in the case of the Companies, for the year ended Dec. 31, 1908, and in that of the Local Authorities for the year ended the 31st of March last—in continuation of previous Parliamentary Papers. As the returns for 1907-8 have only just been issued, as mentioned in another part of to-day's "JOURNAL," some months must elapse before those above referred to will be even presented.

PERSONAL.

RETIREMENT OF MR. CHARLES NICKSON.

That veteran of corporation gas officials, Mr. Charles Nickson, Superintendent of the Manchester Corporation Gas Department, is to retire at the end of this week, after a period of service extending to 65 years. Mr. Nickson, who is the oldest official of the Corporation, recently celebrated his 80th birthday, and, despite his advanced years, is as good a man as many at a much younger age. The Gas Committee, anxious to retain at least part of Mr. Nickson's services, have, by a unanimous vote, appointed him Consulting Superintendent.

As a youth, Mr. Nickson went to Manchester from Frodsham, in Cheshire, in 1844, to take up an appointment in the office of the old Highways Board. When the powers of this Authority were transferred to the City Council, in 1851, Mr. Nickson took up duty under the Corporation. It was in 1858 that his connection with the Gas Department commenced; he being appointed a collector. Advancement came with succeeding years; and in 1883 he was given the post of Superintendent—a position that he has filled since then in such a manner as to win commendation from his Committee and high appreciation from those connected with the various sections of the Gas Department. In his long service with the Corporation, he has personally known every Mayor of the city except one, and every Town Clerk, Treasurer, and City Architect. When Mr. Nickson celebrated his golden wedding in 1901, he was presented with a handsome service of silver; Mrs. Nickson receiving a gold chain and brooch. Accompanying these gifts was an illuminated address or album containing the names of 409 employees of the Gas Department subscribing to the testimonial. The presentation took place in the Lord Mayor's Parlour at the Town Hall, and was made by Alderman Gibson, the Chairman of the Gas Committee, on behalf of the staff.

Mr. Nickson is succeeded as Superintendent of the Gas Department by Mr. F. A. Price, the Deputy Superintendent, who has 32 years' service to his credit. Mr. Price, who has filled the position of deputy to Mr. Nickson for twelve years, was formerly with the Liverpool Corporation Water-Works, under the late Mr. G. F. Deacon.

It is interesting to note that the Manchester Gas Committee includes a number of veterans. Alderman Gibson is 77 years of age; Mr. Lowry, a member of the Committee, is about a month the senior of Mr. Nickson; Alderman Briggs, the Deputy-Chairman, is 78; and two other members (Aldermen Jennison and Evans) are approaching that age. They are all hale and vigorous men for their years.

Mr. J. F. BEDFORD, of the Leeds Corporation Water-Works, has been appointed, from among 120 applicants, Water Manager for the Colne Corporation.

The Maryport Urban District Council have adopted a recommendation of the Gas and Water Committee to appoint as Manager of their gas-works Mr. HORATIO MORRIS, whose father, Mr. W. W. Morris (who formerly held the position), died a short time ago.

Mr. SAMUEL M'LUSKY (brother to Mr. W. B. M'Lusky, of Perth), has been chosen Engineer and Manager of the Coupar Angus Gaslight Company, in succession to Mr. W. Fred Vernon, who has been appointed to Stonehaven. Mr. M'Lusky has for some time been in the employ of the Glasgow Corporation.

The Bolton Water-Works Committee last Tuesday considered the appointment of an Engineer's Assistant, and decided upon Mr. E. W. BOOTH, Assoc. M. Inst. C.E., of Croydon. There were originally over a hundred applications for the post, the salary attaching to which is £200 per annum, rising by annual increments of £10 to £230, on Mr. Booth giving an undertaking to remain in the service of the Corporation during the next three years.

Mr. WILLIAM WALTON, who has been in the employ of the Portsea Island Gaslight Company for the past fifteen years, has been appointed to the position of Manager to the Emsworth Gas Company. At a meeting of the officers of his old Company last Friday week Mr. Walton was presented with a clock, subscribed for by the works officials. The Engineer and General Manager (Mr. J. D. Ashworth), in presenting the gift, wished Mr. Walton, on behalf of himself and the staff, every success in his new sphere. The recipient suitably responded.

It has been decided by the Torquay Town Council to confer the freedom of the borough on Mr. JOHN KITSON; and he will be the first townsman so honoured. Mr. Kitson is a leading member of a firm of bankers and solicitors of Torquay, and has close ties with the town in his professional capacity, as his father had before him. Mr. John Kitson was Chairman of the Torquay Local Board before the Charter of Incorporation for the town was obtained, but did not continue his services on the Town Council. He is Chairman of the Torquay Gas Company, and holds many other important offices.

At the last meeting of the Harrogate Town Council, the salary of Mr. L. Sikes, the Resident Engineer at the Roundhill Water-Works, was increased, on the recommendation of the Water Committee, by £25 per annum.

GAS TRIUMPHANT AT FELIXSTOWE.

Lighting of the New Spa Pavilion.

THERE was opened at Felixstowe last Friday, by Lord Claud Hamilton, a new Pavilion on the Spa, which has been erected on a site occupied for years previously by a band-stand and enclosure, the lighting of which was by means of electricity. The contract for the lighting of the new building and bandstand, however, has been secured by the Gas Company, notwithstanding that the electricity works are practically the property of the town. After the opening ceremony, Mrs. Woodmancy and Mrs. Ward, the wives respectively of the Chairman and Vice-Chairman of the Urban District Council, entertained the guests at tea; and this was followed in the evening by a dinner at the Felix Hotel, on the invitation of Mr. Woodmancy. The total cost of the building, which possesses every convenience for the comfort and refreshment of visitors, with the necessary furniture, was £5000.

The accompanying photograph shows what an effective installation the Gas Company and their Engineer (Mr. F. Paternoster) have fitted up for the lighting of the interior of the building; and it may be remarked that the exterior is just as well provided for. The promenade at the back of the hall is lighted by four 3-light Graetzin inverted lamps, made in copper) to withstand the sea air, and suspended from the centre of the roof. At one end of the promenade, there are lavatories, which are lighted by 2-light Graetzin lamps, suspended from the roof; while at the other end are the refreshment-rooms and cloak-rooms, lighted by 2-light and 1-light Graetzin lamps.

The main body of the building, where there is a seating accommodation for over 600 people, is covered by a roof having two spans; and there are altogether six copper Graetzin lamps suspended from these roofs; five of them being 3-light and one 5-light. Over the steps at the two principal entrances of the building are suspended 3-light copper Graetzin lamps; and over the steps at two side entrances, there are 1-light copper Graetzin lamps.

The bandstand is lighted by means of nine single inverted burners of an enclosed pattern. On each side of the turnstile at the entrance to the grounds, there are fixed 300-candle power Welsbach self-intensifying lamps.

For lighting and extinguishing the lamps in the pavilion and bandstand, the "Pneumatic" distance lighting system has been adopted. The bandstand has a battery of switches which enables the lamps to be lighted and extinguished in three sets of two lamps and one of three lamps. In the refreshment-room is placed a battery consisting of single switches, one for each lamp in that half of the building, and in the lavatory a similar battery of switches for the other half of the building.

The general effect of the illumination is extremely good, and has during the past week called forth admiration and congratulations from the general public and members of the Council; and the pneumatic system of lighting and extinguishing has doubtless convinced even those members of the Council who advocated the use of electricity for the lighting of the building that the Gas Company have scored this time.

The total illumination is about 7000 candles. In all, there are 57 burners, consuming 228 cubic feet of gas, at a cost of no more than 10½d. per hour.



The Gas Lighted Interior of the Felixstowe New Spa Pavilion.

DOUBLE FILTRATION OF WATER.

Five systems of double water filtration were studied by the Massachusetts State Board of Health during the year 1907, and are described in the annual report for the year, which has just appeared. The experiments were carried out at the city filter at Lawrence, and at seven experimental filters, two of which were operated at high rates as preliminary or roughing filters. The two main objects in the process of pre-filtration at high rates are to concentrate the clogging material upon units of relatively small area from which it may be economically removed without disturbing the main filters, and to equalize the quality of water applied to the main filters in order that they may be operated with the greatest possible economy. According to some particulars given in "Engineering Record," one of the pre-filters was operated at rates of 15 and 25 million gallons per acre daily, and quickly became clogged. Instead of the usual method of cleansing by scraping, the clogged sand was washed by running a shallow current of unfiltered water across the top of the filter and stirring the sand surface with a rake. This process is conducted much more quickly than scraping, and does away with the necessity for back-filling the filter to remove air, since the surface never becomes uncovered, and air is never drawn into the interstices of the sand in the filtering layer.

The first system of double filtration was conducted at the Lawrence city filter with sand about 4 feet deep (effective size 0.25 mm.) as the primary filter, and a secondary filter with sand about 3 ft. 6 in. deep (effective size, 0.23 mm.). The rate of flow through the system for five months was a million gallons per acre daily; and the average percentage removal of bacteria was

99.6. The second system was tried with a primary filter with sand about 3 feet deep (effective size, 0.20 mm.), and a secondary filter with sand 3 feet deep, of an effective size of 0.24 mm. The rate of operation was 4 million gallons per acre daily for nine months, and 2.4 millions daily for three months. The average percentage removal of bacteria during this period was 98.7. In the third system, the pre-filter contained only 6 inches of sand (effective size, 0.30 mm.), and the secondary 44 inches of sand, of an effective size of 0.23 mm. The rate was 5 million gallons per acre daily for seven months, and 5.8 millions daily for five months. During this time the average efficiency was 98.6 per cent.

In the primary filter of the fourth system the sand was about 28 inches deep, of an effective size of 0.20 mm.; and in the secondary filter it was about 44 inches deep, of an effective size 0.20 mm. For three months the rate of operation was 3.3 million gallons per acre daily; giving an average efficiency of 92.8 per cent. The primary and secondary filters of the fifth system contained sand 21 inches and 41 inches deep, of an effective size of 0.71 mm. and 0.20 mm. respectively. Running at a rate of 5.6 million gallons per acre daily for five months, the efficiency was 99.6 per cent.

Comparing the third system of double filtration with a single filter containing approximately the same depth of sand, the removal of bacteria by the former was found to be slightly better at all times; while the quantity of water filtered by the combination was about twice as great as that filtered by the single filter. A similar comparison between the third double-filtration system and a filter operated at a rate nearly twice as great as the combined rate of the former showed that the removal of bacteria was also more satisfactory with two filters than with one under such conditions.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

THE THIRTY-SIXTH ANNUAL CONGRESS—Lyons, June 22 to 25, 1909,

REVIEW OF THE PROCEEDINGS.

[FROM OUR OWN CORRESPONDENT.]

THE Thirty-Sixth Annual Congress of the Société Technique du Gaz en France opened last Tuesday, in the large hall of the Hôtel de la Chanson, in the historic city of Lyons, the home of the President, M. Godinet, General Manager of the important group of gas undertakings in the hands of MM. P. de Lachomette, Villiers, et Cie. The Society's Permanent Secretary, M. Payet, was in attendance at the place of meeting on the previous day, to afford members arriving early any information they required, and to put the finishing touches to the arrangements. The meteorological conditions were decidedly "mixed;" for while there was brilliant sunshine such as we in England get on a fine July day, it was tempered in a decidedly unpleasant way by a high wind which would have been creditable to our March, and which raised clouds of white dust that were by no means agreeable to the pedestrians. On Tuesday morning, however, the local Clerk of the Weather had "changed all that." There were heavy clouds hanging over the city, and at nine o'clock large drops of rain—the usual premonitions of a storm—began to fall. This did not deter a goodly number of the congressists from putting in an appearance at the meeting-place; and when, shortly after nine o'clock, the President's bell informed them that he was prepared to open the preliminary routine proceedings, there were about 140 of his colleagues ready to give their attention to what he had to communicate to them. On the right of the President was M. Marquisan, the Vice-President, and on his left M. Payet.

General Meeting.

The first business was the adoption *nem. con.* of the report of last year's proceedings in Paris, as contained in the unusually bulky volume of "Transactions." Then came the admission of new members and associates, of which there was a goodly number—the name of Mr. Thomas Glover, the Past-President of the Institution of Gas Engineers, heading the list as an honorary member. Two Scrutineers were chosen to examine the voting-papers for members of the Committee, and the result of the ballot was the election of MM. Bachelay, Delebecque, Frère, Marquisan, and Seguin for three years, and M. Georges Vautier for two years. At a subsequent stage of the proceedings, it was announced that the "bureau" for the year 1909-10 would remain as at present—viz., President, M. Godinet; Vice-President, M. Marquisan; Secretaries, MM. Boutan and Gaston Gautier; and Treasurer, M. Frère.

Next came the reading by the President of the report of the Committee, which was very long. It opened, as usual, with a reference to the members who had died during the year, of which there were nine ordinary, four associate, and one honorary. In the first-named group were MM. Salanson and Foucart, former Presidents; and it is scarcely necessary to say that the one honorary member was Sir George Livesey. As usual, full notices of the life-work of all were given. Of their late English colleague the Committee said, in the course of their remarks:

His life was closely devoted to the development of the English gas industry in general during the last forty years, but more particularly to that of the South Metropolitan Gas Company; and with his name will be associated the greatest social and economic progress in connection with the gas industry realized on the other side of the Channel. The salient feature in his numerous works in the domain of technics was that he was the first to make a new departure in the construction of the guide-framing and tanks of gasholders. The strike of the men at his works gave a new direction to his thoughts and writings; and he then took up with great ardour questions of tariffs, salaries, co-partnership, and similar problems, with which he occupied himself for the greater part of his time. His fifteen years' efforts for the introduction of the co-partnership system in connection with the gas industry crown his work as a social benefactor. Thanks to his untiring labour, he succeeded in lowering the standard of illuminating power for gas, and in relaxing the restrictions in regard to sulphur. Consequently he became in England a popular personality, with whose name are associated the two great advances made in the direction of cheapening gas. He had been an honorary member of our Society since 1878; and we pay to the memory of this pioneer in the gas industry among our friends across the Channel the homage of our admiration and pious remembrance.

The Committee went on to say that during the year there had been six resignations of members and five of associates, and three of the former and one of the latter class had been excluded. Consequently the total number of members, inclusive of those just admitted, was 771, consisting of 22 honorary, 612 ordinary, and 137 associate members. The Committee next gave a list of the contributions made to the funds of the Society by various gas

companies—ranging from 3000 frs. by the Compagnie Centrale du Gaz, 2500 frs. from the Lyonnais group (MM. P. de Lachomette et Villiers), 2225 frs. from another Lyonnais group (M. Théodore Vautier), and 2000 frs. from the Société du Gaz de Paris, down to several donations of 50 frs. from smaller concerns—the total being 27,525 frs. (£1101). The Committee again expressed their thanks to the donors for these testimonies of their continued interest in, and their appreciation of, the work of the Society. They specially thanked those who, as the result of a personal appeal, had increased their contributions, as the effect had been to increase the total by 1775 frs. compared with the preceding year. This they hoped would help to make up the deficit which had occurred, notably in connection with last year's congress and with the production of the important volume of "Transactions." Passing reference was next made by the Committee to the work of the International Committee on Photometry, on which M. Théodore Vautier, the Chairman, was to present a report; and they suggested that if it was of interest to have everywhere the same term of comparison for valuing the different sources of light, it was no less useful to have one general system for the analysis of coals. This question having been raised by Heer van Rossum du Chattel, the Committee have undertaken, encouraged to do so by M. Vautier, to give it their consideration. The "Transactions" for last year contained the report of the proceedings at the first sitting of the International Committee on Standard Screw-Threads; and those for the current year will contain an account of the second sitting, which took place early last month. Owing, however, to various circumstances which the Committee explained, no decision has yet been arrived at. In last year's report, it was mentioned that a Provident and Assistance Fund had been constituted. But the Committee reckoned without the Administration, who called upon them to make further alterations in the statutes. As the result, however, of the labours of the then President (M. Coze), the statutes were finally approved, and official recognition of the Society for mutual assistance has been secured. The Committee asked the members to interest themselves in this work. They concluded by emphasizing the value of the Syndicat Professionnel, the presidency of which has been relinquished by M. Coze and taken by M. Piaton; and by reminding the members that the offices of the Society have been removed to more suitable quarters.

Following the Committee's report came that of the Treasurer. It showed that the revenue last year was 66,515 frs. (£2661), and the expenditure 72,507 frs. (£2880). The latter included 15,925 frs. (£637) for publications, 8441 frs. (£338) for prizes, and 1079 frs. (£44) for investigations and the library. In the course of the year the capital of the Society was reduced to the extent of 4670 frs. (£187).

Both reports were adopted without comment; and after a few observations by the President on the arrangements for the visits and excursion, the business of the general meeting closed, and the members left the building in drenching rain.

Opening of the Congress.

It was at the afternoon sitting, which took place under the same meteorological conditions, that the Congress was really opened, in the presence of the Prefect of the Rhône (M. Lutaud) and the Mayor of Lyons (M. Herriot), who, the President stated, had done him the honour to come to hear his address. This he at once proceeded to deliver. It was rather long, and dealt mainly with the question of the utilization of tar for heating purposes, which was one of the subjects put down for discussion. He referred to the difficulties formerly experienced by gas companies in disposing of their residual products. Improvements have since enabled tar to be employed for heating; but by the adoption of generators and recuperators it can be dispensed with. This question, which had not occupied attention very much during the past twenty years, had now become of importance, owing to the considerable drop in the price of tar. M. Godinet dealt with the whole subject from a technical point of view, with the aid of two diagrams; and further reference may be made to this part of his address when it is printed. In conclusion, he alluded to high-pressure gas-lamps, and compared the results obtained with them and with metallic filament lamps. At the close of the address, the President was loudly applauded.

Then came the presentation of the medals awarded by the Government to gas-works employees for long and meritorious services, and the distribution of the Society's silver medals and premiums (200 frs.) for like good conduct. In all cases, a few cheering words and a hand-shake accompanied the awards; the recipients connected with the Lyons Gas Company being very cordially greeted by the members. Attention was next directed to the prizes awarded by the Society for the papers read last year. They were as follows: To MM. Charles D'Aubenton-Carafa,

Échiard, Guillet, and Du Pasquier, 250 frs. each; and to MM. Chevalet, Defoy, and Camille Roche, 200 frs. each. M. Marquisan contributed a valuable paper on "New Methods and Appliances for the Distillation of Coal for the Production of Illuminating Gas;" and M. Vautier gave a summary of the proceedings at the sittings of the International Committee on Photometry in 1907. Being, however, both members of the Committee, they could not be recipients of awards for their communications.

Reports on the papers sent in to compete for the Society's prizes this year were next submitted. M. Delahaye read one on the "Duplex Meter," presented by the "Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz," for which the Society had awarded a silver-gilt medal; and also one on "Small Gas-Engines," which had been sent in by the firm of A. Clement. The Committee who had investigated the matter considered the firm were worthy of a silver plate and a diploma for the improvements they have effected in small gas-engines. M. Frère followed with a report on the appliances sent in to compete for the prize for the best distance lighter and extinguisher. There were three—one by Messrs. Cowper-Smith, and the other two by MM. Kilchmann et Gaulis. For the latter the Society awarded a bronze medal and a diploma. M. Frère also read a report on gas-generators utilizing coke which had been submitted by M. Roche. On the advice of the Committee who had examined them, the Society awarded him a diploma and their small silver plate, by way of encouragement and reward for his intelligent and fruitful services.

It was half-past four when the proceedings briefly summarized above were concluded, and the President announced that the Engineer of the works at Cusset to be visited on Thursday afternoon would offer a few remarks upon what the members would see there. By the time he had done so, it was close upon five o'clock; and it was not till then that attention was directed to the papers. The first taken was a short one by M. Parsy, on "The Net Cost of Gas in the Retort-House," of which a translation appears on p. 972. It gave rise to a few observations in regard to the figures put forward by the author; and in the end it was decided that he should add to his communication an explanatory note to the effect that they were only given by way of example. Next came M. Grebel's paper on "The Parsy Furnace," a translation of which, with illustrations, will be given next week. M. Grebel summarized the paper, which elicited the opinion that the furnace described was somewhat on the lines of the one devised by M. de Lachomette, but that it would be useful in small works, especially where water was found near the surface of the soil.

At this point the President was desirous of taking the third paper put down for Tuesday afternoon; but as it was now six o'clock, the members expressed disapproval of this course—indeed, there were few left in the hall. Thus ended the first day's work; and, rain still falling heavily, the members made their way to their respective hotels and habitations.

There was a decided improvement in the meteorological conditions on Wednesday morning; and the members made their way to the meeting-place in bright sunshine. A few minutes after nine, they were asked by the President to listen to the paper by M. Bitard on the Villain system of charging and discharging retorts, an abstract of which will duly appear. The author read certain portions of his paper. A few remarks were made by the President and MM. Lacaze and Visinet; and then M. Teulon dealt with the subject of the extinction of coke at the Marseilles Gas-Works. His paper is noticed on p. 973. A totally different subject was next taken up, by M. Bellemère giving a full summary of his paper on the "Gulf-Stream" water-heater, which distributes hot water with or without pressure, and answering questions in regard to its dimensions, price, &c. A paper of a somewhat similar character was contributed by M. Ramassot, who described the water-heater bearing his name, on which some remarks were made by the reader of the previous paper and M. Mallet. The "Marc" gas-stove was brought under notice by M. Méran. The next paper was a short one by M. Richarme on the high-power incandescent "Rolin" burner, in which the wire gauze screen usually covering the gas outlet to prevent firing-back is dispensed with. This screen frequently becomes clogged up, to the detriment of the mixture and the regular action of the burner. It is claimed for the "Rolin" that it gives the light of 9.6 candles with a consumption of 0.35 cubic foot, with various mantles. It is made in three sizes—1.75, 2, and 5½ cubic feet per hour. In a short paper, M. Grand directed attention to the "Euphos" glass, introduced by Dr. P. Schanz and Herr Stockhausen to protect the eyes from the injurious effects of the ultra-violet rays. The author gave a series of photographs showing the absorptive power of this glass when used with the principal artificial illuminants; and the effect was very marked. The two investigators above named have proved that the higher the temperature of incandescent bodies is raised, the more the ultra-violet rays increase and render them more injurious. Hence the necessity for protection such as it is claimed the "Euphos" glass, which is tinted a yellow-green, affords. With it are made chimneys for incandescent gas lighting, and globes for high-power lights and carbon and metallic filament lamps. The paper brought forth the remark that the literature on the subject had been summarized in the review prepared periodically by M. Payet. Next came a paper by M. Vexiau, who gave a demonstration of the "Tip-Top" automatic distributor of gas for illuminating public signs. This brought the morning sitting to a close.

In the afternoon, the members reassembled shortly after two o'clock to have their attention directed to the subject to which

reference had been made by the President in his address—viz., the utilization of tar for heating. The first paper was by M. Hovine, who described a recuperative furnace having an arrangement for eventually heating by tar; the next was a paper by M. Échinard on the general question; and the third had been prepared for the congress by M. Ménard, and was read for him in his absence. These papers are summarized on pp. 975-7.

At the close of M. Échinard's paper, M. Théodore Vautier, the President of the International Committee on Photometry, communicated to the members the result of the correspondence which has lately taken place between the Laboratories of England, France, and the United States with regard to the adoption of a common unit of light. As the result of the investigations organized by the Committee, which have been carried out by the National Physical Laboratory in England, the Reichsanstalt in Germany, and at the Laboratoire Central d'Electricité and the Conservatoire National des Arts et Métiers in Paris, the English pentane candle has the same value as the French bougie décimale. The Bureau of Standards of Washington has taken the initiative by lowering its unit by 1.6 per cent., in order to make it equal to that of the other two countries. The date fixed for the change, as already stated in our columns, is the 1st prox. The Washington and the English authorities, as well as the Laboratoire Central d'Electricité of Paris, have agreed to adopt the following ratios: 1 bougie décimale = 1 English candle = 1 American candle. Consequently, the three countries will henceforth have the same unit of light—called the "International Candle"—the constancy of which will be ensured, by the care of the three bodies named, by means of frequent comparisons. As the result of these investigations and arrangements, the Hefner unit is equal to 0.9 International Candle. The industries connected with gas and electricity of the three countries named above have agreed to the conclusions arrived at, as have also the Society of Gas Managers of Italy. At the close of M. Vautier's communication, the President remarked that he deserved the members' thanks for putting France in the front rank in connection with photometry.

An article by M. Grebel in the "Génie Civil," towards the close of last year, on the use of the hydrocarbons extracted from coal, schists, and petroleum in internal combustion engines, gave to M. Defoy a subject for a short paper on the utilization of coal tar. He referred to the use of Astatki, the residue from the distillation of the petroleum of the Caucasus, for marine boiler firing, and suggested the possibility of substituting for it a mixture of heavy and medium tar oils. He thought it would be of immense advantage to have available a material which had not to be brought from the Caucasus, but was a national product. Its production would, of course, necessitate the establishment of additional stilleries. The further utilization of tar led naturally to the idea of having some kind of co-operation between companies in regard to its sale or treatment, just as is now done in France in the case of coke. He thought this would have the advantage of checking competition and keeping up prices. As the subject of the utilization of tar was down among those for discussion during the congress, the matter was only slightly touched upon.

On Thursday morning, the subject of distance lighting and extinguishing engaged attention. M. Badon-Pascal read a paper on the Rostin system. M. Aubert indicated the salient features of the "Alex" system; M. Aublant described an appliance which, with the permission of M. Buisson, the Manager of the gas-works at Romorantin, he has had an opportunity of trying there; and M. R.-H. Gaulis brought under notice the Kilchmann system, which has been tried by the Société du Gaz et de l'Electricité of Marseilles. Finally, M. Lhomme read a communication, which was as good as a paper, on further trials carried out by him at Reuil (Nanterre) with the Alder and Mackay and the Gunning system. All these papers will be noticed more fully next week. As, however, M. Lhomme has given special attention to this subject, on which he furnished some interesting particulars on the occasion of the meeting of the Society in Paris last year, it may be mentioned that his conclusion is that while automatic lighters and extinguishers have rendered, and will continue to render, good service to gas managers in a great many cases, it would be temerity on their part to assume that when once they are put in position there is no need for troubling further about them.

Having thanked the authors for their communications, the President directed attention to the subject of the utilization of tar for heating, which, as already mentioned, constituted a large portion of his address. The first speaker was M. Grebel, who asked whether those who had taken up the question of the employment of tar had made centesimal analyses of tars from various sources. The President had concluded by induction, and starting with calculations based on thermic balance-sheets relating to the combustion of tar, that the figures given for the content of hydrogen in analyses previously published were very exaggerated. A simple analysis would furnish more information upon this matter than would discussion. But even taking questionable centesimal compositions, it was found that the utilizable industrial calorific power of a tar containing 15 per cent. of water was only from 8000 to 8500 calories, instead of the 10,500 to 11,000 calories indicated in various works. M. Freyss and M. Hovine confirmed these figures. M. Grebel added that the communications this year and the discussion at the previous congress might lead to the conclusion that the combustion temperature of tar is lower than that of the mixed gas produced by generators. The frequent fusion of the refractory material in furnaces heated by tar, and the rapid distillation obtained by M. Échinard, fully prove that

the flame temperature is high. M. Kuentz remarked that the temperatures cited by M. Echinard were taken outside the flame. This brought the morning sitting to a close.

On Friday, the members assembled shortly after nine o'clock, and proceeded to consider the first subject set down for discussion—viz., mechanical appliances for charging retorts in small gas-works. The first speaker was M. Grebel, who referred to the new refractory steels which can now be employed for the pricking-irons and other parts of charging and discharging machines which are exposed to the heat. Other remarks were offered by the President and MM. Mallet, Vautier, and Lacaze; mention being made of some new German hand-charging machines, with scoop, which cost only 2400 frs. (£96). At this point, a subject not actually set down, but bearing upon the utilization of tar, was introduced by M. François, the General Secretary of the Lyons Gas Company, in a rather long communication in which he described the various materials employed in the treatment of road surfaces. The President thanked M. François for his interesting paper (for this it really was, to all intents and purposes), and then called upon M. Chevalet, who opened a discussion on the treatment of ammoniacal liquor in small gas-works, and gave figures to show that this could be done economically. M. Mallet regarded M. Chevalet's calculations as being too favourable, and expressed the opinion that, notwithstanding the fall in prices, the production of concentrated liquor was more advantageous than the manufacture of sulphate of ammonia. MM. Echinard and Darfeuille added a few observations; and then the remaining subject—the use of india-rubber joints—was taken up. M. Mallet was the first speaker, and he dealt with the action of gas upon india-rubber. He remarked that since it was only necessary to put into gas the benzol of which it was deficient, there was no greater danger in using rubber joints now than there was formerly, when gas was richer. Benzol must not, however, be introduced in a liquid condition, as it was a solvent of gums, and also, though in a less degree, of vulcanized india-rubber. M. Grebel referred to some Somzée rubber joints, in old gas-mains, which were reduced to a pulpy condition, and yet did not leak. Rings which contained a larger percentage of inert matters were certainly more resisting. M. Guillet thought it was the toluene, not the benzol, in the gas, which attacked the india-rubber. M. Darfeuille asked whether india-rubber joints were good in the curved portions of supply-mains. M. Lhomme had not found any leaks whatever in 350 kilometres (21 miles) of canalization.

This brought the technical business to a close; and the President expressed his thanks to all who had contributed to it.

Visits to Works.

On Wednesday afternoon, separate parties were made up to visit the works of the Lyons Gas Company at Perrache, la Mouche, and Villeurbanne, and also their electricity stations. One of these parties likewise visited the gas-works at Lyon-Vaise, which are in the hands of MM. P. de Lachomette, Villiers, et Cie., where there is on trial an installation of Woodall-Duckham vertical retorts. This party also went through the extensive retort, fire-brick, and porcelain works of the above-named firm, which adjoin the gas-works. In the evening, from nine o'clock onwards, visits were paid to the brilliant display of gas appliances of all kinds at the Lyons Gas Company's show-rooms, located in an excellent position close to the Place de la République. The rooms were crowded with congressists and the general public, who examined with much interest the very large and varied collection of appliances. Ironing by gas was going on; and samples of the work of the culinary exhibits were exposed in a portion of the window facing the street. Some of the apparatus described in papers read at the meeting were on view, and their special features were explained.

On Thursday afternoon a large number of members, including several ladies, were conveyed in brakes, which were gaily decorated with the French national flag, to the generating station of the Lyons Omnibus and Tramways Company, and afterwards to the receiver and transformer station of the Société Grenobloise de Force et Lumière (of which M. Godinet is the Chairman), and the works of the Société des Forces Motrices du Rhône, both at Cusset, a suburb of Lyons. On the return, a call was made at the Villeurbanne works of the Lyons Gas Company, where the party had an opportunity of witnessing the final stages of the inflation and starting of a large balloon—a demonstration organized specially for them by the Aéro Club of the Rhône. There had been a very high wind in the morning; and a heavy shower which occurred while the party were at the transformer station seemed literally to "put a damper" on their hopes of seeing the ascent. About half-past three, however, as the rain ceased and the wind had dropped, it was decided, notwithstanding the lateness of the hour, to rise about 3000 feet. During the final preparations, some of the party indulged in the diversion of sending off toy balloons, bearing the words "Congrès du Gaz," and having attached to them stamped post cards, arranged for the filling-in of the place and time of the finding, for posting to the Club. Eventually all was ready, the aeronauts took their seats in the car, the balloon rose into the air, and started on its journey amid the cheers of the spectators. Before leaving the ground, they saw it well away—a comparative speck on the sky—whither? This was the question in many minds. All doubts were set at rest at the banquet in the evening by the President announcing that a telegram had arrived to the effect that a safe descent had been made.

Descriptions of the gas-works visited will be found in an article appearing elsewhere; and the electricity, motive power, and other works will be more fully noticed next week.

Banquets—Presentation to the President—Excursion.

On Tuesday evening, the members were entertained by the Lyons Gas Company at a banquet at the Restaurant Berrier et Millet, in the Place Bellecour—claimed to be one of the largest squares in France—under the presidency of M. Ancel, the Chairman of the Company. The room was elegantly decorated and illuminated by electric lamps tastefully arranged; and the tables were profusely ornamented with flowers. It was a brilliant gathering, numbering about 350, and including M. de Lachomette and other Directors of the Company, the General Secretary (M. François), the chief officials, the Prefect of the Rhône (M. Lutaud), the Mayor of Lyons (M. Herriot), the President and Vice-President of the Société Technique (MM. Godinet and Marquisan), the Permanent Secretary (M. Payet), the President of the Syndicat Professionnel de l'Industrie du Gaz (M. Piaton), the members attending the congress, and practically everybody holding a responsible position in connection with civil and industrial affairs in Lyons. After the banquet, M. Ancel extended a cordial welcome to the congressists, to the authorities, and to all who had accepted the Company's invitation to meet them. He congratulated himself on being present at the 36th annual congress of the Société Technique. He proposed, as usual, "The President of the French Republic," and afterwards drank to the continued prosperity of the "old, but still young, gas industry," and to the success of the Société Technique. M. Ancel was followed by M. Lutaud, who expressed the pleasure with which he remembered the part he had taken in the distribution of the awards in the afternoon, and proposed the health of M. Ancel, who, he said, represented the energy, perseverance, and integrity which characterize those who are engaged in the gas industry of France. M. Herriot congratulated himself on the good relations existing between the City and the Gas Company, referred in eulogistic terms to the attainments of the managers of gas undertakings, and raised his glass in honour of the science which had brought the congressists together, and which laboured daily for the good of mankind at large. M. Godinet closed the series of toasts by returning thanks on behalf of the Société Technique, and by drinking the health of everyone. The brilliant function was followed by a lantern exhibition, by M. Seewetz, the Under-Manager of the School of Chemistry, of the Lumière system of photography in colours.

On Thursday evening, the subscription banquet of the Society took place in the Salle Rameau, under the presidency of M. Godinet. The toast of the "President of the French Republic" was responded to by the Prefect of the Rhône and the Deputy-Mayor of Lyons (M. Gorjas). Other speakers were the President of the Syndicat Professionnel de l'Industrie du Gaz (M. Piaton), and the Vice-President of the Société Technique (M. Marquisan), who proposed the health of the Past-Presidents of the Society. M. Ancel, as the senior Past-President present, acknowledged the toast, in accordance with custom; and the function ended.

Then followed a pleasant incident which may be best recorded here. After the general company had dispersed, the works managers and the technical staff in the service of MM. de Lachomette, Villiers, et Cie. assembled to make a presentation to their chief, in recognition of his election to the presidency of the Société Technique for a second year. The oldest Manager (M. Michot, of St. Chamon) briefly addressed M. Godinet, and, in the name of all the contributors, asked him to accept a token, in the shape of an *objet d'art* and a *livre d'or*, of their appreciation of him as an engineer. M. Godinet, who was much touched by this testimony of the good feeling of his colleagues, in a few words expressed his thanks for the gifts.

On Friday afternoon, a large party of the members, accompanied in many cases by ladies, had an excursion in brakes to Mont Verdun and Poleymieux, and again enjoyed the generous hospitality of the Lyons Gas Company, which had been so conspicuous a feature of the week's proceedings. This excursion was the last item on the programme, and with it the congress was brought to a close.

Before concluding these notes, acknowledgment must be made by the writer of much friendliness displayed towards him by several of the prominent members of the Society, to whom it is unnecessary to refer personally. Exception must, however, be made in the case of the Permanent Secretary, M. Payet, who, with many calls upon his time and attention, facilitated, as far as he was able, the preparation of what is obviously only a summary of the proceedings during the four days over which the congress extended.

LYONS AND ITS GAS-WORKS.

THE city of Lyons—the second city of France—in which the thirty-sixth annual congress of the Société Technique was held last week, as reported elsewhere, is known all the world over for its staple industry, the manufacture of silk, in the production of which it is computed some 85,000 hand-loom and 20,000 power-loom are employed within the city and its environs. It is perhaps less generally known for its historic associations, for it was a great town, and an important centre of civilization, where the representatives of sixty Gallic cities used to assemble around the monumental altar of Augustus, when Paris was but a village. The official Roman town lay on the hillside of Fourvières, along the

right bank of the Saône, on the site occupied by the Gaulish city before the Conquest. Lyons has preserved but few monuments of the Roman epoch—fewer than its condition at that time would lead one to expect; but as its course of prosperity has known no check, the past has disappeared before the present, and the few remaining vestiges owe their safety in reality to abandonment and to neglect. The city occupies almost a unique position, being situated upon a tongue of land at the confluence of two rivers—the Rhône and the Saône; and it is rare to find in any one town two equally beautiful streams crossed by so fine a series of bridges, and reflecting in their waters so magnificent a collection of buildings. Regarded from the point of view of the tourist, Lyons is the best starting-point for exploring the very interesting country lying south of it to the Mediterranean.

Our business here, however, is not with the historian or the tourist, but with the gas maker; and for him Lyons possesses special interest from the fact that it is the headquarters of several groups of gas undertakings—conspicuous among them being the Lachomette, Vautier, and Piaton groups. The first, held by MM. P. de Lachomette, Villiers, et Cie., consists of about 25 undertakings, including that at Lyon-Vaise, and the General Manager is M. Godinet, President of the Société Technique; the Chairman of the second, in which there are about 30 undertakings, is M. Théodore Vautier, whose name is well known to English engineers in his capacity of President of the International Commission on Photometry; and M. Piaton is the General Manager of the third, which is a smaller group. Then there is the Lyons Gas Company, of which M. Ancel is the Chairman, M. Boutan, the General Manager, M. Chervet the Chief Gas Engineer, M. Maréchal the Chief Electricity Engineer, and M. D'Aubenton-Carafa the Chief Distributing Engineer. The Lyons Gas Company were, so to speak, the hosts of the members of the Society during the congress; and right well they filled the position.

From a pamphlet entitled: "Lyons: Its Industries and Gas Company," prepared by the Company for the use of the members, we take the following particulars. It should first be mentioned that the Company supply both gas and electricity; and their central office is on the Quai des Célestins, on the banks of the Saône. They have three gas-works—one at Perrache, another at Villeurbanne, the third at La Mouche—and four electricity stations, situated respectively in the Rue de Pazzi, the Rue du Gazometre, the Cours Bayard, and the Rue Trousset. They have two gas-holder stations, a tar-distillery, show-rooms, and workshops. The present Company is the outcome of the amalgamation in 1880 of three concessionary Companies, who were working under treaties with the Municipality between 1835 and 1849. In 1897, the city was divided into five sections, with one of which the Vaise Gas Company was entrusted, while the Lyons Gas Company had the other four, under concessions for forty years. The same contract fixed the maximum prices to be charged for electricity. For gas it is equal to 2s. 3d. for public and municipal lighting, 3s. 7d. for industrial purposes, and 4s. 6d. for domestic use, with a reduction in the last case of 2½d. per 1000 cubic feet every eight years until 3s. 7d. is reached at the end of the term. The price is actually 4s. 3d.; and that for heating and industrial purposes 3s. 7d. Discounts are allowed. The prices for electricity range from 8c. down to 5c. per hectowatt-hour, with discounts; the price for motive power ranging, according to quantity, from 2½c. down to 0·7c. per hectowatt-hour.

The gas-works are all connected with railway lines; and those at Perrache are close enough to the Saône to be served from the river. The breaking and the classification of coke, as well as the treatment of the ammoniacal liquor, are carried out in each works. The tar is concentrated in a distillery at St. Fons, a near suburb of Lyons, on the site of old gas-works purchased by the Lyons Company. The spent purifying materials are utilized at St. Fons for the manufacture of cyanide. The Perrache works date from the introduction of gas manufacture into Lyons, about 1840. The visitors to the works last week therefore found themselves in the presence of old works which are in process of being modernized and brought up to date by the introduction of mechanical appliances. Their productive power is about 4½ million cubic feet per day. The works were originally divided into two sections, for the sake of security, when they alone served the centre of the city; and the division still exists. The two sections are, however, connected. One contains Lachomette regenerative settings of eight retorts, 20 feet long, furnished with De Brouwer charging and discharging machinery, and also some old settings charged by hand. The other section contains Lachomette settings of nine 20-foot retorts, charged and drawn partly by machines specially designed for the works, and partly by De Brouwer machines in course of installation. A large proportion of the coal is brought up to the works by water. The principal store is furnished with a waggon-lift, for raising the coal conveyed by railway. The coal and coke are dealt with mechanically—the latter by De Brouwer conveyors. All this plant is worked by electricity supplied from one of the Company's stations. Since 1901, the Company have been using water-gas plant on the Dellwik-Fleischer system, which gives an output equal to 10 per cent. of the daily maximum production of the works. This gas is mixed with the coal gas after the latter leaves the hydraulic main; purification and carburetting being done to both together. Each section of the works is provided with separate exhausters, condensers, "Standard" washers, and station meters. The gasholders date from the various periods of the extension of the works. The oldest have

the old "knee-joint" pipes; more recent ones are telescopic; and the latest, erected on adjoining land, has a metal tank. Their total utilizable capacity is about 2½ million cubic feet per day. The ammoniacal liquor plant has been erected on land adjoining the works; and it will deal with from about 6500 to 9000 gallons daily. Briquettes are made and utilized for heating the retort and boiler furnaces in conjunction with coke. One of the settings in the first section of the works is provided with separate purifiers and exhausters so as to constitute it a kind of experimental works; there is a laboratory for ascertaining the quantity of water and ash in the coal; and another is used for the study of new processes and for testing the gas and bye-products chemically. Finally, the Perrache works centralize, under the direction of the Company's Engineer-in-Chief (M. Chervet), in the workshops the repair of appliances and the construction of small pieces of plant required for the other stations; and in the offices the keeping of the accounts and the study of new works.

The Villeurbanne works, which are situated on the left bank of the Rhône, were originally the local works for the supply of the district; but they have, of course, been extended, and are now being further enlarged. They are used for study and experiment rather than for production. They are arranged for a production of about 1¼ million cubic feet of gas per day; but this can be raised to 1¾ millions. There are eight old settings of seven retorts, and 24 generator settings of eight, all 10 feet long. The last twelve of these settings are provided with mechanical coal and coke handling plant, the trial of which permitted of the study of that which was to be put up at Perrache. There is a small water-gas plant on the Dellwik-Fleischer system. The gasholders have a total capacity of close upon a million cubic feet. Features of these works are dust-washers, the object of which is to reduce the ash in small coke, and consequently facilitate its sale; and there is a compressor capable of ensuring a delivery of 176,000 cubic feet per hour, at a pressure of 12 inches of water. At these works the Company study their process for the conversion into hydrogen, and even into methane, of the carbon monoxide in the water gas. An electricity generating plant of 50 H.P. has been erected as a stand-by, in case of accidents. Close to these works is a field, with a covered storehouse upon it, which the Company place at the disposal of the Aëronautic Club of the Rhône.

The other works (La Mouche), erected in open fields, stand on the left bank of the Rhône above Lyons. The retort-house is equal to a production of 1¼ million cubic feet; but the land possessed by the Company will allow of extensions being made as required. A single bench of eight settings of nine inclined retorts has been constructed up to the present time; but the building and the coal-handling plant are equal to two similar benches. The coke is removed by a De Brouwer conveyor from the house to the yard, and there cooled, broken, and sorted. The other plant does not present any novel features. There is only one gas-holder—a telescopic one—and it has a capacity of rather more than 700,000 cubic feet.

The distribution of the gas is effected by trunk mains. From the Perrache works a 32-inch main supplies the centre and northern part of the town; a 20-inch one is kept exclusively for the supply of the left bank of the Rhône; and one of similar size feeds the communes on the right bank of the Rhône and Saône near the junction of these rivers. From the Villeurbanne works, there is a 20-inch main for distant service; a 16-inch one for local supplies feeds a series of mains radiating in different directions round the works. From La Mouche, a 24-inch feeder supplies gas to the very centre of the network of mains formerly connected with the old Guillotière works, which are now only a gasholder station. The mains supply a superficial area of about 34,600 acres, and their length is about 390 miles, of which 168 miles are outside Lyons. They can all be brought into communication with each other in case of accident. The great difference in the levels in parts of Lyons necessitates special attention being paid to the pressure-regulating arrangements.

The mains supplying the public lighting serve 11,300 lamps; and, with the exception of a few fishtails used in the outskirts, they are all fitted with incandescent burners of special design, decided upon, after agreement with the Municipality, as the outcome of prolonged experiment. Some of the lanterns are fitted with Bandsept burners. The Company are now trying in certain of the principal places "Selas" lamps of 3000-candle power and "Soleil d'Or" lamps of 1000-candle power, on the high-pressure system. The whole of the public lighting (by gas and electricity) cost last year close upon £35,000. The Municipality, however, did not pay any part of this, as, in accordance with their treaty with the Company, they take out of the gross receipts 10 per cent. for gas and 6 per cent. for electricity; they have £8000 for the use of the subsoil for the mains; and, further, a special annuity of £3000—making for last year a total of £35,720, quite apart from other sources of revenue, such as the stamping of meters. Altogether, the Company handed over last year more than £38,000 to the City, who get the public lighting for nothing and £3200 into the bargain.

As already mentioned, the Company possess four electricity generating stations. The pamphlet contains particulars of these, as well as of the various gas appliances the Company supply to the consumers. These, however, may be left for the present.

The personnel of the Company numbers nearly 300, of whom six are ladies; and there are about 1000 workmen. They enjoy certain privileges. They get their gas at 3s. 7d. instead of the usual price of 4s. 3d., and they can have appliances on hire at

reduced rates. Gratuitous supplies of coke are allowed in certain cases. Every attention is paid to their health, by the provision of baths, &c.; and should they be sick or meet with an accident, funds are available, and they are provided for in their old age. On the whole, therefore, the City generally and a large section of its workers profit by the Company's existence.

The following particulars in regard to the Lyon-Vaise Gas-Works were obtained through the courtesy of M. Godinet.

The works are situated on the right bank of the Saône, above Lyons; and they belong to a Company entirely independent of the Lyons Gas Company. This peculiarity arises from the fact that about sixty years ago the canton of Vaise was not part of the city of Lyons, but an independent commune. Though its annexation took place in course of time, the Gas Company kept their independent position, but at the same time they are subject to similar obligations with respect to the sale of gas as their neighbours. In addition to Vaise itself, the Company light five adjacent communes—viz., Tassin la Demi-Lune, Saint-Rambert, Ecully, Champagne, and Saint-Cyr. The site of the works dates from their erection nearly seventy years ago; and they adjoin the extensive retort, fire-brick, and porcelain works of MM. P. de Lachomette, Villiers, et Cie. In 1900 and 1901, the works underwent considerable improvement, which brought the plant thoroughly up to date. Gas is made in a bench of six settings of inclined retorts 12 feet long, heated by Lachomette generators. These retorts are equal to the production of 530,000 cubic feet of gas per day. Actually, the production varies from about 300,000 cubic feet in summer to 390,000 cubic feet in winter. Consequently, the six settings are never all at work. In addition, there is an installation of four vertical retorts on the Woodall-Duckham system, which is now under trial. The old horizontal retorts are kept in reserve for use in case of accident. After leaving the retorts, the gas is dealt with by a horizontal and a Pelouze and Audouin condenser, a "Standard" washer, and six oxide purifiers, each having a superficial area of 172 feet. They are calculated for dealing with a make of 530,000 cubic feet of gas per day; and arrangements have been made for their duplication, if required by the development of the works. There are four holders. Two of them date from the erection of the works, but are still in good condition, and each will contain 26,500 cubic feet of gas. Another holder, put up in 1865, will contain about 45,000 cubic feet; and the latest, erected in 1872, close upon 100,000 cubic feet. The four holders, which are all single-lift, have a total capacity of somewhere about 198,000 cubic feet. The annual make of gas is at present about 124 million cubic feet; but it can easily be raised to 176½ millions, and even more, without further enlarging the plant. It should be added that, in connection with the bench of inclined retorts now in use, De Brouwer coal and coke elevators, conveyors, breakers, &c., are employed, so as to reduce manual labour to a minimum.

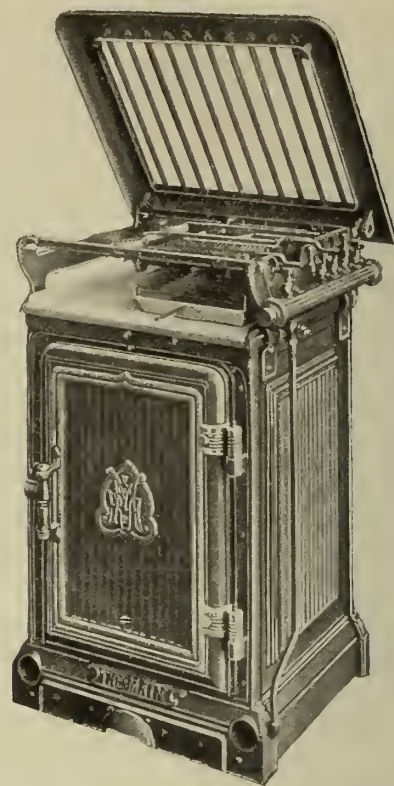
A NEW TYPE OF GAS-COOKER.

Simple System of Heat Regeneration.

THERE has just been placed on the market by Messrs. R. & A. Main (London and Falkirk) a new type of cooker, which they believe will mark one of the greatest advances that have been made in gas cooking up to the present day. The accompanying illustration shows the design. The particular feature it embodies is one familiar to every gas engineer—viz., the application of a simple system of regeneration to the oven. All the air necessary for combustion and for efficient ventilation is heated to a temperature of 300° Fahr. before it reaches the point of combustion; and the makers assert, from careful experiments, that the result is a saving of 25 per cent. in gas.

Messrs. Main do not contend that this idea of regeneration, as applied to gas-ovens, is new, as they have used it for the last ten years with the greatest success in their large gas-cookers for hospitals, hotels, restaurants, and public institutions. The oven is jacketed by hot air; and an important feature consists in the fact that all the silicate packing is confined to the outer casings of the oven. No grease can come in contact with it; and every manager knows how offensive this particular detail is in connection with the gas-oven. The burners have been constructed with the greatest care, in order to ensure a maximum of efficiency in every respect; and they have the necessary air-regulators. The top can be made fixed or lifting, as desired; and a point about these new ovens is that, if careless housewives should allow grease to accumulate on the sides of the ovens, they can be efficiently cleaned without disconnecting the cooker, and the ovens restored to their original condition in a short space of time in the consumers' houses. Gas managers will appreciate the immense importance of these features, as the cost of disconnecting and removing ovens from consumers' houses—with the subsequent taking to pieces of the different parts, and re-erection, including van-hires—is a most serious item. This result is obtained by the construction of the enamel plates in the oven without screws. When the crown of the oven is removed, the enamel plates can be taken away with the greatest facility, and replaced with equal ease in half-an-hour.

The cookers are made in three sizes, of one height and one depth,



The Main "London" Cooker, with Hinged and Lifting Top.

from front to back. This enables the manufacturers to standardize all the parts; and as there are only three sizes of varying widths, the same sides, and the same oven burners and bridges, fit each size of cooker. The top boiling-burners are also standardized, and fit the different sizes. Consequently there is a great reduction in the amount of stock with which the gas company require to replace the parts.

ARBROATH GAS-WORKS.

A Paper by Mr. P. C. Smith.

AT the Scottish District Meeting of the Association of Municipal and County Engineers, held at Arbroath on the 19th inst., Mr. P. C. SMITH, the Burgh Surveyor, read a paper on the "Municipal Works of Arbroath," in which he dealt with the gas and water works. His remarks on the gas undertaking were as follows.

The gas-works were acquired in 1871 from a private Company. The capital of the Company stood at £20,000, on which they were then paying a dividend at the rate of 7 per cent.; and the Town Council, when taking over the works, made the shareholders' stock into annuities bearing interest at 7 per cent.

Within the last seven years, the whole of the plant has been renewed under the management of Mr. A. C. Young, the Gas Engineer. The present capital debt outstanding on the works, including the annuities capitalized, is £59,225, which is equal to 13s. 4½d. per 1000 cubic feet of gas sold, which in 1907-8 was 88,564,730 cubic feet. The capital debt has not been altered for a number of years, except in so far as was required to meet the cost of the Corporation's free gas-cooker scheme and coin-meter installation. The sinking fund has been practically equal to the sum spent on meters and cookers during the past seven years; so that the capital account remains stationary, while the output of gas has been increased by nearly 40 per cent. in the same period, and all renewals of plant have been met out of revenue—£11,255 having been spent on works plant, mains, coal-waggons, &c. Meantime, a spiral-guided gasholder is in course of erection, at a cost of £4600; and a set of water-cooled condensers are also being constructed. When these are completed, the gas-works will have a producing plant equal to 1,000,000 cubic feet per day, and a storage capacity of 700,000 cubic feet.

The price of gas in recent years has been: 1900, 4s. 4½d. per 1000 cubic feet; 1904, 3s. 6½d.; 1908, 2s. 11d.

According to "Engineering Record," heating a building with hot water from the jackets of a gas-engine is to be tried at Detroit, in conjunction with a 1400-H.P. engine and producer plant now being built.

In the list of honours conferred by His Majesty on the occasion of the official celebration of his birthday, are knighthoods for Mr. W. E. B. Priestley, M.P., who was Mayor of Bradford in 1904-5, Lieutenant-Colonel Leishman, M.B., R.A.M.C., who is distinguished for bacteriological research, and Mr. T. E. Thorpe, chemist, who is a Director of the Government Laboratories.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

FIFTIETH ANNUAL GENERAL MEETING AT FRANKFORT-ON-THE-MAINE, June 21 to 25.

[BY OUR SPECIAL REPRESENTATIVE.]

A REVIEW OF THE PROCEEDINGS.

THIS year's Meeting of the German Gas and Water Association commemorated its jubilee; and therefore the proceedings assumed a somewhat exceptional character. The City of Frankfort was chosen for the meeting because it was there that the Association first met. In 1859, two days only sufficed for the gathering; and it was not until 1869 that an extension to a third day was found necessary. Since then a fourth, and sometimes a fifth day, has been added—the last day being generally devoted to an excursion. In 1881, Frankfort was chosen as the most appropriate venue for the coming-of-age meeting of the Association; and in due course it may be anticipated that the centennial meeting will be held there also.

Welcome by the Municipality.

The proceedings this year were inaugurated by an evening reception on Monday, the 21st inst., held by invitation of the Municipality in the ancient halls of the Römer. The Chief Burgomaster, Dr. Adickes, in brief and well-chosen words, welcomed the guests in the name of the City. The President of the Association, Mr. E. Körting, of Berlin, expressed thanks for the hearty welcome accorded to them by Frankfort, which was, he said, a city held in the highest esteem by the Germans of the North, and beloved by those of the South. It was there that the parents, and may be the grandparents, of many of the present members brought the Association into being. A liberal repast was then served to those assembled—numbering about 900 in all—with the orderliness and dispatch with which almost habitually such gatherings are catered for in Germany. Greetings and conversation, stimulated by an ample supply of ripe Rhine wine, continued until a late hour.

The Business Meeting.

The meeting on Tuesday morning was formally opened by the President, Mr. Körting, in the large hall of the Zoological Gardens. He referred to the previous meetings of the Association in Frankfort, and welcomed the numerous contingent of visitors from Austria, Switzerland, and other countries beyond the limits of the German Empire. Dr. Adickes, the Chief Burgomaster, then expressed, somewhat more formally than on the previous occasion, the welcome which the City of Frankfort extended to the Gas and Water Engineers. He pointed out that the Association was founded at a time of reviving political activity, and that it had zealously striven for fifty years at the problems presented by the development of the industries it represented, and that it would continue to endeavour to advance them. Professor Freund, Rector of the Frankfort Academy, then spoke a few words of welcome on behalf of the local Physical Association and the Chemical Society, and as the representative of the social and commercial sciences in the town. He was followed by Town Councillor Rölle, who spoke in the name of the local Architects' Club and Engineers' Association, the district branch of the German Association of Engineers, and the Electro-Technical Society. Herr Schmetzer next spoke as representative of the parent body of the Association of German Engineers. Herr Singer then said a few words of welcome on behalf of the Union of German Electro-Technical Associations, and Herr Hermann for the Austro-Hungarian Institutions. All these congratulatory addresses concluded with one by Herr Muescher, the Manager of the Bäle Gas and Water Works, who spoke in the name of his Swiss colleagues.

Honorary Memberships and Presentations.

Then followed an event which constitutes, we believe, a new departure in the recent history of the Association—viz., the nomination of Dr. H. Bunte, Professor at the Technical College at Karlsruhe and General Secretary of the Association, as an Honorary Member of its Council. The nomination was greeted with the heartiest signs of approval by the meeting; and Dr. Bunte briefly expressed his appreciation of the honour conferred upon him. Next the able and devoted service which Dr. W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, has rendered for many years to the gas industry was recognized by his nomination as an Honorary Member of the Association, which act was also received with great applause, of which the recipient made appropriate acknowledgment in a brief speech. The Bunsen-Pettenkofer memorial award was next presented to Herr Wunder, of Leipzig, Herr Söhren, the Manager of the Bonn Gas-Works, Herr Blum, the Manager of the Berlin-Anhalt Engineering Company of Berlin, Councillor Richard Pintsch, of the well-known Berlin firm of lighting engineers, and Mr. W. H. Lindley, Consulting Engineer, of Frankfort.

Presidential Address.

Mr. E. Körting, of Berlin, then delivered his Presidential Address, which constituted a retrospect of the changes which

have taken place in the conditions of gas manufacture and supply during the last fifty years. An abstract-translation of this most interesting address, with reproductions of most of the diagrams used to elucidate its chief points, is commenced on another page of to-day's "JOURNAL."

At the conclusion of Mr. Körting's address, Councillor Kölle, of Frankfort, gave an account of the water supply of the city from 1874 to the present time. The drinking water now comes partly from various springs and deep wells in the Vogelsberg, partly from similar sources at Wetterau near Inheiden, and partly from a number of underground water pumping stations. The total available supply amounts to about 32 to 35 million gallons per diem, of which less than one-half is at present called for. The quantity available from the existing sources should suffice for the needs of the city until 1924. This is on the supposition that an unlimited supply continues to be given; but Herr Kölle strongly advocates the introduction of the meter system, which he estimates would extend the sufficiency of the present sources of supply by a further 10 to 15 years. There is also a supply of flushing water from the River Maine; but this water is very dirty, and the lecturer would prefer to obtain a supply of the cleaner water of the Rhine. The total prime cost of the water delivered at the stand-pipes or taps is 7.6d. per 1000 gallons for the spring water, 6.8d. for the underground water, and 4.8d. for the flushing water supply. A well-illustrated and detailed account of the water undertaking of Frankfort, prepared in May, 1903, had been brought up to date by the inclusion of a supplement dealing with its position from that time until the spring of this year, and was presented to those attending the meeting.

Gas and Water Supply of Frankfort.

Councillor Kölle also referred to the gas supply of Frankfort, which is shared between the Imperial Continental Gas Association, who have two works in the city, and the Frankfort Gas Company, who have one works. The latter were first in possession; but some time in the forties of last century, dissatisfaction was felt at the supply provided, which was gas made from rosin, wood, and anything except coal. The Imperial Continental Gas Association were then invited to supply coal gas for certain purposes, and agreed to do so on certain conditions. Then followed a fight for the partition of the area of supply, and for the most favourable terms of concession, with the result that local influences led to the Frankfort Gas Company obtaining a concession which still has about 50 years to run, and to the Imperial Continental Gas Association, by active competition, securing the major share of the business at low prices. In many parts of the city, consumers have either undertaking's supply at their disposal; but it is obvious that such duplication of mains and services is uneconomical and occasions more frequent breaking up of the pavements than would otherwise be called for. Thanks, however, largely to the lifelong activity of Mr. W. W. Drory as Manager of the Imperial Continental Association's works, the Association have obtained a very strong position in the city, on which perhaps it would be undesirable to lay too much emphasis at the moment, as delicate negotiations are in progress between the two gas undertakings and the Municipality for a re-adjustment of the conditions of supply. There is, of course, a strong Socialist element in the City Council in favour of the gas supply being taken over by the Municipality; but the fact that the concessions have still many years to run puts the Gas Companies in a favourable position. Meantime warm debates are taking place on the "Gas Question;" but there is, we believe, a good prospect of the Imperial Continental Gas Association continuing to supply gas in Frankfort for many years hence. They supply ordinary coal gas; but the Frankfort Gas Company, by the terms of their concession, have to supply a gas of nearly 30-candle power. They are now using large quantities of Australian oil-shale for the manufacture of this rich gas, for the consumption of which modified incandescent and heating burners are required.

It had become evident in the course of the proceedings already reported that the hall as arranged was unsuitable for the meeting, because only a few members seated immediately in front of the speaker could succeed in following his words. The bad acoustic qualities of the room caused those at a little distance from the platform to give up the attempt to follow him, and to indulge in conversation (at times scarcely subdued) and to move in and out of the room at frequent intervals. Consequently, the speakers and the audience were both labouring under great disadvantages; and as the German Association pursues the plan of not circulating proofs of the papers before or at the meeting, discussion of them was practically out of the question. These remarks apply more especially to the first two days of the technical proceedings. On the third day the position of the platform had been altered, and speakers were followed without much difficulty.

Storage of Coal.

Herr Prenger, the Manager of the Cologne Gas, Water, and Electricity Works, next read a paper on the "Storage of Coal,"

which embodied the results of replies received to the circular-letter of inquiry which, as mentioned in the annual report, the Association had addressed to a large number of its members. Replies had been received in regard to 183 works. It appeared that, of this number, 141 stored their coal under cover, and only 42 stored it in the open. Curiously enough, the replies indicated that heating and spontaneous ignition of the coal was as liable to occur when the coal was piled only to a small as to a great depth in the store. The construction of ventilating shafts in the stores was not generally approved, and good and uniform ventilation was commonly relied upon in order to avoid any firing of the coal. Opinions differed as to the extent to which the coal depreciated in quality on prolonged storage. The questions involved in the storage of coal on gas-works were not by any means yet cleared up satisfactorily by the answers summarized by Herr Prenger. The data, however, are to be handed over to the staff of the Association's Experimental Works for exhaustive investigation. The problem is, of course, rather different from that of the storage of coal on English gas-works, on account of the greater quantity which must be stored in many German works, owing to the closing of water communication by frost every winter, and to the different classes of coal used and the greater fluctuations of weather conditions to which they are exposed—especially when stored in the open.

It was announced at the meeting on Tuesday that Mr. E. Körtig, the President of the Association, had been elected an Honorary Member of the Institution of Gas Engineers. Donations were announced from the Halberger Foundry of £250 to the general funds of the Association, and of £150 from Herr Blum, of the Berlin-Anhalt Engineering Company, specially for the support of the Experimental Works of the Association.

Papers Dealing with Water Supply.

The technical proceedings on Wednesday opened with a paper by Herr Reese, of Dortmund, on the "Development of Water Supply during the last Fifty Years." It seems that there were comparatively few water-works in Germany at the commencement of that period, only a few towns—such as Hamburg, Berlin, &c.—having them. In 1874, the Berlin Corporation bought the works in that city and took over the supply itself. From about the same date also water-works had come into being very generally throughout German towns. Most towns make a profit out of the water supply. There are about a million water-meters in use in Germany, and some 19,000 miles of mains laid. Reference was also made to the proposed new water law for Prussia, which is mentioned in the annual report of the Association on another page. The next paper was by Dr. Steuer, of Darmstadt, on the "Origin of Underground Water," with special reference to the plain of the Rhine in Hesse. After a general discussion of theories of the origin of underground water, the author went on to state the results of eight years' observations in the Hessian plain. He distinguished the different streams of underground water there by the results of examinations of the chemical characteristics of the water. The paper was chiefly of interest to those concerned in the water supply of towns in the Hessian district. The next paper was by Herr Scheelhaase, of Frankfurt, and dealt with the "Removal of the Acidity of the Underground Water of the Frankfort Forest." It appears that when the former spring water supply of Frankfort had to be supplemented about 20 years ago by underground water from the Forest, it was found that incrustations formed in new mains, and that from one through which not much water passed the water tasted strongly of iron. It was found on investigation that the water contained an unusually high proportion of carbonic acid, which was responsible for the corrosion of the mains. Various methods were then tried for getting over the trouble; the one finally used being a marble irrigation process. The author of the paper had come to three general conclusions on the subject—viz.: (1) The action of the oxygen in neutral water is local. It takes place only where the iron of the pipe has become exposed through the failure of the internal coating. It does not give rise to the formation of fungus-like growths, nor to constant clouding of the water passing through the distributing system. (2) Carbonic acid in the water, in the absence of oxygen, dissolves iron, but does not produce rust. The usual coating applied to the pipes by the makers—viz., tar-asphalt—for protective purposes is not sufficiently proof against free carbonic acid. (3) Carbonic acid and oxygen together cause both solution and rusting. The fungoid growths then appear; and a light flocculent deposit which is formed produces turbidity of the water in the distributing system whenever there is a small change in the rate of flow of the water.

Requirements in Regard to the Quality of Gas.

The next item in the proceedings was an address by Dr. H. Bunte, Professor at the Karlsruhe Technical College, on "Requirements in Regard to the Quality of Gas." After referring to the fact that in the early days of the gas industry there was no authoritative standard for the quality of gas, the author remarked that, even to the present day, Frankfort afforded a striking example of the lack of any definite requirements, for a very rich gas and a relatively poor coal gas were being supplied in competition one with the other. The requirements therefore must be extremely varied or undetermined. The quality of gas had generally, until quite recently, been judged only or mainly by its illuminating power when consumed in self-luminous flames. But the criterion of quality thus obtained was not trustworthy, as the

result of measurements of this illuminating power were affected by the variety of burner used, the gas pressure, the rate of consumption, and other conditions. Now, however, it has become of no value at all, because incandescent burners are almost exclusively in use. Lighting has through them become a mere branch of heating, for which, according to Dr. Bunte, the calorific value of the gas only is of importance. This conclusion had been arrived at as the result of investigations which had been carried out at the Chemical-Technical Institute at Karlsruhe. The old photometric examination of the gas had ceased to have the slightest significance, and must be displaced by determinations of the calorific power of the gas. This change had already been made in Berlin and a few other towns. In the view of the speaker, it would be reasonable to maintain at the present day a standard net calorific power of 5200 calories per cubic metre at 0° C. and 760 mm. (about 553 B.Th.U. per cubic foot at 60° Fahr. and 30 inches). He did not, however, attach very great importance to this precise figure being adopted, provided uniformity in the calorific power of the gas was maintained. This was of extreme importance at the present day, as many recent incandescent burners were highly sensitive to fluctuations in the quality of the gas. If this condition is observed, then neat coal gas, water gas, coke-oven gas, or mixtures of such gases, may quite properly be supplied. In regard to purity, the old requirements as to ammonia and sulphuretted hydrogen ought to continue in force. There was no necessity to fix a maximum for the proportion of carbonic oxide permitted in the gas, because wood gas, which had been introduced long ago, and had been extensively used, contained large quantities of carbonic oxide, and had not proved to be at all objectionable from the hygienic standpoint. Therefore the calorific value of gas afforded an absolute and the only necessary criterion of quality for all heating and lighting purposes. It had the advantage that it was definite and rested on a scientific basis. Calorific power determinations were also valuable as a check on the quality of the raw materials used in the manufacture of gas, and of the bye-products.

Dr. H. Strache, Professor at the University of Vienna, discussed the subject of Dr. Bunte's address at considerable length. He regarded as highly satisfactory the recognition that there was now no sense in judging the quality of gas by its illuminating power in a self-luminous flame. There were no instruments except the calorimeter available for measuring the quality of gas, so it was not unreasonable to resort to that. But the relation subsisting, according to Dr. Bunte, between the calorific power of gas and the illuminating power which it afforded in the incandescent burner, was only in evidence when the quantity of primary air which was theoretically the most favourable was admitted in the incandescent burner. The researches on the relation between calorific power and the intensity of lighting by incandescence, which had been made by M. Sainte-Claire Deville and by Moyes and Schmiedt, had been carried out with artificial air supply, and therefore the results were not directly applicable to the ordinary upturned or inverted gas-burners, but only to burners supplied with gas or air at high pressure. The latter researches had, moreover, shown the best results with gas of low calorific power. It cannot be upheld that with the present means of using gas for lighting the illuminating power obtainable in the incandescent burner is proportional to the calorific power of the gas, because whereas of two gases the richer needs the more air for its combustion, yet in the ordinary bunsen burner the poorer will obtain the most air, and will develop the higher illuminating efficiency per unit of heat used. It would at the present stage be very unwise on this account to fetter the gas industry by any prescription putting a minimum limit on the calorific power of the gas supplied. It is quite possible that development may run on the lines of using somewhat higher gas pressures, and by improvement of the bunsen burners used, securing therewith such a supply of air as is at present only obtained in high-pressure lighting burners. Carbonic acid in gas is injurious, not only on account of the reduction of calorific power which it causes, but still more on account of the reduction it effects in the temperature of the flame. Thus the illuminating power in the incandescent burner is reduced by the presence of carbonic acid in the gas to an extent greatly exceeding the reduction of calorific power. Dr. Strache said that he had some researches in hand dealing with this point, but they were not yet completed. Water gas is a cheap gas; but if used, care must be taken that variations in the calorific power are avoided. The most favourable method of adding water gas to coal gas was, according to Professor Strache, that described by Herr Terhaerst, of Nuremberg, in the "JOURNAL" [Vol. CV., p. 903]. It would be wrong for the gas industry to resolve to accept any limitation in regard to the calorific power of gas supplies. It should be quite free to deliver gas of the quality which it found to be best adapted to requirements.

Evolution of the Gas-Engine.

The technical proceedings on Thursday opened with a long paper by Herr Johannes Körtig, of Dusseldorf, on the "Evolution of the Gas-Engine." Pictures of a large number of different gas-engines were rapidly thrown one after another on the screen to illustrate the changes gradually made in construction, and many diagrams were also shown. It was claimed by the author that German inventors had been in the forefront in the development of the gas-engine. When in 1860 the first workable gas-engine was produced, it was freely concluded that the death knell of the steam-engine had been sounded. Though this conclusion

was, and still must remain, erroneous, the gas-engine and its kind had taken their place alongside the steam-engine and had found certain uses which were entirely reserved for them. Engines of the gas-engine type were indispensable for the submarine boat, the motor-car, and the flying machine. All sizes were at constant work, from the engine of many thousand horse power using blast-furnace gas to the very diminutive portable engine. It was worth comment that the later types of construction of the steam-turbine were being introduced into gas-engines.

Inverted and High-Pressure Lighting.

The next paper was by Herr Lebeis, of the German Welsbach Incandescent Gaslight Company, of Berlin, on "Advances in Inverted Gas Lighting and High-Pressure Gas Lighting." This paper was also elucidated by the throwing of a number of pictures of burners and burner parts on the screen. The present position of the art of illumination was due to Welsbach's great discovery. The efficiency of the lighting of an incandescent gas-burner was dependent very much on the addition to the gas before combustion of the proper proportion of air. After referring to the phenomena of combustion in the atmospheric burner and their bearing on the construction of proper burners for incandescent lighting, he went on to describe some modern types of burners. Recent inventions had, he said, facilitated the introduction of more air in the inverted burner, with the result that a great increase was shown in the intensity of the light and of the duty obtained. Considerably smaller burners were being introduced by the German Welsbach Company, which, owing to the greater intensity of the light, would prove more economical than former burners, and would quicken the competition with electric lighting. At prevailing prices for gas and current in Germany, electric lamps of the latest type would be three times as dear in use as the new gas-burners affording the same candle power.

The Supply of Gas to a Distance.

The next paper was by Herr Kuckuk, the Manager of the Heidelberg Gas-Works, on "The Supply of Gas to a Distance, and the Linking-up of a Number of Places in a Supply District of Large Area." The subject of the paper is a comparatively new development of gas supply, dating only from about six years ago. It does not, of course, refer to such instances of the long-distance transmission of gas as that from the Beckton station of the Gas-light and Coke Company to the city and west-end of London, but to the supply of outlying places or isolated suburbs from a central town gas-works. Something similar has been done for years past in the distribution of natural gas over wide areas and great distances in America, and in connection with the long-distance transmission of electrical energy to villages in Europe. The recent development in Europe, and in Germany in particular, of the supply of gas from a town gas-works to villages from 2 to 20 miles distant is somewhat analogous to the latter case. For the sake of economy, the mains must be of small diameter, and the gas has therefore to be passed into them at high pressure. From the Heidelberg Gas-Works, such high-pressure mains already run in four different directions—viz., to Ziegelhausen, 4 miles distant; Neuenheim, nearly $1\frac{1}{2}$ miles distant; Eppenheim, $2\frac{1}{4}$ miles distant; and Wieblingen, $2\frac{1}{2}$ miles distant. A similar main is now being laid down to Rohrbach, 2 miles away from the works. There is a governor station at the end point of each high-pressure main, and thence the gas passes into the local distributing system at ordinary pressure. Diagrams were exhibited of a large number of similar installations in connection with other town gas-works in Germany, the more unique or important of which have been described from time to time in the "JOURNAL." The pumping and governing plant in the majority of cases has been supplied by the Cologne Engineering Company, who have made a speciality of this branch of work. The first scheme of long-distance gas supply, in the present sense, was one for the Rheintal, where now 17 places, with an aggregate population of 39,370, are supplied from one central works. This system was constructed by the firm of Rothenbach and Co. In the year 1908, the consumption of gas amounted to about $37\frac{1}{2}$ million cubic feet. There are now throughout Germany 344 villages or localities supplied with gas from 102 central gas-works through high-pressure mains. Many of these installations are of quite recent date, and figures as to consumption are not available from others also; but it is known that 32 central works supply through high-pressure mains 102 local communities having an aggregate population of over 1,570,000. The consumption of gas in these communities amounts to about 672 million cubic feet per annum. These figures will afford an idea of the extent to which the system of high pressure is being adopted in Germany. From the point of view of the gas industry, it is advantageous in opening up an entirely new field of supply, and in bringing gas into active competition with electricity in yet another direction. Its advantages to the districts supplied in improving the amenities of life in such outlying places are too manifest to need particularizing.

Reports of Technical Committees.

The papers read at the meeting have now all been mentioned; but there were also the reports of the Technical Committees of the Association, which were presented by the Chairmen. Some of these reports are being reproduced in abstract translation in the "JOURNAL" to-day—*vide* p. 970.

General Business—Election of Officers, &c.

The business of the meeting also included the passing of the accounts, the election of officers, and the reception of the annual report of the Council, which report, translated in abstract, is given on another page to-day. The meeting elected Herr H. Prenger, the Manager of the Cologne Gas, Water, and Electricity undertakings, to be President in place of Mr. Körting, who, under the rules, was not again eligible for re-election. For next year's meeting Königsberg was chosen, but on the understanding that if it proved desirable the Council could decide upon Dantzig instead. Königsberg is distinguished technically for having the cheapest gas supply of any town in Germany. With the methods of manufacture adopted there, readers of the "JOURNAL" have been kept acquainted through the communications made from time to time by the active and highly original Manager of the gas-works, Herr Köbbert. There is no objection to the selection of Königsberg on the ground that the gas-works will not well repay inspection; but it is an extreme outpost of the German Empire, and fears are entertained that many members of the Association who habitually attend its annual meetings will find the journey too long and costly to be lightly undertaken. On some grounds it would prove a distinct gain to have a smaller number of persons attending the meeting than has been usual of late years. The numbers this year by the third day of the meeting had reached 1023, which is a trifle less than the total at some recent years' gatherings.

Visits.

The afternoons were devoted to visits to works, of which usually there were alternatives provided. Thus on the Tuesday afternoon, some members went to the engine works of the Pokorny and Wittekind Company, where turbine compressors and blowers, compressed air plant, &c., were to be seen in course of construction. After leaving these works, the party proceeded to the No. II. or Solmstrasse works in Frankfurt of the Imperial Continental Gas Association. There is here an installation of vertical retorts, erected by the skill of Mr. Drory, the Engineer, between two benches of inclined retorts—all being under the roof of what was in early days a combined horizontal retort-house and coal-store. The arrangement, which is original and perhaps unique, answers well, and has avoided expenditure on a new retort-house to meet the increase in the demand for gas. A second and, by a curious misunderstanding, the larger party went in two steamers up the River Maine to the gas-works of the adjacent town of Offenbach. Here also there is an installation of Bueb vertical retorts—viz., eight beds. These did not appear to be working so well as they should, and the coke (from English coal) seemed friable and poor. The works are elaborately equipped with conveying plant, the power for which is electrical and obtained from a new and extensive power house. A balloon ascent took place from the works in the course of the afternoon, and was watched with interest by those present. A plan of the works was handed to each visitor. A third party the same afternoon visited the Gutleutstrasse works of the Frankfurt Gas Company, and the central electricity station of the town. Yet a fourth party went to the city's underground water-works at Hattersheim. The evening was devoted to attending performances at one or other of two theatres—the Opera House being closed at the time—and, later, most of the members re-assembled by arrangement at three restaurants for supper.

On the Wednesday afternoon, one party visited the town water-works—the reservoir station and the plant for the removal of carbonic acid. A second group went to the collecting ground at Hinkelstein and the pumping-station. A third group inspected the site and buildings now nearing completion for the International Air-Ship Exhibition which is about to be held in Frankfurt, and subsequently visited the Scientific Institute, containing the rooms of the Physical Association, the Natural History Museum, and the Academy of Social and Commercial Science. This party perhaps were to be more especially congratulated on their choice, as the whole of the programme proved to be most instructive and entertaining. In the evening, the members met together for their evening meal in the restaurant of the Frankfurt Palm Garden.

For Thursday afternoon no special visits were arranged; but certain "sights" of the town were suggested as worthy, and, as a fact, unofficially, visits of small parties took place to various works. Early in the evening those attending the meeting sat down to a banquet in the large hall of the Zoological Gardens. Speeches were made by, among others, Mr. Lindley and Mr. L. Körting (the past Manager of the Hanover works of the Imperial Continental Gas Association), to the latter of whom was, according to custom, entrusted the toast of "The Ladies." The banquet was followed by the illumination on a large scale of the pretty gardens. After witnessing this, many of those present returned to the large hall for dancing, which continued vigorously until two o'clock in the morning.

On Friday afternoon, a special train conveyed the members to Homburg, whence electric tram cars took them to the Saalburg. Here the very complete and now restored walls, buildings, and wells of a Roman town were inspected with great interest. The descent was then made to Homburg, and an excellent evening meal was served in the Kurhaus. The grounds were subsequently illuminated, and Frankfurt was reached again by special train about midnight. Thus was brought to a close the successful jubilee meeting of the Association, which had been favoured with,

on the whole, good, if somewhat cool and at times unsettled, weather.

Report of the Council for the Past Year.

The report of the Council points out that the present meeting celebrates the jubilee of the Association, which held its first annual meeting in Frankfort-on-the-Maine in May, 1859. The Association may congratulate itself on the very satisfactory record of its growth and manifold activities during the first half-century of its existence. An album, giving a retrospect of its work, has been prepared for presentation to those participating in the present meeting. This album, which is embellished with excellent photogravure portraits of the men who have been instrumental in bringing the Association to its present high position, will be referred to elsewhere in the report of the proceedings of this year's meeting.

The Council express their deep regret at the death, on the 20th of August last, of Herr J. Nolte, the President of the Association for the years 1906-8. It will be remembered that the illness which ultimately proved fatal prevented this highly-gifted and genial Engineer occupying the presidential chair at last year's meeting of the Association in Berlin, and of welcoming in person the contingent of English gas men who visited Berlin by invitation of their German colleagues in connection with the meeting of the Institution of Gas Engineers. Much gratification is expressed in the report on the success of this visit.

Reference is next made to the stir created in the gas world in Germany by the proposal put forward last autumn for the imposition of a tax on gas and electricity, and the accessories for lighting therewith, in the Budget scheme of the Imperial Chancellor for this year. The Council of the Association convened a meeting at Eisenach on the 6th of August last, and organized opposition to the projected tax, in conjunction with other technical bodies, the interests of whose members were also prejudicially affected by the proposal. Statements of the objections, from the industrial and social standpoint, to the taxation of gas and electricity were published in the "Journal für Gasbeleuchtung," and circulated widely in pamphlet form. The scheme of taxation and the statements issued in opposition thereto were dealt with fully in a number of articles and reports in the "JOURNAL" at the time, and need not now be referred to in detail. Suffice to say that the Council report with much satisfaction that the scheme was rejected by a large majority when the section of the Finance Bill embodying it was brought up for first reading in the Reichstag. Hope is expressed that the requirements of the Exchequer may in future also be met in some other way than by the imposition of a charge on gas and electricity supplies, which are agencies of extreme importance in furthering industry in general. Unfortunately, uncertainty as to the future has been revived in one direction, the report continues, during the past few weeks by the projected tariff law of the Prussian Diet with regard to the imposition of a tax on automatic machines, which may or may not be taken to include prepayment gas-meters. It is probable, however, that it is not intended to bring the latter under the scheme [*vide* "JOURNAL," June 8, p. 628]. The projected Prussian water law, to which reference was made in the report of last year's meeting of the Association, has formed the occasion of several meetings of the Water-Works' Committee of the Association; and as a result the Council have presented a memorial to the Prussian Ministry of Agriculture, setting out the bearing of the measure on water supply from the point of view of those associated with water undertakings. Hope is expressed that effect will be given to the representations thus made.

The report next refers to two questions of an international character—viz., the proposed establishment of an international standard unit of light, and of standard gas threads for unions and pipes. The questions have repeatedly come before the Council, and have been given the fullest consideration. As to the standard of light, the Association, in agreement with the cognate body of German Electrical Engineers, pledged itself at the International Congress held at Geneva in 1891 to the adoption of the Hefner as the international unit. Having regard, the Council say, to the ready reproducibility and reliability of the Hefner, it has become widely disseminated in technical circles in Germany, and its relation to the standards of light in general use in other countries has been carefully established. Measurement made by scientific institutions in Germany, France, England, and America have demonstrated that the unit of the English Harcourt pentane-lamp, the American unit based thereon, and the tenth-part of the French Carcel are approximately identical in value. The American, English, and French representatives have, therefore, decided to make the agreement between these three units absolute, and to call the standard thus established the "international" unit of light. The Hefner unit differs from the other standards of light by about 10 per cent.; and as it, the Council say, "surpasses them in simplicity, reliability, and precision," the Council, after full deliberation with the Photometric Committee of the Association, other technical Associations, and the Reichsanstalt, decided not to give its assent to the aforesaid agreement between the other countries, and with a view to preventing misunderstandings to refrain from the use of the term "international unit of light." The Council recommend instead that further steps should be taken with a view to establishing, in conjunction with the physical and technical institutions of other civilized countries, a "really international" unit of light.

In regard to the unification of screw-threads, much preliminary work has been done since the subject was broached at the Inter-

national Gas Congress at Paris in 1900. There is a disposition to make the Sellers' threads (which are in common use in America) the standard; but the German Association of Gas and Water Engineers, recognizing that the matter is one of great importance outside the scope of its membership, has secured the collaboration of the German Association of Engineers. Owing to the absence abroad of the deputies appointed by the latter body, it has been impossible to arrive at a settlement so far as Germany is concerned in time for the conference that was summoned by the Société Technique du Gaz en France for the 8th inst. The Council, therefore, asked the Société to postpone coming to a final pronouncement until the German Association is able to co-operate with it therein.

In view of the celebration of the jubilee of the Association, the Council have deemed it appropriate to collect data as to the development of the gas industry in the last half-century. These data, for the provision of which by gas undertakings thanks are due, are to be presented at the meeting, and will be dealt with in another part of the report of the proceedings. Valuable material has similarly been collected, by means of replies to a series of questions, in regard to the storage of coal on gas-works. This has been put into shape by Herr Prenger, the Manager of the Cologne Gas-Works, and, as will be seen from another column, was presented to the meeting.

At the instance of the Council, a meeting of gas-works chemists took place at Carlsruhe on March 27 and 28. It was attended by forty representatives from all parts of Germany. The matter primarily discussed was the quality of gas which conformed to the present conditions of the supply and application of gas. The methods of testing coal, and other raw materials, and the working of gas-works plant were also exhaustively discussed. The proceedings proved most instructive; and a digest has been prepared for circulation among the gas undertakings that were represented at the meeting.

The reports of the Technical Committees of the Association and of work carried out at the Instructional and Experimental Gas-Works of the Association at Carlsruhe on German gas coals are dealt with separately. The work accomplished by the various Committees since their institution forms, however, the subject of memoirs in the jubilee album already referred to. The Council have had under consideration the revision of the methods adopted for fixing the place and date of the annual meetings of the Association, and the most suitable date for closing the financial year of the Association and of the Experimental Works. It submits recommendations on these points of internal administration to the meeting.

The statistics of gas supply collected by the Association, which now relate to 273 undertakings, show a considerable increase in the output of gas in the working year 1907 over the preceding year on both large and small works. The statistics are in future to be compiled, if practicable, on a more comprehensive basis.

The Association at the close of its past year comprised 891 members, 199 associates, and 2 honorary members—an increase of 36 in all classes over the figures for the preceding year. The eight District Associations, which are affiliated to the main body, have been active during the year; and brief reports of their proceedings are included in the report of the Council.

Reports of the Technical Committees.

I.—THE COMMITTEE ON PHOTOMETRY.

This report, which was presented to the meeting by Dr. Krüss, of Hamburg, opens by referring to the tests which have been made, in connection with the high-pressure main from Lubeck to Travemünde, on the effect of high-pressure transmission of gas to a distance on its illuminating and calorific powers. The tests have not yet been brought to a conclusion owing to official claims on the time of Herr Hase, the Manager of the Lubeck Gas-Works. The attempts to establish standard methods for the testing of the illuminating power of high-power gas-lamps have also been inconclusive, and existing methods must for the time being be followed. A proposal emanating from electrical engineers, to the effect that the word "lux" should be accepted generally in substitution for "metre-candle," has been agreed to by the Committee, notwithstanding that they believe that the latter term is preferable, and even now has many supporters among practical photometrists, such as Dr. L. Weber, Professor at Kiel.

The Council referred to this Committee a question brought before them by M. Godinet, the President of the Société Technique de l'Industrie du Gaz en France, at the instance of the American Gas Institute, as to the adoption of an international unit of light. The term "bougie internationale" or international candle was suggested; and it was to be derived from an approximation to the English spermaceti candle, the Carcel lamp, and the American "candle" based on electric glow-lamp standards. It would have a value of 1.11 Hefners. This Committee could not recommend the acceptance of the proposal, as the definition of a unit of three different descriptions was in itself objectionable, and not one of the three sources of light on which it rested was so certainly and simply reproducible as is the Hefner unit. The Committee take the view that, however desirable the establishment of an international unit of light may be, it must for the time being be based, so far as German technical work is concerned, on the Hefner. The Committee, therefore, are in this matter in complete agreement with the decision of a meeting called by the Commission of Units and Standard Measures, which was attended

by representatives of the Imperial Physical-Technical Institute ("Reichsanstalt"), the electrical industry, and the gas industry.

II.—THE HEATING COMMITTEE.

The report of this Committee was presented to the meeting by Herr i. V. Eisele, of Cassel. It states that the most important matter dealt with in the course of the year was the formation and promulgation of a new set of rules for fitting work. At last year's general meeting at Berlin, Dr. Schilling, of Munich, who was then Chairman of the Committee, proposed the adoption of three formulæ as a basis and programme for the preparation of rules. Although it was expressly provided therein that the rules should be carried out only by properly trained gas men and not by police authorities, a proposal that the local police should have powers in regard to the certification of the workmen was strenuously opposed by Herr Kordt, of Düsseldorf, Herr Blessinger, of Elberfeld, and Herr Lempelius, of Barmen. Under the circumstances, the meeting decided that merely rules for fitting work should be formulated, without provision for local police regulations. At the next meeting of the Committee, Dr. Schilling's proposals were discussed; and it was decided to divide the rules into two sets, of which the first should be purely technical, and the second administrative. The settlement of the latter could, it was thought, be held over. When, however, the preparation of the rules was put in hand, and a large number of existing German and Austrian prescriptions were collated, it was found that the proposed division would be impracticable. Instead of a restriction of the scope of the rules, considerable extension was decided upon; and, under the heading "The Supply and Application of Illuminating Gas," they comprised everything that seemed requisite or desirable for controlling the relations between gas-works, fitters, and consumers. The special rules relating to fitting work then formed only one—viz., the third—section of the whole.

The scheme comprised the following sections:

- I.—*General*, forming a concise introduction for instructing the public about gas manufacture, distribution, and supply.
- II.—*Gas Ordinances*, for regulating the relations of gas-works to their consumers by means of approved rules and prescriptions to be followed in local sets of regulations (which cannot well be made quite uniform).
- III.—*Rules for Fitting Work*, to regulate the relations of gas-works to fitters.
- IV.—*Instructions as to the Use of Gas*, which are intended, either with or without Section I., to be handed to the consumer by way of advice, either when his agreement is signed or when his installation is finished and ready for use.

The question of the organization for carrying out Section III. was left open in deference to the diametrically opposed views of many members, though the Committee have drawn up a simple, direct, and workable scheme for adoption. But in order to avoid the police control, which rightly or wrongly is so much disliked, the Committee have introduced expedients which they now learn cannot, from the legal standpoint, be made to answer, and must therefore be modified. It seems clear that penalties must be provided for infractions of the rules; and it will be difficult to make these enforceable unless they are enacted by the police. The proposals of the Committee must be regarded merely as affording a basis for discussion with the German Union of Incorporated Fitters and others, with a view to formulating something satisfactory to all concerned.

The Chairman of the Committee—viz., Dr. Schilling, of Munich—has unfortunately had to resign owing to the great claims of official work on his time. Other members of the Committee were for similar reasons unable to assume the chairmanship; but with a view to getting the Committee's proposals ready for the meeting, Herr i. V. Eisele, of Cassel, who signs the report, undertook the work temporarily.

A number of matters of smaller importance have been dealt with by the Committee, and it has been decided to reprint a brochure on the "Use of Gas Coke for Central Heating Installations."

The Committee asked for, and received, 2000 marks (about £100) for the continuation of their work during the ensuing year.

Midland Junior Association to Visit Beckton.—It may be remembered that when the Junior Associations visited the Franco-British Exhibition last year, great disappointment was felt at the inability of the members of the Midland Junior Association to be present in time to hear Mr. H. E. Jones's address; and the President of the London and Southern District Junior Association (Mr. W. J. Liberty) said he would endeavour to arrange a day for them in London in 1909. The proposal was accepted, with Beckton as the objective. By the kindness of Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, this has been made possible; and next Saturday the members of the Midland Junior Association, to the number of about 50, will arrive at Paddington at 10.30, and be met by the President and officers of the Southern Junior Association. They will then motor direct to Beckton, where the Council of the latter Association will await them, and, under the direction of Mr. Thomas Goulden, the Chief Engineer, will inspect the works. Subsequently, the joint party will return to Central London, to be shown over some of the distribution subways by Mr. Liberty. Tea together will bring the official portion of the day's programme to a close.

GERMAN ASSOCIATION—ANNUAL MEETING.

Inaugural Address of Mr. E. Korting, the President.

Gentlemen,—You expect to-day from your President a comprehensive review giving a short history of the gas industry for the last fifty years. This is a difficult task. As a young man I have studied history extensively and with pleasure, and I know what exhaustive searches and what a large number of independent proofs are requisite before the historian is in a position to take up his work to some extent objectively. I am no longer, however, an independent *savant*, but a much-worried business man; and I have also in the past year had to spend more of my spare hours than I cared for on the spectre of the gas-tax. With the best will in the world, therefore, I cannot possibly to-day submit to you a carefully prepared scientific thesis. You must be content—for good or evil—with the subjective impressions and views of one technical man who in particular was born and brought up on a gas-works, and has been active in the gas industry for twenty-eight years.

We are well agreed that in the course of the last fifty years great revolutions have taken place in the gas industry. What they comprise and to what causes they are, in my opinion, to be traced, I will endeavour to place shortly before you. I distinguish in the gas industry two sharply-defined periods, which I will designate as the old and the new. They are sharply separated, not according to date, because the new period began sometimes earlier, sometimes later, at different gas-works. Neither are they defined according to the people, as many of us have experienced both periods. They are distinguished by their intellectual contents and methods of working, and by their aims and results. It is difficult to form a picture of the old period as it was then seen, as it already lies tolerably far behind us. But we must endeavour to do so for our comparison.

The key to the comprehension of the good old time is afforded by a pleasantry which passed from mouth to mouth in Vienna twenty years ago. The organization of gas engineers of Austria-Hungary was known there as "The Gas Cobblers' Association." This witticism hits the nail on the head. The gas industry of the good old time was a manual one. The ingenious Englishman who at the beginning of the previous century created gas lighting had discovered everything of importance for the succeeding series of decades. Young gas engineers learnt as apprentices of the master the manipulation and experiences, to be improved upon and enlarged later by fresh ones which, however, were not considerably raised above the level of the old. Wholly in the spirit of this time comes the following pretty little story, which probably is not generally known. A large German town built a gas-works for itself. The new plant was started and worked quite well; but after four weeks the efficiency of the retort-settings gradually diminished from day to day. Not knowing what to do, they went finally to General Manager Oechelhaeuser for help. He said to them, "Ah! gas manufacture is an art which must be learnt. I can only advise you to lease your works as quickly as possible to my Company." This was done; and on the same day the retorts were scurfed and yielded as much gas as before.

Great gas-works did not exist generally throughout Germany in the year 1858. The Municipal Gas-Works at Berlin fifty years ago had only a total annual make of about 390 million cubic feet. In the sixties, a fairly small room served for the whole technical and business staff of officers of the Hanover Gas-Works; and things went on so easily there that I commonly did my school-work in the office. In particular, there were no engines in gas-works. The coal was mostly shifted by wheelbarrows. In the retort-house, the settings were of six and seven retorts with direct firing. The retorts were charged with shovels either by two men—one on the right and one on the left of the stage—or by one man with an iron barrow. The coke was drawn into barrows and immediately tipped out in front of the house. Then men came with hammers and broke it small. Great technical questions worried the gas manager but little at that time, though he may often have suffered sufficient racking of the brains owing to the faulty development of the technical methods he employed. But he had no time for this, as he had everything to do himself. He could not get much assistance from drawings. One of my first reminiscences is going with my father to the Hanover foundry. He there drew with chalk for the foreman the castings which he desired. That tallies exactly with a well-known expression of the great English gas engineer, the late Sir George Livesey—viz., "I do not believe in drawings. I prefer a piece of chalk and a sheet of iron." It may be seen from the drawings of that date how little the eye had then been trained technically. All objects were shown shaded, as thereby the impression of substantialness was more easily conveyed. Also there was no time to make drawings of all the connections, &c., on the works, and to use all the well-conceived safety arrangements which are now customary. It will astound many of the present day to know that at our Berlin works the lutes of the purifiers were warmed in winter with naked gas-flames.

There were on the whole more accidents and interruptions of working than now; and these were always a heavy burden on the manager. I recall vividly a speech for the toast of "The Ladies" which my father made about thirty years ago at a meeting of the Association. Every moment a workman rushed in with a fresh

report of a calamity. "Sir, the relief purifier has been blown up;" "Sir, we have only half-a-foot of gas left;" "Sir, the main is full of naphthalene. We can get no gas into the town," &c., &c. The only thing which could make the unfortunate gas manager put up with his existence was the true love of his spouse. If this speech should be once more unearthed in later centuries, a professor will certainly conclude from it that the gas engineers of the Nineteenth Century must have been much in the same position as the defenders of Port Arthur in its last stage.

On the other hand, they were—owing to the simplicity of the work—in a position at times to relegate a great portion of their duties to an assistant or foreman. A well-known Belgian gas engineer was a celebrated landscape painter. He put his head once a day out of the studio window and said, "Tommy, is all in order?" After the obligatory "Yes, sir," had been given, he had done his duty for the day. In any case the gas engineer of years ago frequently found ways and means of interesting himself in things of general interest and ideals. The old Privy-Councillor Oechelhaeuser was a student of Shakespeare and a politician. Dr. Schilling was an eminent *litterateur*. My father introduced into Hanover gymnastics for scholars, cultivated portrait painting, founded and conducted a Gynmastic Club, was a Guardian, a National Associate, Freemason, and a prominent member of the Art Union. Mr. Edward Drory was a photographer, boat-builder, gardener, and bee-keeper. The foregoing men were, as is well known, all excellent technical gas men; and their personal value was enhanced by their many-sidedness, and thereby doubly fitted for their position and their industry. A few of their colleagues, however, failed to take a sufficiently earnest view of their calling. One old manager was repeatedly told by his Board that he had too many workmen; and he then made the following classic statement: "First they complain that the stokers' wages are too heavy, and I then transfer the men to coal. Then they are annoyed at the high coal wages, so then I book the men to coke. And now they begin on the high coke wages. I will make the wages low on any account which the gentlemen desire, only not on all at once, as then I should have nowhere to book the men." In another gas-works there was introduced an extremely neat book on the cost of all new buildings. The manager, however, never wished to enter in it anything to show that an estimate had been exceeded. He would therefore use the surplus on one piece of construction to cover the deficiencies on another, with the result that finally the whole figures were false and of no use. Naturally these statements are interesting because they stand in complete opposition to the methods dictated by the hard necessity at the present day of giving an exact account of every capital expenditure, and of throwing light on the working (even to the smallest detail) by book-keeping. In general, I think that years ago the number of characteristic leaders and considerable men in our industry was greater than at present, whereas now we have available better technical training and far more complete technical assistance.

To the speaker, a typical representative of the good old time was Herr L. G. Drory, the predecessor at Berlin of his brother Mr. E. Drory, who died a few years ago, and for a long time first technical official of my Association. His name survives in the well-known automatic tar overflow for hydraulic mains. Apart from this, he is little known to the public. Herr L. G. Drory was, however, a man of strong independence of character, having a great sense of justice and an iron faithfulness to duty. His retort-house working was a model for that date. He had from the first recognized that with direct-fired retorts only lightly-built settings produce good carbonizing results; and in his settings he allowed only three half-brick thick columns. The retorts worked only for 200 to 300 days under fire. On the other hand, a setting of seven retorts was built ready for use in two days. Masons who could not do this were sent away without mercy.

From English coal, Herr G. L. Drory 30 to 40 years ago produced 8120 cubic feet of gas per day and 10,765 feet per ton, and was therewith far in advance of his time. He was also celebrated for the stern discipline which he maintained over his numerous workmen. He loved to sit in the retort-house of an evening, with a glass of ale and a cigar, and watch the men at work. Frequently he drove away from the works ostensibly in his carriage, and the next moment he returned on foot by a back door. Woe to the workman whom he then found idling—he was immediately dismissed. The workmen called their chief in consequence the "Hunter;" but his colleagues spoke of him as the best Superintendent the Company had. The overseer's position had not then been much developed. A former chief of mine made retort-house superintendents of stokers who had broken down. They obtained less wages than the men under them, with the result that they only idled. It was reserved for the new period to undertake the technical instruction of young, intelligent workmen, to strengthen their sense of responsibility, and to allow them to rise to better paid official positions. The post of retort-house overseer was thus inaugurated. Without it, we should scarcely be able to-day to work our highly-developed settings. This by the way. A third fundamental principle of Herr L. G. Drory was far-reaching economy. An old installation was never replaced by a new one on the gas-works, but additions were always made wherever there was room for them. [In illustration of this, there was given in the address a reproduction of an old plastic like works' plan, made out of wood and metal.]

(To be continued.)

FACTORS IN THE NET COST OF GAS.

By M. PARSY.

[A Paper read before the Société Technique du Gaz.]

The author endeavours to reduce the factors concerned in the cost of manufacturing coal gas to a series of formulæ—a method which is recommended to those who are apt to disregard the complex nature of the problem.

He first seeks to find a formula based only on the price of the coal and the yield obtained from it. As a basis for these calculations, it is assumed that the quantity of coke obtained from one "tonne" of good gas-coal is 700 kilos., and that of this quantity 200 kilos. are employed in heating the furnaces or lost in the course of manufacture—leaving a net quantity of 500 kilos. available for sale. Calling:

H, the cost of one tonne of coal.

C, the return from the sale of coke derived from one tonne of coal.

R, the yield of gas in cubic metres per tonne of coal.

P, the net cost of gas per cubic metre, and then leaving out for the moment the other factors in the case,

$$P = \frac{H - C}{R}$$

From this formula it is seen that for each value of $H - C$ which is greater than 0, there is reason to increase the value of R in order to reduce that of P . If, on the other hand, $H - C$ becomes equal to 0, R likewise becomes equal to 0. But for $H - C$ to equal 0, C must equal H —that is to say, the tonne of coke will have a value double that of the tonne of coal. Notwithstanding that this condition will never be fulfilled, there is reason for increasing R (the yield of gas), since every quantity of coke produced, without a corresponding yield, represents superfluous purchase of coal.

An example will make this argument clearer: Assuming that the price of the gas coal is 20 frs. per tonne, and that of the coke sold, 36 frs. per tonne, for a daily make of 3000 cubic metres—

1. With a yield of 300 cubic metres per tonne, we have

Cost	10 tonnes coal at 20 frs.,	200 frs.
Return	5 " coke at 36 "	180 "

Difference . . . 20 frs.

2. With a yield of 250 cubic metres per tonne, we have

Cost	12 tonnes coal at 20 frs.,	240 frs.
Return	6 " coke at 36 "	216 "

Difference . . . 24 frs.

That is a loss of 4 frs. in the second case, representing the purchase of 2 tonnes of coal at a cost of 40 frs., in order to produce 1 tonne of coke sold for 36 frs.

It is not often that coke will fetch double the price of coal, since the fact of the two combustibles being offered for similar purposes keeps their prices dependent on each other. For this reason no regard need be paid to the fear which is often expressed, that the price of coke will drop as the result of the development of the gas industry. The price of coal will serve to maintain a proper equilibrium of the net cost.

The tenour of this reasoning will be better understood by applying it to three specific cases, assuming, for the sake of simplicity, that the yield of gas in each case is 300 cubic metres per tonne of coal.

1. Works A in Belgium is close to the coal mine, and makes more than 4 million cubic metres per annum. Its coal costs 17 frs. per tonne and the coke fetches 17 frs., since almost all of it is exported. The sale of gas is 160 cubic metres per inhabitant. From the formula, therefore, the net cost per cubic metre is

$$\frac{17 - 17}{300} = 0.028$$

2. Works B is to the north of Paris, where coal costs 22 frs. per tonne and the coke sells for 24 frs. In this case, the net cost per cubic metre is

$$\frac{22 - 12}{300} = 0.033$$

3. In the case of the Works C, which is situated in the south, 30 frs. is paid for the coal, and the coke commands the exceptional price of 35 frs. per tonne. The net cost is therefore

$$\frac{30 - 17.50}{300} = 0.041$$

It is thus seen that the Works A, in spite of the low price of its coke, is at an advantage, and that it will retain this advantage as compared with Works C so long as the price which it gets for its coke is above 9 frs.; since

$$\frac{17 - 4.50}{300} = 0.041.$$

In short, it is the price of the coal which actually regulates the net cost of the gas.

As regards the effect of the tar and ammonia on the net cost of

manufacture, the return obtained from these latter must also be subtracted from the cost of the coal, whence the formula becomes

$$\frac{H - (C + g + n)}{R}$$

where *g* and *n* represent the return obtained for tar and ammonia respectively per tonne of coal.

Assuming that *g* represents 50 kilos. of tar at 20 frs. per 1000 kilos. (say, 1 fr.) and that *n* amounts to the same sum, the formula gives:

$$\frac{12 - (12 + 1 + 1)}{300} = 0.0266$$

These figures go to show that tar and ammonia will not do much towards reducing the cost of manufacture.

Respecting the effect of labour in increasing the cost of manufacture compared with the incomplete result arrived at above, the sum, *s*, expended per ton of coal requires to be added to the cost, *H*, of the coal. The formula then is:

$$\frac{(H + s) - (C + g + n)}{R}$$

In practice, *s* may vary from 1 fr. to 3.5 frs., according to the labour-saving appliances possessed by the works, which latter involve another item of cost—namely, that of motive power (*f*), an average figure for which cannot be given. Three other further factors adding to the cost require to be considered—namely, the interest *a* representing the capitalization of the distillation plant, *i* representing other capital, and also the cost (*e*) of upkeep of plant, in each case reduced to tonnes of coal distilled per 24 hours. The formula then takes the form—

$$\frac{H + (s + f) + (a + i + e) - (C + g + n)}{R}$$

It may be said that the values *a* + *i* + *e* together represent one-tenth of the first cost of the distillation plant. This figure will, however, be much below the truth; and the cost may be ascertained approximately in typical cases as follows.

1. Ordinary horizontal retorts cost 2000 frs. per tonne of coal distilled per 24 hours. Thus *a* + *i* + *e* = 0.54.
2. Inclined retorts or horizontal retorts with machine charging cost 4000 frs. per tonne of coal distilled. Therefore, *a* + *i* + *e* = 1.09.
3. Vertical retorts and machine charging cost 6500 frs. per tonne of coal distilled. Here *a* + *i* + *e* = 1.78.
4. Inclined retorts cost 10,000 frs. per tonne of coal distilled. So, *a* + *i* + *e* = 2.73.

Lastly, it must be pointed out that the figures given above require to be increased by at least 50 per cent. for the reason that it is indispensable to keep reserve plant as a provision against breakdowns, repairs, &c.

In regard to the item for labour (1 fr. to 3.5 frs.), it is curious to note that, in order to reduce it, there is an instance of an expense of 2.73 frs. per tonne of coal distilled per day incurred for a "director of works." Progress in this respect would appear to be in following a mean course. It is a question of reducing the cost of labour while at the same time increasing the charges for capitalization and upkeep. There may be reasons for this latter course, arising from difficulties with workmen; but the huge capitalization of gas-works such as exists in the case of some municipal undertakings in Germany, is not at the disposal of every concern, and therefore means must be adopted suitable to the financial conditions.

COKE QUENCHING AT MARSEILLES GAS-WORKS.

By M. TEULON.

[A Paper read before the Société Technique du Gaz.]

The difficulty of finding a satisfactory solution of the problem of quickly, conveniently, and effectively quenching hot coke as it comes from retorts served by modern machines, has given rise to a great variety of arrangements and methods. Those adopted at the Marseilles Gas-Works were described in a short paper by M. Teulon, which was read at last week's annual meeting of the Société Technique de l'Industrie du Gaz.

The carbonizing plant at the Marseilles works comprises:

Two benches of 12 retorts,	3 metres	(9 ft. 10 in.) long	Benches
" " " " "	5'20 "	(17 ft. 1 in.) "	Nos. 1-4.
" " " " "	6 "	(19 ft. 8 in.) "	Nos. 5 & 6

For some months past, benches 1 to 4 have been worked by Sautter-Harlé machines, while those numbered 5 and 6 have been operated by De Brouwer machines. Fig. 1 shows the plan of the arrangements adopted for dealing with the coke from benches 1 to 4, which have their producers on the ground floor and the retorts on a stage floor.

Under the charging stage are three pumps, each capable of delivering about 70 litres (15.4 gallons) per second. Two of these pumps suffice for the working, while the third one is kept in reserve. At the back of each bench is placed a channel of L shape, about 60 centimetres (nearly 24 inches) wide, which receives the water from the pumps. The slope given to this channel is about 1.6 per cent., which gives a speed of 2 to 2½ metres (say, 6 ft. 6 in. to 8 feet) per second to the water.

As the coke falls into this, it is quenched and carried along to an inclined screen A. The water passes through this, and returns through a filtering tank to the suction side of the pumps; while the coke passing over the screen is received into a tip-wagon.

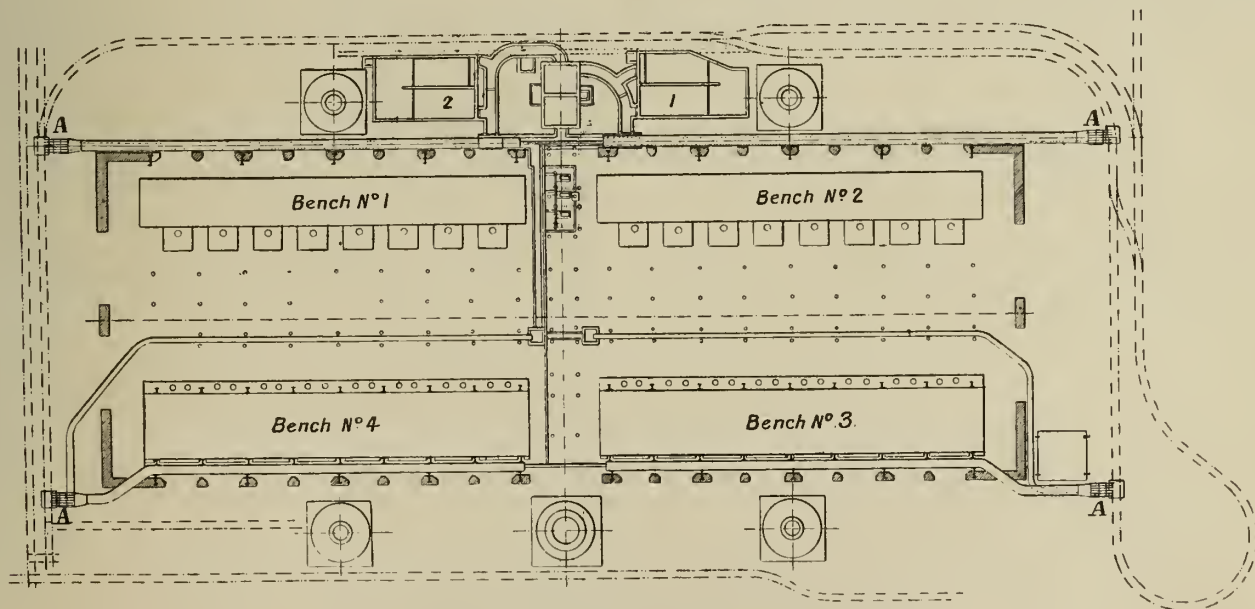


Fig. 1.—Plan of the Coke-Quenching Arrangements at Marseilles.

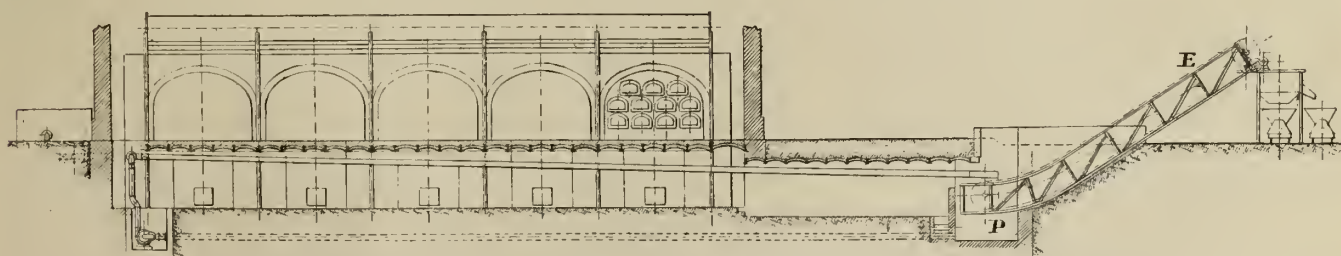


Fig. 2.—Elevation of the Coke-Quenching Channel for the Retort-Benches Nos. 5 and 6 at Marseilles.

One of the greatest difficulties met with was due to the necessity of getting rid of the dust suspended in the water. To effect this, two filtering tanks, indicated on the plan by the figs. 1 and 2, provided with baffle-plates, were introduced. One of these is always in use, while the other is being cleaned out. Each is of such a capacity as to be able to hold the dust produced by about a week's working.

The quenching of the coke from benches Nos. 5 and 6 is done on the same principle—only, as shown in fig. 2, the channel is here under the ground level, and an elevator E receives the coke and throws it into a tip-waggon. The dust which is deposited in the sump P is cleared out by a chain of buckets, which are continually dredging it.

The advantages of these methods of coke quenching, which have been for some time in use at Marseilles, are given as follows:—

1. The coke obtained is very grey, very clean, and the amount of water contained in it is very slight.
2. The upkeep of the whole installation is very small.
3. The conveying of the coke by means of the current of water at a speed of about 2·5 metres (say, 8 feet) per second, allows of the almost immediate carrying away of the large mass of coke drawn from the retorts by the machines in a short space of time.
4. The channel can, without inconvenience, be curved, as seen in fig. 1, to a fairly small radius, which may be advantageous in certain cases.

CONCRETE AND MASONRY DAMS.

At a recent Meeting of the Institution of Civil Engineers, Mr. L. A. B. WADE, M.Inst.C.E., read a paper on "Concrete and Masonry Dam Construction in New South Wales." The following is an abstract of the communication.

In thirteen cases concrete walls curved in plan have been built for the storage of town water supplies; the resistance of the material in the wall and the sides of the valley being relied upon for stability, and complex questions of stresses being disregarded. Nine of the thirteen walls are curved for the whole of their length; of the rest, the Cootamandra has two tangents of gravity cross section, and the Tamworth, Parkes, and Woolongong walls each have one tangent of gravity cross section. In all cases, they abut against the rock sides of the gorges to their top levels. The gravity tangent at Parkes is constructed on a flat bench of rock at a level about 13 feet below the top of the wall; the thrust of the arched length being taken by the gravity length, assisted by an anchorage of steel rails placed vertically, and connecting the wall to the rock foundation.

In two cases pressures of 24 and 25 tons per square foot have been allowed on hard granite; but later these limits have been reduced to 20 tons. Hard slate, sandstones, conglomerates, and ironstones are limited to 15 or 12 tons per square foot, according to quality, and the softer sandstones to 10 tons. These limiting pressures apply to the walls rather than to the abutments, as the end of the wall can be splayed, thus reducing the pressure per unit area in the abutments. The walls in all cases are of portland cement concrete, with plums of greater resistance than the concrete, which is therefore the measure of the crushing resistance of the wall. The proportions of the concrete in all cases are 11½ cubic feet of sand, 10 cubic feet of shivers from ¾-inch to 1½-inch gauge, and 13 cubic feet of metal of 1½-inch gauge. The results of tests of concrete gave a mean crushing resistance of 50 tons per square foot when mixed with soft sandstone, and of 100 tons with sound igneous rocks. It has been assumed that concrete in bulk offers a crushing resistance one-and-a-half times greater than that of unsupported 6-inch cubes. The maximum pressures allowed on different materials give a factor of safety of 5 on results from unsupported 6-inch cubes, which, if the assumption of increased strength be correct, will be 7½ for concrete in bulk.

The section of a wall of 500 feet radius to resist 20 tons per square foot and of a wall of 270 feet radius to resist 10 tons per square foot closely approximates to that of a gravity wall for a similar depth of water. The author is of opinion that gravity walls should be made straight; a curve having no advantage as regards strength or adaptability to meet contraction sufficient to justify the increased quantities. The economical limit justifying substitution of curved for gravity walls is with radii somewhat less than the foregoing; bearing in mind the greater length of a curved as compared with a straight wall. Thus the use of curved walls is restricted to comparatively narrow valleys and gorges.

Igneous rocks as foundations proved the most impervious media against leakage. In the case of granite, all soft seams were followed up. In sandstones and conglomerates, the weaknesses were found along horizontal beds; and in cases leakage occurred under the flanks of walls—water entering some distance up-stream, and the exit being some distance down-stream. In two instances, short drives were carried under the flank of a wall to cut out weak places, being filled again with concrete, and grouted through drill-holes under pressure. The worst leakages have been experienced in shale and slate.

The proportions of material used in concrete are sufficient for the required resistance at a minimum cost, but not sufficiently impervious for a thin wall. In earlier walls a 6-inch facing of special concrete was placed on the up-stream side, for water-

tightness. Subsequently, it was found that by working the sloppy concrete *in situ* against the mould boards, a skin was formed on the surface, and a practically impervious wall was thus obtained. When, however, surplus water dried out, vertical cracks developed. Further experience showed that longitudinal contraction was less in a wall of concrete placed *in situ* fairly dry and well rammed, and that cracks either do not occur, or occur only to a much less extent. But a skin could not be obtained, and thin walls leaked excessively. It was found that two coats of neat cement applied as the timber was stripped, gave good results and did not scale, owing to the absence of frosts.

Cracks have appeared more or less in the Parkes, Cootamandra, Tamworth, Wellington, and Mudgee dams; but no failures have resulted. No cracks have appeared in any of the other dams. The cracks in the Mudgee dam are more open than are those in dams constructed of dry concrete. Vertical cracks in all cases twist in their course, inwardly as well as vertically, and open and close with change of temperature. They almost disappear with high temperature and low water level and cold temperature and high water level, and open most with cold temperature and low water level. They occur, as a rule, at quick changes of foundation level.

The author is of opinion that such vertical cracks, as they occur naturally, do not endanger the stability of the walls; but as they are likely to develop, it is better to provide parting joints to allow of the cracks forming on radial lines, spaced at intervals, than to allow them to occur naturally. Iron built horizontally into the top levels of walls has been suggested to prevent vertical cracks; but the author thinks this would lead to horizontal cracks. Iron might be built in if the parting joints were provided, and if it did not cross the joints.

In the opinion of the author, the experience gained of these structures since the first was completed in 1895 shows that curved walls, relying for stability on their resistance to crushing, from a safe and economical means of storing large bodies of water.

The author furnished the following particulars in regard to the Cataract dam for the Sydney water supply, to the subject of the construction of which the remainder of the paper was devoted. The dam is straight in plan, and will retain 21,500 million gallons of water, covering an area of 2400 acres. The dimensions are—

Length of wall	feet	811
Height above river bed		157
Depth below river bed		35
Total height—base to top		192
Top width		16½
Bottom width		158
Maximum depth of water stored		150
Length of spillway weir		715

The highest estimated flood level is 4 ft. 6 in. over the spillway weir. The material of which the dam is constructed is local Hawkesbury sandstone; and its maximum crushing stress was limited to 8½ tons per square foot. A system of 6-inch rectangular conduits filled with broken stone, parallel to, and about 6 feet back from, the up-stream face, was constructed to drain the interior of the wall; and these conduits were again drawn into 6-inch earthenware pipes, laid at right angles to the wall, with exits on the down-stream face. The sandstone, from experiments, gave a crushing strength of 276·3 tons per square foot on 12-inch cubes, unsupported. Tests on concrete at 90 days gave an average of 113·5 tons, and mortar for hearting about 102 tons, per square foot.

Russian Sulphate of Ammonia.

According to the "Chemical Trade Journal," a difficulty has arisen in connection with the production of ammonia in South Russia. As a bye-product of the production of coke, amounting to about 0·3 per cent. of the coal used in the operation, it was sent almost entirely in the form of water solution to the South Russian Soda-Works. But as many coal concerns have begun to capture the ammonia produced by coking, the quantity won is far in excess of the requirements of the South Russian Soda and Chemical Works. A market must therefore be found for it. Otherwise the Donetz coal industry will be severely hampered in its change over to the coking process with the winning of the bye-products; and on this to a certain degree depends the development of the briquette-producing industry. The only way out appears to be the production of sulphate of ammonia with the ammoniacal water obtained by coking. It is no use relying on the poorly developed Russian chemical works to use up the sulphate from the Donetz basin. These took only 100,000 poods in 1903; and although the demand has increased during the past five years, it has been far inferior to the productive capacity of the works in the Donetz basin alone. In 1908, 224,000,000 poods of coal were used in the production of 160,000,000 poods of coke, the possible yield of sulphate of ammonia from which is 672,000 poods. By adding the product from the gas-works, we get a total of 700,000 poods; so that, by assuming the demand from the chemical works to have doubled in the past five years—i.e., risen to 200,000 poods—we have to dispose of a balance of 500,000 poods. Obviously, it must be sold to agriculturists; and as a matter of fact a demand has been created in the North-Western and South-Western districts of Russia, where it is said the soil finds sulphate more suitable than Chile saltpetre. The question now is simply one of price; and active steps are being taken to have the railway tariffs changed in favour of the Donetz product.

THE USE OF TAR AS A FUEL IN THE DISTILLATION OF COAL.

Three papers on this subject were communicated to the recent congress of the Société Technique du Gaz. That of M. Echinard deals with the general principles on which tar may be used; M. Ménard describes a form of direct-combustion furnace suitable for the heating of a setting of six retorts; and M. Hovine records the satisfactory results obtained with a regenerative type of furnace, in which tar or solid fuel may be employed with as frequent alternation as is required. The following are abstract translations of the three papers.

M. Echinard on Heating by Tar.

M. Echinard emphasizes the necessity of paying attention to the special conditions under which tar must be used for heating purposes. These are: The supply of the tar in such a manner that the quantity may be kept uniform or readily modified; the intimate mixture of the tar and air used for combustion; the preservation of the brickwork in the furnace.

The most serious obstacle to the uniform delivery of the tar is the suspended impurity in it. The use of a steam-heated coil will get over the difficulty of the viscosity of the tar; but, on account of the small particles of coke, dust, &c., in the fluid fuel, irregularities very easily arise. The tar should always be drawn from the upper part of the cistern, the lower portion of which is provided with an outlet of good size, in order to permit of the less pure residues being drawn off. This precaution, however, is not enough; and it is always advisable to filter the tar, either with an apparatus such as the Drory or (more simply) with an ordinary large-mesh filter. The less water in the tar, the more suitable for use as a fuel.

As regards the different methods of delivery, the means available include a cock, a calibrated delivery tube, and an aperture in a thin plate. Delivery by displacement by water and by air or liquid pressure may also be employed.

Discussing first the first class of methods, the author considers that delivery through a hole in a thin plate is much to be preferred to that with a cock, the barrel of which is constantly getting wholly or partly choked. The only use which is generally made of a cock is to entirely cut off the supply of the tar. A delivery apparatus in which the tar issues from a hole in a thin plate is alternative with an apparatus like that of Letreust (described at the Congress of 1883) which is the most perfect type. Another description of regulating apparatus is that shown in fig. 1. The delivery tube B is provided with a cock; and a tube A is fitted into B. At its upper end, it is provided with slots and covered with a cap C, to which is attached a rod T, to be worked by hand and allowing of the slots being placed so as to give the quantity of tar required. In case of any obstruction, all that is necessary is to raise the cap C slightly, and the tar which escapes drives the obstruction forward.

The principle of regulating the supply of tar by the displacement of water consists in driving the tar contained in a receptacle by means of water entering a vessel placed within the first. The cost of a separate internal vessel may be avoided by partitioning off the cistern holding the tar; but this plan has the drawback that, unless proper attention is given to the process, water will be transmitted to the furnace as soon as all the tar has been expelled. For convenience in working, it is necessary to have a tar reservoir to each furnace and one to spare.

In this method, the weight of the water displaces the tar; the water being itself regulated, with great accuracy, by a cock or an aperture in a thin plate. Theoretically, if the water-supply remains constant, the delivery of the tar should also be constant; but in practice, unfortunately, the tar does not behave as a true fluid even when heated to 50°, 60°, or even 70° C. (from 122° to 158° Fahr.). It tends to stop whenever it encounters a rough surface—suddenly flowing again when a certain quantity has accumulated. A series of measurements by M. Kuentz shows plainly the irregularities in the supply of tar, even when the supply of water is perfectly regular. Moreover, variations of temperature will naturally affect the rate of the delivery of the tar.

A number of pieces of apparatus have been worked out, in which fluid pressure is employed to control the delivery of the tar. The injectors or atomizers serving to deliver the tar as a finely-divided vapour in the furnace are also, many of them, able to regulate the supply, or include a device for the purpose. In that of Field and Kirby, tar, steam, and air are injected. The tar supply is connected with a central chamber in which a cross-head valve, moving one way or the other, increases or reduces the number of holes through which the tar can escape, and thus controls the supply. The steam surrounds both the air and tar passages; the action of the apparatus (fig. 2) being as follows: Steam, admitted at V, fills the chambers, E, F, H, and escapes at

F¹ and H¹, inducing a current of air into the chamber I, and out at I¹. The apparatus being in use, the tar in the central chamber C flows through the holes D and thence into the furnace. The

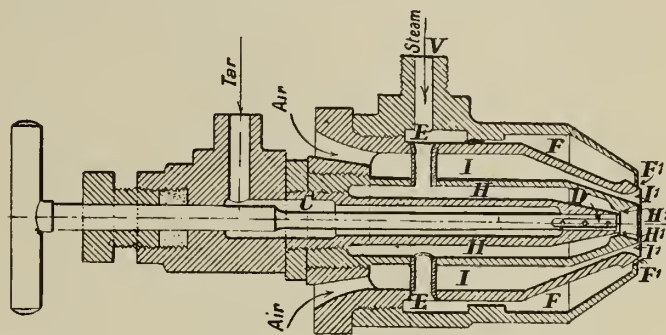


Fig. 2.—Field and Kirby's Steam and Tar Injector.

steam-jets are placed together (crossing each other) and break up the tar into a very fine state of division.

In the Bohler apparatus (fig. 3), which is also on the triple injection system, a plate pierced with a certain number of air-supply holes is fixed to the front of the furnace. The air enters the apparatus at the slightly conical chamber E. Steam enters an annular chamber surrounding the air-chamber by the tube A.

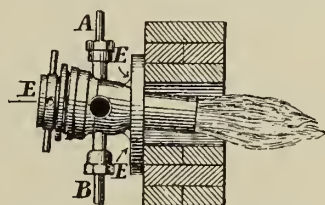


Fig. 3.—Bohler's Triple Injector.

Tar enters a second annular chamber by the tube B. All these three chambers open successively upon a fourth cylindro-conical chamber placed as a continuation of the central chamber, and here mix the air and tar.

Of the many pieces of apparatus of the atomizer-injector type, and serving merely to convey the tar into the furnace, only a few can be specifically mentioned. Among these latter, the Grébel injector (on account of its simple construction and low price) may be given the first place. It is made entirely from ordinary iron tubes, and M. Grébel places in front of it a regulating apparatus consisting of a hole in a thin plate. The Bary injector has been constructed specially for naphtha oil; but it, apparently, could be used also for tar. In the Körting injector, the mixture of steam and tar enters the furnace by a rectangular opening, the effect of which would seem to be to deliver the combustible as an extended sheet. This apparatus should give very good results, without calling for any alteration of the furnace. A very similar piece of apparatus is used at Omaha, U.S.A., except that the tar and steam are separately delivered into the furnace.

In regard to all these injectors in which steam is employed, the quantity of the latter becomes a considerable factor in the use of tar as a fuel. M. Bohler, who speaks with much knowledge of the use of liquid fuel, estimates the consumption of steam in this type of apparatus at '850 kilo. per kilo. of fuel. M. Grébel (in the "Journal des Usines à Gaz," Oct. 5 and 20, 1908) puts it at '800 kilo. per kilo. of fuel. The author's own observations lead him to give the figure of 1.5 kilos. per kilo. of tar. This quantity may be capable of reduction—probably by using the tar in a more fluid state. When using naphtha oil as a fuel, experiments made in the Moscow Technical School with a Bary injector gave '400 kilo. of steam at 4.5 atmospheres pressure per kilo. of fuel.

Although makers of injectors are unanimous in selecting steam as the vehicle for the injection of tar, it would seem that compressed air might equally well be employed if means were taken to heat the air before admitting it to the tar.

In examining the methods which may be employed for securing the mixture of the tarry vapours with the air necessary for their combustion, the conditions of the ordinary direct-combustion furnace may be fulfilled by delivering the tar upon coke or coal spread on a grating. This is the method adopted in similarly heating locomotive boilers, and also in some gas-furnaces. The difficulty is in distributing the tar over the whole surface of the grating. In cases when the tar is allowed to travel in a thin stream over the hearth, the air for its combustion should meet it at every point of its journey. This is done in the arrangement brought forward by M. Letreust in 1883. Nearly the whole of the air supply was placed beneath the delivery of the tar; and the two, therefore, moved in opposite directions and came into intimate admixture.

But this method, owing to the narrow stream of tar, can never give very good results, from the difficulty of concentrating the air over the comparatively small area. This defect is remedied in the atomizer types of injector, the proper method of using which would

seem to be based on that of generator and other metallurgical furnaces—namely, by breaking-up the supply of the tarry vapours into a number of channels, and introducing the air supply between each. This is done in most furnaces designed for the combustion of heavy oils. The same plan is followed in the Bary furnace, in which, however, the air-passages are formed in the sides as well as in the base of the furnace. In the case of generators, it should be easy to do still better in the way of securing an intimate distribution of the tar-vapour and the secondary-air supplies. This is done in the generator and regenerative furnace of Lachomette and Villiers (mentioned in a later paragraph).

Next to the means of providing complete contact with the air, the most important condition to be fulfilled is the avoidance of excessive temperature in the brickwork or retorts, as the result of the energetic combustion of the injected tar by the air which enters around the injector. This latter cannot be reduced altogether; otherwise the mouthpiece of the injector would rapidly choke up. It is therefore necessary to provide a protecting wall of refractory material as is done in the Field, Körting, and Bary furnaces. In the Babcock and Wilcox type, the injectors are mounted in quite the lowest part of the furnace and shielded in the wall; and, therefore, this precaution does not appear to be necessary. Apart from the necessity of avoiding these points of excessive temperature, the tar requires plenty of space for its combustion (for the reason also that the supply of the fuel cannot be perfectly controlled), and a furnace of ample length and height will not so easily give rise to trouble on this score as one of smaller proportions.

In giving practical shape to these considerations, a setting for eight retorts provided with the regenerative chambers of Lachomette and Villiers was modified for use with tar as the fuel, without, however, altering the passages for the supply of the secondary air. The setting has been in use some 800 days, and after part of the front wall had been removed, the whole of the generator chamber was dug out to form a chamber 800 metre by 900 metre and the whole length of the furnace, to which tar was supplied by a Brebel injector. This latter was 42 mm. in diameter, and was placed almost at the centre of the arch of the furnace in an aperture of the wall about 80 mm. diameter. Three small flues were arranged in the lower part of the chamber, controlled by three valves, and admitting to the chamber by apertures arranged in a diamond-shaped pattern. This was to avoid much coke being formed from the tar, and also to reduce the entrance of cold air from around the injector. Except for this, no special arrangements are adopted.

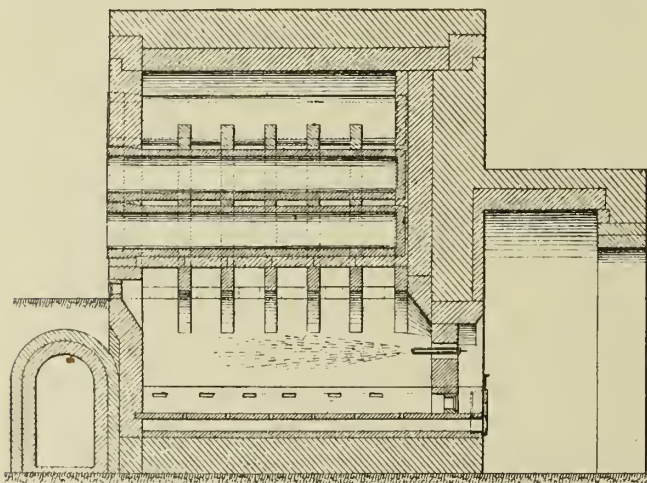


Fig. 4.—Lachomette and Villier's Tar-Heated Retort-Setting.

The action of the furnace (see fig. 4) is as follows: The tar on delivery from the injector is surrounded by a certain amount of cold air which comes in around the injector. Part enters into combustion, while the remainder, owing to its fine division and active propulsion, is swept into the chamber, where it finds no passages except those between the arches. It thus enters and meets with the supplies of secondary air—the flames spreading freely. In other words, the combustion commences in the first chamber, and is continued at and above the second burners; the centre of combustion being near the passages of the secondary air, and as low down as it can be. There is thus no exposure of the retorts to undue heat. It has not been found necessary to provide any supply of primary hot air in order to remove the coke formed by the tar. After a month's use, not a trace was to be seen on the floor of the furnace.

As the result of watching the action of this furnace, it is intended in the next installation to drop the injector still lower, and then if possible employ warm primary air.

As regards the temperatures attainable, it may be pointed out that in the first chamber, which is the hotter of the two, the temperature does not exceed 1400° C., even when distilling a charge in 3 hours 25 minutes. A heat of 1350° C. is reached in six to seven minutes, after which the temperature remains practically constant at 1410° C. As already stated, the excessive heating in places with which tar is commonly credited does not occur at all with the arrangement here described.

One other fact which must be mentioned is the great range of

power at disposal. Charges have been worked off in 6 hours, in 4 hours 48 minutes, and even in 3 hours 25 minutes; and in every case, the heat was uniform throughout the length of the retorts. During a period of 27 days, the following was the result obtained from the furnace:—

Coal distilled	161,100 kilos.
Tar employed	18,881 „
Percentage of heating	11.7

In addition to this, further economy is effected by the very small amount of labour required for a bench of retorts when tar is used for fuel. When once the furnaces are started, scarcely any attention is needed. With proper means of regulating the supply of tar as devised by M. Godinet, a whole bench of six furnaces should require only one man to look after it—a result which was not anticipated in the early stages of experiments with this fuel.

In conclusion, some short account was given of other directions in which use may be made of tar as a source of heat. The author recently examined a large metallurgical furnace in which tar was being used as the sole fuel. The consumption was 5 tonnes per 24 hours; and the works estimated that tar at 30 frs. per tonne was cheaper to use than coal or coke at 25 frs., apart from economies in labour. Babcock and Wilcox furnaces, as also those of M. Bary, are equally suitable for the generation of steam; and Mr. Field, of the South Metropolitan Gas Company, uses tar for the heating of boilers by means of an injector of his invention. The Körting, Bohler, and other types of installation are employed for heating boilers—in fact, since the waste gases from the combustion of the tar used for steam-boilers escapes at a temperature of 300° C., the fuel naturally renders better service in this case than when, as in the case of gas-furnaces, its temperature is 1000° C. In other places, the tar is burnt in admixture with oil residues or coke dust; a mixture being made in the same way as mortar, and burnt in a grate with bars 5 mm. thick and the same distance apart. The use of tar as a fuel for locomotives has engaged the attention of several railway companies; and the Chief Engineer of the Chemins de Fer de l'Est has reported favourably on the employment of tar as a fuel for express engines making long journeys (170 to 260 kilometres) on account of the sustained power which can be secured owing to the absence of clinker. This Company uses the Scherding injector in conjunction with a Bohler apparatus. The Paris-Lyons line has also used tar in districts where there are steep inclines and a good many tunnels, with the object of diminishing the production of smoke. The injector used is that of Holden. The freedom of tar from smoke and ash will, no doubt, lead to still further uses of it as a fuel.

A Retort-Setting Heated by Tar.

M. Ménard, in his paper, described the use of tar for heating a setting of six retorts; the tar being allowed to drip on to the solid bed of the furnace by means of a device specially made to ensure the greatest possible regularity of flow. The setting was one able to take seven retorts in the ordinary way; but the centre retort was removed in order to allow of a greater space above the hearth of the furnace necessary for the complete mixture of the tarry vapours with the air used for their combustion. Otherwise, the vapours fill the furnace, burn badly, and give rise to obstructions in the flues. If all seven retorts are installed, there is difficulty in attaching the apparatus used for the delivery of the tar,

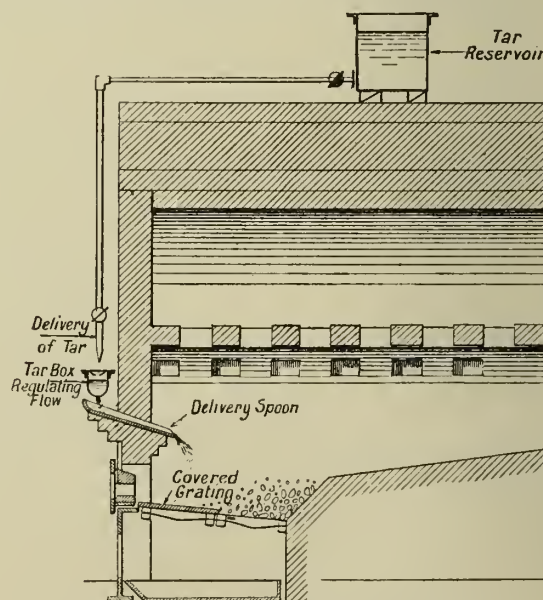


Fig. 5.—The Hovine Tar-Heated Retort-Setting.

and in securing it from access of dust and even from it being knocked about during charging, with the result of losing a large part of the advantage of using tar as fuel. The arch above the hearth of the furnace is taken up right under the two upper retorts which rest upon it; the sides being built against the retorts in the second row. The arch is built with open spaces between these two rows of retorts, for the passage of the flames; and it is

also provided with holes on the sides allowing of flames passing into the passages. One or two apertures, formed by leaving out a single brick, are made in the top of the arch, in order to heat the upper part of the furnace. The furnace door and the grating are placed in the ordinary way; but the latter is built solid with refractory bricks, and the door is made with an opening from '05 to '06 metre high, and from '07 to '08 metre wide, for the admission of air.

The front wall of the furnace is about '24 metre in thickness; and at a level about '12 to '15 metre below the arch a kind of cast-iron spoon (fig. 5) is provided, from which the tar is delivered on to the hearth of the furnace. This spoon is '55 metre in length. It projects on the inside of the furnace about '20 metre, and about '10 metre on the outside, where it is supported by built-out brickwork.

A vessel of sufficient capacity (about 6 hectolitres per furnace) is placed on the bench and provided with an overflow which takes away any excess of tar again to the tar-pit. A sieve, of the kind used for oats, is laid over the vessel, in order to remove impurities from the tar. An iron pipe of 40 mm. internal diameter, and branch tubes of 33 mm. lead off from these vessels, to each of which it is advisable to provide a cock as well as to each branch tube, in order to be able to cut off the tar from a whole bench or from any given retort. The branch tubes are taken down the front of the setting between the two top retorts; and they end in a cock and a special form of delivery attachment. The former is used only to cut off or turn on the supply of tar. The flow of the latter is regulated by the attachment.

This latter (fig. 6) is made from an iron tube of 33 mm. internal diameter and of from '15 to '20 metre in length. The end is constricted to a conical section 13 to 14 mm. in diameter. In this aperture is fitted a plain pin (untapped) with a notched head, from which the pin is suspended in the tube, projecting from the constricted aperture about 6 or 8 cm. The annular space between the pin and the aperture of the tube regulates the flow of tar. Owing to suspended matter, the flow of tar is not perfectly regular; and it is necessary occasionally to adjust the pin, or even remove it in case of obstructions. However, a perfectly regular supply is obtained in the furnace by means of the tar-box placed on the abutting brickwork, which supports the delivery spoon on the furnace front. The box is made from thin iron plate, '40 metre long, '15 metre high, and '15 metre wide; the bottom being cylindrical and supported on four feet which raise it '05 metre. An aperture in the box, 3 mm. in diameter, delivers the tar on to the spoon. The box also serves the purpose of keeping the tar at a uniform and somewhat elevated temperature—that is to say, in a state of fluidity in which it runs easily. The box is provided with an overflow in the event of the delivery tube going wrong and giving too large a flow.



Fig. 6.—Tar Delivery Attachment.

—sufficient to distil four charges each of 1000 kilos. in the six retorts.

To aid the combustion of the tar, a jet of water of 1 to 2 mm. diameter is arranged in the furnace at the point where the tar leaves the spoon. It thus supplies, by its decomposition, oxygen and hydrogen, which respectively aid the combustion of the tar and contribute to the heat. Tar which does not burn at the end of the spoon falls on to the bricks of the grating, and is there burnt by the air entering the door of the furnace. Some coke is formed; but this is pushed further down the hearth, where it also burns, with the result that with proper working there is absolutely nothing to remove from the furnace.

The furnace can be started from the first with the tar, with the aid only of a wood fire on the bricks; but as tar burns very badly in a cool furnace, it is best to use some coke at the commencement. As soon as the furnace is warmed, the grating is covered and the delivery of the tar commenced. A setting for six retorts to be heated by tar requires extra care in making, owing to the great heat generated by the tar.

M. Hovine's Paper.

M. Hovine, after referring to the early use of tar as a fuel for gas—dating as far back as 1876 in Paris (when satisfactory results were obtained), and to the more recent types of furnace described by Dauge, Drory and Lemerle, Echinard, and himself, proceeds to give a description of a regenerator furnace recently designed by him for the Turin Gas-Works (see fig. 7) in which tar or other fuel (preferably coke dust) may be used alternatively without any alteration to the furnace, and with satisfactory results in both cases.

The chief difficulty in using tar in a direct-combustion furnace made for ordinary purposes—namely, the great heat developed in parts of the setting—is not felt to the same degree in a furnace of the regenerator type; and using one such generator with two Hovine recuperative chambers, it was found practicable to employ the two systems of heating with equal effectiveness. The

tar is contained in two vessels placed on the bench and regulated for constancy of delivery by a stream of water with the aid of such well-known devices as the Prony vessels—a pair of communicating receptacles containing two liquids—or some similar arrangement.

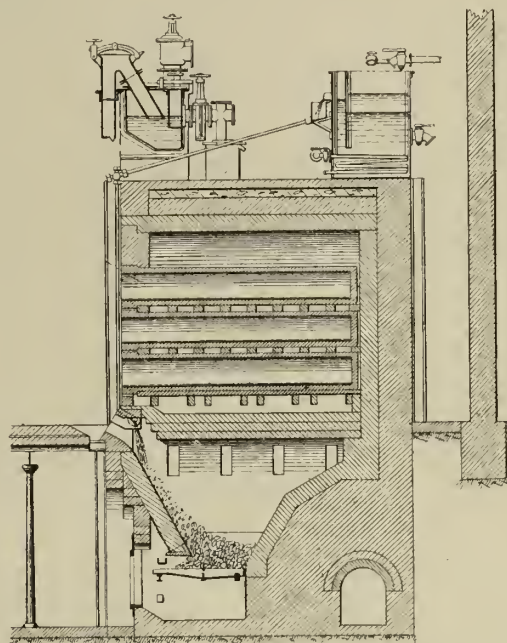


Fig. 7.—A Convertible Tar-Heated Retort-Bench at Turin.

The supply of tar is divided between two distributing tubes placed at the mouth of the gas-generating chamber. The tar streams down the sloping floor of the chamber; is there distilled; and passes off as vapour—leaving a coke which accumulates at the base of the chamber. The vapours pass on to the combustion chamber, meeting the secondary air supply in the usual way. The heat for the first vaporization of the tar is provided by coke burnt on the grating. This is replaced, as the tar consumes, by the coke from the latter which passes down to the grating. When the furnace is fully working, no fuel beyond the tar is used.

In two furnaces built after the first models had been working for two years, the only alteration it was found advisable to make was the introduction of a steam-heated coil in the receptacle for the tar, in order to preserve the latter in a more fluid state. These two furnaces have been working continuously for over two years with tar alone. Their two predecessors were first employed for a year with frequent alternations between tar and solid fuel; but they have been used for the past six months with tar only. The four furnaces distil regularly six charges of 170 kilos. per 24 hours in retorts '64 by '35 by 3 m.—equivalent to (say) 1000 kilos. per retort per day. The consumption of tar is 9 to 10 per cent. of the weight of coal carbonized, or 800 to 900 kilos. per day per furnace. There is no smoke whatever, and no blocking of the flues. A very intense and regular temperature is maintained in the furnace, while that in the generator and at the burners is fairly low, and does not affect the brickwork of the setting. No coke other than that obtained from the tar itself is required for the grating.

In transferring the furnace from tar to solid fuel, all that is necessary is to cut off the supply of tar and charge the generator with coke; and, similarly, in returning to tar, the fuel is allowed to burn low in the generator and the delivery of the tar commenced. The furnace has proved capable of ready adaptation according to the market value of the particular combustibles.

THE PROPOSED INTERNATIONAL UNIT OF CANDLE POWER.

[From the "Chemical News."]

At the Ordinary Meeting of the Physical Society on the 11th inst., a paper on the above subject was read by Mr. C. C. PATERSON; and we are indebted to our contemporary for the following abstract of it and of the discussion to which it gave rise.

The paper discusses the units of candle power at present officially accepted in Great Britain, France, the United States of America, and Germany. The numerous intercomparisons which have taken place during the past five years between these units show that the candle, as interpreted in France, Great Britain, and the United States respectively, has practically the same value in the three countries. The authorities in the gas and electric interest in the United States are prepared to adjust their units of candle power to bring them to a single value which is to be the same as the British and French units. The paper gives the results of comparisons showing that, within the limits of experimental error, the British and French units are identical. The change involved in the unit at present maintained at the Bureau

of Standards, Washington, is shown to be 1·6 per cent. The agreement established forms the subject of an official memorandum from the National Physical Laboratory (with the concurrence of the Metropolitan Gas Referees), the Bureau of Standards, Washington, and the Laboratoire Centrale, Paris.* The proposal to call the common unit of light to be maintained jointly by the National Standardizing Laboratories of America, France, and Great Britain, the "International Candle" has been submitted to the International Electro-Technical Commission, and through it to all the countries of the world which are represented on that Commission. The Hefner unit is shown to be almost exactly 9·10ths of the new unit. The comparisons between the units have been made by two methods: (1) Direct comparisons of the flame standards in France, Germany, and Great Britain. (2) Through the medium of electric sub-standards which have had values assigned to them in the National Laboratories of the four countries. The agreement between the ratio values by the two methods is very close, and is shown by a table giving the results of the various comparisons which have been made.

Dr. FLEMING said it was interesting to hear that the chief powers had come to an understanding with each other as to the unit of light. It must be remembered, however, that this proposed "International Unit" had no objective existence, and no greater value as a unit of comparison than the Hefner or pentane units, to which it was related by an arbitrary definition. He greatly regretted that the National Physical Laboratory authorities had acquiesced in the adoption of a flame standard of light with all its difficulties and its variabilities. Influenced as they were by atmospheric pressure, moisture, carbon dioxide, height of flame, composition of fuel, and number of persons in the photometer room, these flame standards could not possibly be considered as a final solution of the problem of obtaining a primary standard of light. What was really required was the concrete realization of a permanent primary standard, which would be the standard of reference for secondary standards like the "Fleming-Ediswan" large-bulb glow-lamp standards, which he (Dr. Fleming) had introduced seven years ago. He remarked that Mr. Paterson made only very brief reference to M. Violle's work on the platinum standard, and ignored altogether the careful work of Professor Petavel carried out in 1899 in the Davy-Faraday Laboratory. Professor Petavel's conclusions were that, with suitable precautions, the unit of illumination could be reproduced within 1 per cent. by means of the molten platinum standard. He asked Mr. Paterson if any attempt had been made at the National Physical Laboratory to repeat or extend Professor Petavel's work; and if not, why not. Investigations of this kind, which were difficult to carry beyond a certain point in private laboratories, were peculiarly the province of a State-aided institution like the National Physical Laboratory. He was pleased to see that Mr. Paterson endorsed the conclusions which he (Dr. Fleming) had stated seven years previously in a paper read before the Institution of Electrical Engineers—viz., that properly prepared (large-bulb) glow-lamps constituted the best secondary standards. He had now employed for fourteen years secondary standards of this type, and had not found anything to surpass them in convenience and accuracy. The flame standards were unequally affected by changes in atmospheric pressure and moisture. Hence any figures for ratios such as were given in Mr. Paterson's paper were true only under certain accurately defined conditions of surrounding atmosphere which were very difficult to reproduce. Accordingly, elaborate experiments to ascertain how many Hefners were equal to 1 pentane were not of nearly such importance as the construction of some final constant primary standard of light; and in his (Dr. Fleming's) opinion the most satisfactory form for this primary standard of light was to derive it from the light emitted normally by a defined area of some substance in a state of incandescence at a known fixed temperature. He was sure that many practical photometrists—especially those connected with the electric lighting industry—were not at all convinced that the best primary standard was a flame standard, or that the pentane or Hefner units were a completely satisfactory solution of the problem of obtaining a primary standard of light.

Dr. RUSSELL complimented the author on his experimental results. The *bougie décimale* was the unit adopted by the International Congress of Electricians in 1889, and was defined to be the twentieth part of the Violle standard. He was not prepared to accept that it was equal to 1·11 Hefner units. Lummer's and Petavel's results rather discounted the importance to be attached to Violle's number. In connection with Dr. Fleming's remarks, he stated that the unit suggested by Waidner and Burgess had many advantages. They proposed to adopt as the unit of intensity the radiation from a square centimetre of a black body maintained at the temperature of the fusion of platinum. He referred also to the unit suggested by Steinmetz; and, as Mr. Dyott was present, he asked if he could give any information about this unit.

Mr. DYOTT said his experiments had been made exclusively in connection with Professor Steinmetz's magnetic arc. He had not made any experiments on his photometric unit.

Mr. DOW said the pentane lamp as a standard was not very inferior to the Violle standard. He did not think one could as yet accept as a standard an area of a black body at a high temperature.

Dr. DRYSDALE thought that Mr. Paterson was to be congratulated on his summary; and the international agreement arrived

at was most welcome. As he understood the paper, however, it was simply an attempt to obtain agreement between present existing units rather than standards, and left the matter of the best form of standard perfectly open. He thought that everyone having experience with flame standards would thoroughly agree with Professor Fleming's condemnation of them; and there could be no doubt that the primary standard should be an incandescence one. He, however, did not agree with Dr. Fleming's suggestion of reviving the Violle standard. What was wanted in an incandescence standard was a definite area of a definite surface at a definite temperature. When the Violle standard was suggested, there was little knowledge of the radiating properties of surfaces, or high temperature measurement; and therefore the only suitable thing was to take a very pure substance, using its melting-point as a bench-mark of definite though unknown temperature. But everyone who had studied the history of the Violle standard was aware of the great difficulties of setting it up; and it had the disadvantage, according to Petavel, that the surface was dependent on the gas mixture used, besides an extremely short period of constancy, and high expense. In the meantime, it had been realized that a perfectly black body was easily obtainable, and that it had perfectly definite radiating properties was proved by the laws of Stefan and Wien. Optical pyrometry had since advanced to a high degree of accuracy; and therefore it seemed decidedly preferable to suggest a unit area of a black body at a definite temperature. Mr. Jolley and he had come to the conclusion that a square centimetre of a black body at a temperature of 2000° absolute would perhaps be a good unit, and would be probably of the order of 100-candle power. This temperature was probably pretty close to that of the ordinary carbon filament glow-lamp, so that there should be no colour difficulty, and it should not be exceptionally difficult to maintain constant. If the temperature were measured by an optical pyrometer of (say) the Fèry form based on the Stefan law, the deflection would be proportional to the fourth power of the absolute temperature, while the light according to Lummer and to integration from Wien's law was proportional to T^{12} . Hence the light would be proportional to the cube of the deflection only, and the probable error would not be large. Finally, a point in favour of the black body was the perfectly definite character of its spectrum, which made it a standard of colour as well as intensity, and suitable for spectro-photometric comparison. As the surface would be that of a solid, it would be unnecessary to maintain it in a horizontal position, as with the Violle standard; and the amount of light could be easily varied by a diaphragm. He thought Mr. Dow had slightly misunderstood the nature of Professor Fèry's results; and it would be unfortunate if this should militate against the idea of the black body as a standard. There was no difficulty in obtaining a perfectly black body either by an enclosure or reflector. What Professor Fèry's recent experiments had shown was not that Kurlbaum's black radiators were at fault, but that he had been in error in assuming the perfect absorption of platinum-black with which his receiving bolometer was coated. This had necessitated an increase of the constant in the Stefan formula from Kurlbaum's value of 5·32 to 6·32; but this was a point which could easily be settled, and did not indicate any real difficulty in the use of the black body or the determination of its temperature, which could be simply extrapolated from known temperatures by the aid of the Stefan law.

Professor C. H. LEES said that Professor Petavel's recent work on the radiations from heated platinum strips suggested that he was not altogether satisfied with the Violle standard.

Mr. PATERSON expressed his interest in Dr. Fleming's remarks, and said he had probably misunderstood the object of the paper, which dealt with the relations existing between the various units now in use. He agreed with his observations on the flame standard. He had not referred in his paper to the work of Dr. Fleming and Professor Petavel on the Violle standard, as it hardly came within the scope of the paper. They had not tried to reproduce the Violle standard at the National Physical Laboratory. With regard to Dr. Drysdale's remarks about the use of a black body, he did not think it possible to keep the temperature sufficiently constant to enable it to be used as a standard.

Birmingham Water Accounts.—Mr. Thomas H. Clare, the Birmingham City Treasurer, in his annual abstract of accounts, gives particulars of the finances of the Water Department in the twelve months to March 31 last. He points out that the revenue account shows a balance of income in excess of expenditure of £201,304. The profit and loss account shows a loss of £80,658, which has been provided for as follows: Contribution from borough rate £65,000, and transfer from capital under section 22 of the Birmingham Corporation Water Act, 1902, £15,658. The amount of capital expended during the year under the 1892 Act was £51,446. The total expenditure on capital account to March 31 last under the 1875 and 1879 Acts was £2,097,860; the total expenditure under the 1892 Act was £6,153,062; and the aggregate capital expenditure was £8,250,922. The gross amount of loans negotiated, including annuities under the 1875 and 1879 Acts, was £2,097,860; the gross amount of loans negotiated under the 1892 Act was £6,212,500; and the aggregate of loans negotiated was £8,310,360. The amount provided from revenue for redemption of debt during 1908-9 under the 1875 and 1879 Acts was £16,813, and under the 1892 Act £822. The gross amount provided for redemption of debt to the end of 1908-9, under the 1875 and 1879 Acts and the 1892 Act, was £224,622. The balance of loans remaining to be provided for under the 1875 and 1879 Acts was £1,902,622. Under the 1892 Act, the amount was £6,183,116—an aggregate of £8,085,738.

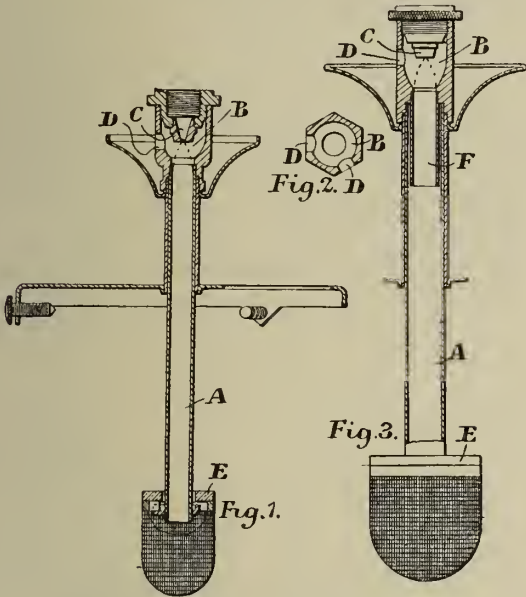
* See ante, pp. 439, 890.—ED. J.G.L.

REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.

BARBER, G. H., and BARRETT, S. R., of the Birmingham Corporation Gas Department.
No. 452; Aug. 26, 1908.

These inverted incandescent gas-burners are of the type with which a closed mantle is used; the object being "to obtain increased efficiency, to avoid the formation of sooty deposits, to avoid the necessity for air regulating devices, and to enable the light to be turned down very low when required without liability of the mixture firing-back in the burner-tube."



Barber and Barrett's Inverted Gas-Burner.

In carrying out the invention, a plain tube A (fig. 1) is provided at the upper end with a mixing-chamber B, fitted with any usual form of gas-nipple C. Air is supplied to the chamber B through holes D or tubes (horizontal or inclined downwards) so arranged that their axis or axes are in line with the point of the gas-nipple, whereby the air admitted by each is directed to this one point; the holes being relatively disposed in such a manner that no two are arranged opposite to each other. It has been found that two holes arranged at an angle of 120° to each other (as shown) give good results. The air admitted through the holes D so arranged meets beneath the gas-nipple C, but does not collide in the same manner as two jets travelling from exactly opposite points. The gas issuing from the nipple carries forward the air down the burner-tube A, thus completely mixing with the air. When the walls of the mixing-chamber are thick, holes are sufficient; but when they are thin, small tubes may be fitted at the requisite positions to direct the air to the point of the gas-nipple.

In order to provide for varying qualities of gas in various localities, gas-nipples may be used having apertures adjusted to pass the proper volume of gas of a richer or poorer quality—thus enabling correct mixtures of gas and air to be obtained with the same proportions of air inlets and burner-tube.

The areas of the air inlets, the cross section of the tube, and the length of the tube may be varied considerably according to the pressure and quality of gas used and the power of burner required; but it has been found, by arranging the air inlets as described, that it is possible to dispense with any regulator or shutter for the air inlets, and that a burner so arranged will burn quietly and without firing-back within considerable range of pressure. Excellent results as regards efficiency, as well as the avoidance of a regulator or shutter, are said to have been obtained by experimenting with burners having the following proportions, which are based on gas of 16-candle quality:—

For Burners consuming Gas per Hour, at 20-10ths Pressure.	Calibre of Tube in Inches.	Length of Tube from End of Gas-Nipple to Bottom of Burner-Tube.	Area of Air Holes in Decimals of Area of Burner-Tube.	Proportion of Length of Tube to Calibre, about
3 to 4 cubic feet	0'4 to 0'45	4'5 to 5'2 inches	0'75 to 0'95	12 calibres
1'0 to 1'5 cubic feet	0'24 to 0'275	3'5 to 4'2 inches	0'75 to 0'95	15 calibres
0'5 to 0'8 cubic feet	0'16 to 0'2	2'2 to 2'5 inches	0'75 to 0'95	14 calibres

In larger burners (as fig. 3), it is desirable to insert a tube F, so as to insure that the tube immediately below the nipple shall be as shown in fig. 1—approximately the same diameter as the jet from the nipple where the jet enters the tube.

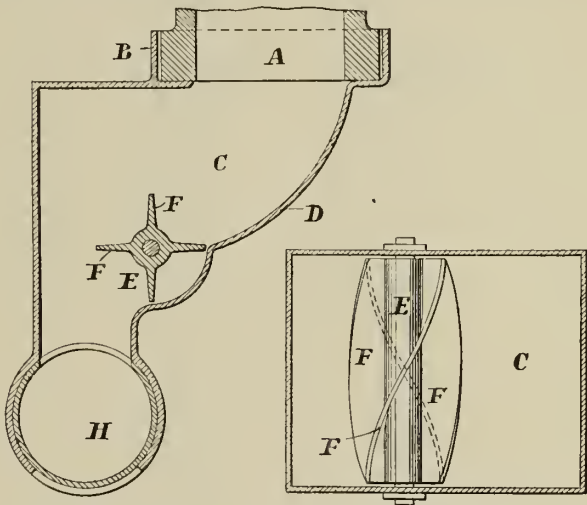
In order to enable the burner to be turned down very low when required, without any liability of firing-back, and to increase the luminosity under normal conditions and to prevent the formation of sooty deposits, the burner is fitted with a mantle having a closed top, so that the gases of combustion are compelled to pass out only through the meshes of the mantle. The closing of the mantle is preferably effected by a loose disc E, of porcelain, fire-clay, or even metal, threaded on the

burner-tube, and adapted to seat on the top of the mantle ring; suitable orifices being provided in the disc if necessary to correspond to the radial arms of the mantle holder, so that the disc can lie flush with the top of the mantle and completely close the latter.

Discharging Vertical Retorts.

WOODALL, H. W., and DUCKHAM, A. M'D., of Bournemouth.
No. 12,070; June 3, 1908.

In their patent specification No. 15,053 of 1907, the inventors described an apparatus for discharging vertical, or substantially vertical, retorts, in which the charge of the retort is supported on an inclined surface placed at such an angle beneath the retort that, although it supports the greater part of the weight of the charge, it does not prevent the discharge of the coke by gravitation, and in which, for regulating the free discharge of the coke, there is a roller at the lower end of the inclined surface—preferably with teeth and being rotated on its axis to govern the discharge. Even when the roller has teeth, they point out that, owing to the coke being of such size that the angle between one row of teeth or the blade equivalent thereto and the next row or blade cannot be small lest the coke be not engaged, the coke is not continuously moved or stirred. According to their present invention, therefore, the stirring of the coke is rendered continuous by arranging the teeth so that they are equivalent to helical blades, or by substituting actual helical blades for the rows of teeth. Thus the coke leaving the retort is always in contact with a blade at one or more points, and is continuously stirred.



Woodall and Duckham's Vertical Retort Coke-Discharger.

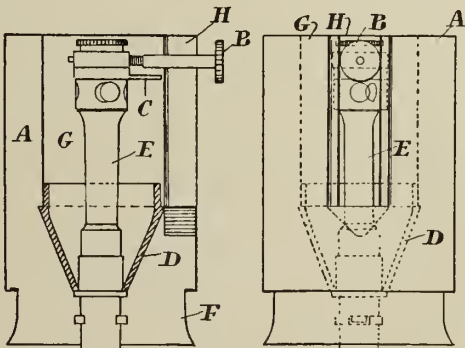
The illustration shows a vertical section through the lower end of the retort and discharging device, and a sectional plan.

As in the 1907 specification, A is the retort, B the iron ring supporting it, C the gas-tight hopper attached to the ring, and D the sloping side of the hopper. The roller E is cast with helical blades F, each of which is preferably of such pitch that it extends 90° around the roller. The known form of rotating faced drum is provided at H for removing the coke from the hopper "without appreciable loss of gas or admission of air."

Incandescent Gas-Lamps.

NOAD, A. C., of Clapham Junction, S.W.
No. 12,146; June 4, 1908.

This invention has particular reference to incandescent gas-lamps in which the burner is of the inverted type, and provides a draught chimney or flue which carries the products of combustion past the air-intakes of the bunsen burner without vitiating in any way the air taken in there, and also allows free circulation of air around the burner and easy manipulation of the gas and air regulators on the burner.



Noad's Inverted Incandescent Gas-Lamp.

The patentee points out that in one form of inverted burner the mantle may not get an even draught on all sides, and, in another form, it is difficult to induce sufficient air into the bunsen burner for proper combustion. To overcome these objections, he proposes to make the draught chimney in the form of an annular chamber A, open top and bottom, and have the outer wall connected at the bottom with a chimney immediately above or surrounding the mantle, and the inner

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. Forshaw's Institution Paper.

SIR,—As the meetings of the Institution are naturally limited to its members, I trust you will afford me the hospitality of your "JOURNAL" to deal with one or two points in connection with Mr. Forshaw's paper on "Illuminating Efficiencies."

Putting on one side for a moment any criticism of the actual experiments referred to, I commence by taking strong exception to the statement with which his paper is prefaced—that "the belief has recently become prevalent that the illuminating efficiency of a combustible gas used in conjunction with an incandescent mantle is proportional to its net calorific value."

I do not know, Sir, the ground upon which this statement is based, because, having a fairly familiar knowledge of the views of English experimentalists in this field of investigation, I should have stated, had I been asked, that it is quite incorrect.

There appears to be a confusion of ideas in Mr. Forshaw's mind; for what has been stated, and can be repeated, is that the calorific value of a gas affords a better comparison of its lighting value under modern conditions than does a photometric test in an argand or flat-flame burner. No responsible person has ever stated that calorific power *per se* is the be-all and end-all of the value of a commercial gas. I quote below what I wrote in the "Gas Analyst's Manual" in 1902, and venture to think that it expresses the general view held in this country, and, as I think, the correct view.

"The efficiency of gas for use with mantles does not entirely depend upon the calorific power. The flame-heat influences the illumination produced by a mantle. The temperature of the flame depends to a great extent upon the amount of air required in combination with the gas for its complete combustion; and the smaller the amount of air required, the higher will be the temperature of the flame—within limits, of course. There is, therefore, to some extent, a balance set up between a gas of lower calorific power, requiring less air for its combustion (as carburetted water gas) and a gas of higher calorific power, requiring more air. The ensuring of this efficient degree of air admixture depends upon the construction of the burner; but the facts stated have been supported by experiments which show that a greater illuminating power has been developed in an incandescent burner properly treated as regards air admixture with gas of a low calorific power than with gas of a higher calorific power. Some recently published experiments of Russell and White do not, however, bear out this result, but do not disprove the statement made above as to the relative influence of flame-heat and calorific power."

It is always a dangerous thing to commit one's ideas and thoughts to paper; but I can safely say that there is nothing in these words, written several years ago, which I would to-day wish to either modify or alter. Therein lies the reason why low-grade gas may be described from one point of view as being relatively more efficient than high-grade gas, because the nearer the theoretical amount of air required for perfect combustion approaches the induction capacity of a burner used naturally, the better will be the duty per foot of gas burned, if the calorific power of each foot passing through the burner is considered.

Perhaps at a later date I may be permitted to publish full data of experiments which have been, and are being, made at the present moment in investigation of the propositions laid down in the sentences quoted above.

Now as to Messrs. White and Russell's table. The figures set out therein surely cannot be considered satisfactory, because the calories per candle of the commercial gases are very much too low, due to the extraordinarily high duties in candle power per cubic foot assigned to the various gases. That such results can be obtained in special burners, with special treatment of gas or air pressure, is not to be denied; but they certainly cannot be attained normally. Some figures taken from my note-book may not be without interest in this connection:—

Gross Calorific Power per Cubic Foot.	Candles per Cubic Foot, Upturned Burner.	Calories (Gross) per Candle.
152	22'0	6'9
148	20'0	7'4
147	19'1	7'17
146	17'2	8'4
144	19'0	7'6

These gases are all of different composition; and it will be seen that the figures show that something beyond calorific power must be taken into consideration in comparing efficiencies for incandescent mantles. Engineers should, by the way, bear in mind that—other things being equal—the lower the figures under "calories per candle" the better the gas for mantle illumination.

Now as to Mr. Forshaw's experiments, Mr. Leather touches, I think, the germane points in his remarks made at the Institution meeting; and what Mr. Leather left unsaid, you, Sir, have stated with such moderation and correctness in your comments on page 801 of your issue of the 22nd inst. that I am sure the thanks of all gas men will be given ungrudgingly to you for such a lucid and able summary. It is quite apparent that the experiments of Mr. Forshaw, and consequently his conclusions, are vitiated firstly by unsuitability of burner, and secondly by unsuitability of mantle. Obviously, the great divergencies from the normal amount of air required for combustion of the hydrogen and carbon monoxide leave us in a state of uncertainty, while the unsuitability of the mantles used is evidenced by the contradictory nature of the Tables II., III., IV., V., VI., VII., and VIII., and from the statement (flying in the face of well-ascertained experience) that an internal porcelain cone improves the illuminating power. For instance, in Table II., the duty from carbon monoxide without air is less than from carbon monoxide with air, while in Table II.A., the reverse effect is chronicled. In Table IV., the duty with 1'56 parts of air is

greater than with 1'16 parts of air; but when the air is increased to 1'91 (or a nearer approach to the normal) the candle power is less. It is obvious that in some of these tests the flame must have been, so to speak, in China and the mantle in Peru. Similar discrepancies appear in Tables V., VI., VII., and VIII. I refer to this discrepancy with some amount of emphasis, because it is so diametrically opposed to my experience of the illuminating power afforded by commercial gas, when the air supply is increased.

Adverting to the relationship of calorific power and illumination of mantle, it will, I think, probably be found that there is a ratio between the illuminating power of a mantle and the calorific power of the gas used expressed in terms of volume of gas *plus* volume of air.

You go to the essence of the question of measuring the air supply in the summary I have referred to; and I should like to state in this connection that I entirely agree that the slightest deviation from atmospheric pressure of the air supply affects very greatly the illuminating power. It follows, therefore, that in experiments of this nature the air supply must be delivered under such circumstances as will permit the slightest deviation from normal pressure to be seen at once and checked. It, therefore, follows that to do this one must have a gauge of sensitivity hitherto undreamed of. Recognizing this most important fact, Mr. Simmance has, in conjunction with Mr. Alfred Mansfield, constructed a gauge which will measure accurately by a moving pointer and a scale, a variation in pressure (and, of course, in vacuum) of 1-10,000th of an inch of water.

No doubt, Mr. Forshaw will explain how he kept his air supply constant; and if he will also give full data as to how he arrived at the *net* and *gross* calorific values of the carbon monoxide and hydrogen he used, it will also be of service to experimentalists.

Of course, even if it is ultimately definitely established that hydrogen in commercial gas is a thing to be shunned, this is, I think, a position of affairs already reached, but from another motive—*i.e.*, that the greater the percentage of hydrogen the greater will be the deduction from gross to net calories, and the lower the net or calorific power.

By the way, tests recently made under my auspices on gas from vertical retorts show a smaller difference between net and gross than is the case with gas made in inclined or horizontal retorts and much less than gas mixed with carburetted water gas.

In concluding this necessarily brief treatment of the many points involved, may I join in the chorus of congratulations to Mr. Forshaw for his patience and industry, and express the hope that the line of investigation he has commenced may be taken through to its definite conclusion, and published for the benefit of the gas industry.

Westminster Palace Gardens, June 24, 1909.

JACQUES ABADY.

Mr. J. H. Brown and Vertical Retorts.

SIR,—Mr. Charles Hunt in his letter of the 12th inst., makes certain statements which I cannot allow to pass unchallenged. Mr. Hunt's letter reads as follows, viz.:—

"Further, in fairness to the Dessau Company, I would like to state that throughout the whole of the correspondence which I had with Mr. Brown, subsequent to the results of the tests being known—extending over some five months—this point was never raised; and although the Dessau people were asked to tender for an installation, no guarantee was ever asked for with regard to illuminating power. Had any such guarantee been asked for, there would have been no difficulty in meeting the Nottingham Corporation in the same way as the Sunderland Gas Company were met upon the same point."

Such a statement is most unfair to the Nottingham Gas Committee, who would doubtless before now have erected vertical retorts, if it had been possible to obtain satisfactory guarantees with regard to illuminating power.

Repeated efforts were made to obtain such guarantees from the Dessau Company without success.

In view of Mr. Hunt's statements, contained in his letter of the 12th inst., my shortest and most effective reply is to quote largely from a letter I sent to Mr. Hunt dated March 21, 1908.

City Gas Offices, 6, George Street,
Nottingham, 21, 3, 08.

Dear Sir,—I have to-day received a communication from the Dessauer Vertikal-Ofen-Gesellschaft, informing me that you have been appointed their representative in England, and that you will be glad to discuss any question connected with the proposed plant of verticals for Nottingham, and more particularly the question of guarantees.

I wish therefore to put before you our present attitude with regard to the suggested installation of vertical retorts for Nottingham.

Twelve months ago, my Committee instructed me to visit the various installations of vertical retorts in England and abroad.

After considering my report, a small Sub-Committee was sent to make a further inspection of the vertical installations then at work.

My Committee were anxious to commence the erection of an installation of six beds of verticals, provided that a reasonable undertaking could be obtained from the Dessauer Company—guaranteeing labour and fuel costs, make per ton, and particularly the candle power of the resultant gas.

These figures were based on information submitted to us by Mr. Körting, purporting to be results obtained under normal working conditions at Dessau and Oberspree.

When I endeavoured to bind them to these figures, their reply was, "Not knowing the coal and cannel used at Nottingham, how can you expect us to give you a guarantee as to carbonizing results to be obtained with your coal?"

My Committee forthwith decided to erect a trial bed to my designs; but about this time Mr. Drory called in Nottingham, and made an offer to test coal (exactly similar to that we are at present using in Nottingham) in the vertical retort installation at

Dessau. *In order that the Vertikal-Ofen-Gesellschaft might be able to make us a definite guarantee.*

My Committee then most willingly reconsidered their position, and decided to accept the offer, and to send 250 tons of coal and 150 tons of cannel, such as we are regularly using here, so that a full-working-scale trial could be made of this coal and cannel in the Dessau vertical retorts—thus enabling the Company to make us a firm offer and guarantee as to the satisfactory working of their plant with coal such as will be used at Nottingham.

If on the completion of these tests, the Vertikal-Ofen-Gesellschaft can give us a satisfactory guarantee with regard to carbonizing results, and particularly with regard to candle power—a minimum of 16 candles with the No. 1 "London" burner being essential—I am sure that my Committee would very favourably consider any reasonable offer which might be made by the Vertikal-Ofen-Gesellschaft.

In a previous letter to Mr. Körting, dated Feb. 29, 1908, on this same question, I stated as follows, viz. :—

I think that I have already explained to you that my Committee, in all probability, would be willing to erect a moderate sized installation of these vertical retorts at our Radford works if the Contractors are prepared to guarantee the make per ton, and the candle-power, over a definite period, with certain costs.

They would be willing to proceed with the erection almost immediately; but without such a guarantee they would not be prepared to go any further in the matter.

It is perfectly obvious from the above correspondence that our only object in sending coal and cannel to Dessau was to enable the Vertikal-Ofen-Gesellschaft to couple a definite guarantee, particularly with regard to the illuminating power of the gas produced, with their tender for the erection of the retorts.

Subsequently the Chairman of the Nottingham Gas Committee and myself had an interview with Mr. Hunt and Mr. Körting in London to discuss this question of guarantees.

On our return to Nottingham, we were firmly of the opinion that it was quite useless hoping to obtain from the Vertical Retort Company any guarantees with regard to illuminating power, acceptable either to the Gas Committee or myself.

After considerable correspondence, we eventually obtained a tender for the erection of an installation. The illuminating power was specified as about 14 to 15 candle power, with the "Carpenter" burner, whereas our minimum rate is 16 candles with the No. 1 "London" burning at the 5 cubic feet rate—the standard required by the Gas Committee.

In consequence of the opinion formed of the Vertical Retort Company's attitude with regard to illuminating power, the Gas Committee decided not to proceed further with the proposal to erect vertical retorts in Nottingham.

Further explanation is obviously unnecessary.
Nottingham, June 24, 1909.

J. H. BROWN.

Vertical Retorts.

SIR,—I hardly know what to make of the first paragraph of Mr. Settle's letter. I have always felt sorry for him; but he is less than just in his deprecation of the intermittent vertical retort (as regards illuminating power), so far as he may intend this to apply to the Dessau system.

The exhaustive report made by the Carbonization Committee of the Institution of Gas Engineers in June last year, and which is signed by Mr. A. E. Broadberry and Dr. H. G. Colman, mentions as one of the advantages of this system "the satisfactory average yield, the purity, and the lighting and heating value of the gas"—this being supported by the average result of a three-days' working test, which gave a yield of 11,410 cubic feet of gas per ton, of an illuminating power of 16·10 candles tested by the Carpenter burner, with a net calorific value of 5·40 B.Th.U.

If confirmation of these results were at all necessary, it is furnished by particulars which have recently come to hand of tests made at the Genoa Gas-Works, extending over a considerable period; the average production per ton from English coal having been upwards of 12,000 cubic feet of an illuminating power equivalent to 14 candles when tested by a No. 1 "London" argand. This result is equal to a yield of fully 10,500 cubic feet of 16-candle gas tested by the same burner.

Whatever may be the relative merits of other systems, this much is perfectly clear in regard to the Dessau system—namely, that it is capable of satisfying equally both those who desire the maintenance of a comparatively high standard of illuminating power, and those whose progressive instincts lead them in the other direction.

Victoria Street, S.W., June 24, 1909.

CHARLES HUNT.

The Institution Gas-Heating Committee's Report.

SIR,—I am pleased to note that you recognize the value of training in physics of many of our younger engineers; but I think you do scant justice to the older generations (outside the specialists on this subject), as many of the latter would pass an examination in practical physics much easier than many of the former.

I regret that members of the Committee should think that the speakers on the subject ["JOURNAL" June 26] are confusing heating by convection with radiation. In the discussion (which was restricted by circumstances) at the Institution meeting, it was not possible to observe that nice distinction in scientific accuracy that is perhaps desirable, and would have been observed had there been more time. Still the fact remains that the main heating of a room by a gas or coal fire will be due more to radiation than to convection; for though the radiation does not heat the air direct, it heats the floor, walls, and furniture, and these in turn heat the air in contact with them, and set up convection currents. The air heated by convection from the stove or fire itself will not play a great part in heating the apartment, as, being nearest the flue, it will be the first to be drawn out of the room, either

through the flue or the ventilator. It will also be admitted that convection currents will be mainly vertical, and therefore limited in their warming capacity. Radiation is mainly horizontal or nearly so.

It would have avoided the so-called misconception on the part of their hearers, and made the report much clearer, had the Committee added a convection column to the appendix; as, in reading and listening, these points are apt to be overlooked by anyone not in such close contact with the experiments as the critics of the critics.

With regard to the calorific values of the gas given in the report, I was not alone by many in doubting the correctness of the 142 calories net; and if the members of the Committee will work out the theoretical value from the analysis given, they will find it considerably below that stated. In order to clear up this point, it would be as well if they give us the particulars of the method adopted and the apparatus used in ascertaining the calorific value of the gas used in the experiments.

Stretford, June 26, 1909.

H. KENDRICK.

SIR,—May I briefly trespass on your space in order to correct a slight error in your notes on my remarks during the discussion on the Gas-Heating Research Committee's report at the Institution meeting? Dealing with the case of properly constructed gas-fires, I indicated that a large volume of air might be carried over the fire without impairing the heat capacity; and there would thus be a pure atmosphere in the room with no possibility of carbon dioxide escaping from the fire into the room. By mistake, this has been rendered in the report as "carbon monoxide." Of course, with properly constructed stoves such as I had in view, there is no carbon monoxide produced, once the refractory fuel is heated up; and my reference was entirely to carbon dioxide, which, of course, is one of the ordinary products of perfect combustion.

Essex Works, Birmingham, June 23, 1909.

H. JAMES YATES.

SIR,—With reference to the report of the "Gas Heating Research Committee" published in your last issue, this should supply a want, as tests carried out without prejudice and independently of manufacturers, are certain to be more convincing than others. But what is required are comparative tests of all types and classes of gas-fires.

I consider that the report has made a far too premature appearance, and is therefore liable to be misleading. For instance, considering that practically all the tests were made by a type of fire and fuel that is known to be anything but a good pattern for radiant duty, such a statement as "the total radiation from an open gas-fire is 32 per cent.," is decidedly a sweeping assertion.

If you will refer to tests made by the late Mr. Thomas Fletcher, F.C.S., you will find that he gives the radiant duty from an "iron spray" type of fire as 50 per cent. better than the "ball fire." I prophesy that the Committee would find similar results if they tried the comparison. Also the burner used (from the description given), I think must have been wrongly constructed and incorrectly adjusted to give the best duty for its gas consumption.

The statement as to reflectors is also misleading. A reflector only intercepts the radiant heat, and throws it in another direction; and if it is placed below the fire it is worse than useless, as it prevents the heat from being thrown on the floor, where it is wanted, and reflects it into one's face, where it is not.

The superheating of the gas has the same drawbacks as the superheating of the air; and little or no benefit is derived.

The room used for the testing should be more like a living room and less like a padded cell.

Beyond the too definite statements, the Committee have done little as yet beyond coming to the old conclusion "that gas-fires are not detrimental to human life provided they are fitted to reliable flues."

However, with the "men and means," I hope some useful work will be done, especially in "comparative" testing.

Warrington, June 24, 1909.

THOS. W. FLETCHER.

Mr. Bell's Paper on Carbonizing.

SIR,—The last paragraph of Mr. Bell's paper conveys, like the postscript of a lady's letter, very important information. As comparatively heavy charges have been the rule at these works for at least 25 years, and as the result of such a system has made itself fully felt in the cost of production of gas here and elsewhere, it is not necessary for me to labour this portion of the subject.

But expediency led me some time ago to alter or prolong the period of distillation, to eight and up to twelve hours; and I am able, under ordinary working conditions, to at least substantiate the figures given in the paper—in fact, the results are somewhat better as regards gas make per ton, and residuals for sale; while coke used for fuel shows a marked decrease. This would follow as a natural sequence, as the greater portion of the heat would be transmitted by conduction.

But whether the prolonged charge in a completely filled retort will lead to better results than those obtained by a more rapid transmission of heat to the core of the charge, so that an equal bulk of coal can be carbonized in six hours, my experiments leave me in some doubt.

Dorking, June 24, 1909.

SAMUEL CARPENTER.

Ruscoe's Drilling-Machine at Eastbourne.—The recently executed interesting piece of work at Eastbourne described in last week's issue (p. 891) has doubtless attracted the attention of many of our readers. It consisted of the drilling of a live gas-main, and of the attachment of a 24-inch T-piece, while the main was under pressure and without disturbing the gas supply. The application of the use of compressed air to the drilling-machine was Mr. John Hammond's idea; but Messrs. John Ruscoe and Co., Limited, of Hyde, ask us to mention that the drilling-machine used was made by them, and is their property. How the machine found its way to Eastbourne does not concern us or our readers; that apparently is a purely private question as between our correspondents and Mr. A. O. Ruscoe. But Messrs. John Ruscoe and Co., Ltd., desire us to also state that neither Mr. A. O. Ruscoe nor Mr. E. Pass has any connection with their firm.

PARLIAMENTARY INTELLIGENCE.

PRESTATYN URBAN DISTRICT COUNCIL BILL.

This Bill, which provides for the transfer of the Prestatyn gas undertaking to the Prestatyn Urban District Council (see *ante*, p. 735), was again before the Local Legislation Committee last Wednesday, when the various clauses were considered in detail.

Mr. FITZGERALD, on clause 6, said that the clause provided that if the Council did not pay the purchase money on the date of transfer, the rate of interest, so long as it remained unpaid, should be 4 per cent. The vendor would be placed in a very awkward position if the transfer was not carried out on the date stated in the clause. If the Council did not carry out the transfer and pay the money, the Company wanted the Council to have to pay 5 per cent.

The Committee allowed the 4 per cent. to stand.

Mr. FITZGERALD then asked for a proviso to be added to the clause: "Unless such purchase shall be completed within six months after publication of the award, the powers of purchase by this Act given to the Council shall lapse." The Committee, however, decided not to add the proviso.

With regard to clause 13, by which the Council were to purchase the stocks and stores, the Local Government Board pointed out that it was usual to impose on the Board of Trade the duty of nominating a valuer under such similar clauses. The clause was passed, on it being pointed out that the report of the Local Government Board had been complied with.

Clause 15, with regard to the inspection of works and books before transfer, was struck out, on the application of Mr. Fitzgerald, who undertook that there would be no unreasonable obstruction.

It having been agreed that the price of gas should be 5s. 6d., instead of 6s. (the maximum price stated in clause 21), the clause was passed. The remainder of the clauses relating to the gas proposals were also passed.

LEGAL INTELLIGENCE.

Gas-Workers' Society Officials in Court.

Before the Birmingham Stipendiary last Wednesday, F. H. Cox, Thomas Cooper, and A. J. Merrell, Secretary, Treasurer, and Chairman respectively of the late Salford branch of the Amalgamated Society of Gas Workers, Brickmakers, and General Labourers were proceeded against by the General Secretary for withholding certain books and moneys belonging to the parent Society. Mr. Willison, for the prosecution, explained that the branch of which the three defendants were officers thought fit to send a certain memorial to the Gas Committee, which the Executive Council said was contrary to the rules. As a result, the defendants were called upon by Mr. Simpson, the General Secretary of the Society, who asked Cox to withdraw the memorial, and said that otherwise the Executive Council would have no alternative but to close the branch. Correspondence followed; and Cox wrote that they declined to do as the Executive Council wished—that they accepted the position, and were no longer members of the Society. In other words, they took advantage of the opportunity to secede from the Society. On May 12, Mr. Simpson waited upon Cox for the purpose of receiving the books and moneys of the branch, in accordance with the rules. Cox produced a minute-book and a contribution-book; but none of the quarter's contributions had been entered in the latter. When this was pointed out, Cox remarked, "You can take the books as they are or leave them." When asked about the money, he replied, "I have some, and other people have some. My instructions are not to pay you any money." The defendants then issued a printed circular stating that they were forming another Society, and had actually used the Society's funds for printing the circulars. After a good deal of correspondence, the books were handed over, together with £5 18s. 6d., which was shown to be due to the Society. Mr. Willison now asked for an order for £1 0s. 6d.—9s. for the printing of the circulars, 9s. 6d. for the Committee, and 2s. for the hire of the room in which the meeting was held at which it was decided to issue the circulars. These items had been charged by the defendants against the funds of the Society; and the branch had no right to issue a circular without the consent of the Executive. For the defence, Mr. Hazel said the parent Society closed the branch because it had petitioned the Corporation Gas Committee for an increase of wages. The memorial had been successful; and this had exasperated the Society, who in this matter had behaved like a bully attacking a small child. He contended that his clients had a right to withhold the money which was withheld. The Stipendiary, however, ruled otherwise; and ultimately Mr. Hazel undertook to hand over 17s. 6d. to the Society, and pay 10s. costs.

Bradford Reservoir Litigation.

The House of Lords last Friday (by the judgment of the Lord Chancellor and Lords Macnaghten, James, Atkinson, Collins, Gorell, and Shaw) finally disposed of a case brought by Mr. T. E. E. Yorke against the Bradford Corporation. The Court of Appeal reversed the judgment of Mr. Justice Joyce in an action in which the appellant was the plaintiff and the respondents the defendants. The questions raised were as to the construction and effect of a conveyance as to the mines near Gouthwaite Hall of which the appellant was tenant for life in possession, in consequence of the action of the respondents, who acquired certain of Mr. Yorke's lands for the construction of a compensation reservoir in connection with their Nidd water scheme. By the covenant, the Corporation bound themselves, before interfering with the present outlet or mining "loose" (an artificial channel for

drainage purposes), to provide a sufficient outlet for draining the mines or pay compensation according to the Lands Clauses Act. In course of time the reservoir was completed, and water covered to the depth of many feet the lower portion of the only outlet or loose which the plaintiff had suggested to be the one referred to in the contract. Nothing was done to this loose beyond covering it with water. After that, the plaintiff was desirous of again working the disused mines, and required the defendants to provide a sufficient outlet or drive a heading as prescribed by the covenant, and failing this to pay compensation. Ultimately the action was brought for specific performance; or, if the works demanded could not be done so as effectually to drain the mines, then for a declaration that the plaintiff was entitled to compensation. In dismissing Mr. Yorke's appeal, with costs, the Lord Chancellor said they had to consider what was the meaning of the word "interfering" with the present outlet or mining loose, and what was meant by draining the mines. He thought the meaning was that if the defendants did anything to prevent the mines from being drained by the loose as effectively as they were when the covenant was made, then the defendants were to provide a substitute in the way described, by which the mines would be as well drained. It was assumed by both parties that there was a mining loose which effectively drained the old workings, and which might drain more than the old workings. It was intended that if the work done by this mining loose should be by the defendants prevented, then other means of doing the work should be provided, which should be sufficient to do what the old loose did. He agreed that if the plaintiff could show that the mining loose not merely drained the old workings, but also drained the strata which they might enable him to reach, the defendants would have been obliged to effect the same thing. But they were not in any case obliged to do more than drain the area which the mining loose drained. These being the contract rights, the next and last question was, Have the defendants broken their contract? Upon the evidence there was much ground for thinking that this mining loose did not ever drain these mines at all. He could not, however, affirm that it was so; and hereafter it might appear that the mining loose did drain some part of the mines. But so far as the evidence went, if the mining loose did drain the mines at some level, nothing that the defendants had done had been proved in the smallest degree to affect the efficiency of the mining loose for this purpose. In the only old shaft that had been opened, the water stood about 10 feet above the level of the water in the reservoir. It was obvious that the plaintiff had not proved any sort of interference with "the present outlet or mining loose," if by this was meant an impairing of its efficiency for the purpose of draining the mines.

Liability for Prepayment Meter Robberies at Tottenham.

Three summonses issued by the Tottenham and Edmonton Gas Company against consumers for the recovery of gas accounts, which were adjourned by Judge Wheeler at the Edmonton County Court in April, and which should have come on for hearing again a few days ago, were withdrawn by the Company. The defendants had slot-meters in their houses; and these were broken open by thieves, and the money abstracted. In two instances, prosecutions were instituted by the Company, and the Judge, at the first hearing, questioned whether the Company had not already been paid, and adjourned the cases with a view to the matter being argued on legal grounds. The Company, however, decided not to go on with them.

Charge of Stealing Acetylene Burners.

At the County of London Sessions, before Mr. Robert Wallace, K.C., Carl and Theodore Knischka, clerks, stood their trial on a charge of being concerned in stealing and receiving a number of acetylene burners and other articles to the value of £200, the property of Messrs. Louis Bernstein and Co., of Holywell Lane, E.C. Carl Knischka pleaded "Guilty." It was stated that he had been a book-keeper in the employ of the prosecutors; and when taking stock recently, they discovered that 400 gross of acetylene burners were missing. A circular advertising similar burners for sale, and issued by a firm in the City Road, attracted the attention of the police; and Carl Knischka was found to be the proprietor of the business. Some £220 worth of stolen property was recovered. Theodore Knischka was acquitted. Mr. Wallace said that Carl Knischka had occupied a position of trust; and he had been abusing it by stealing for some time. He would be imprisoned for twelve months, and certified for deportation; and he would have to pay £25 towards the costs of the prosecution.

Landlords and Liability for Water-Rates.

A case which has lately been decided against the Metropolitan Water Board by Judge Woodfall is of considerable importance to property owners. The defendant, who is the owner of three houses in Rotherhithe, each rated to the poor at £19, was sued for 17 quarters' arrears of water-rates in respect of these houses. Mr. Given (instructed by Mr. George Kebbell) contended, on behalf of the defendant, that the Board must prove by expert evidence that defendant became liable, that the "annual value" of the property was under £20. This the Board were unable to do; and the learned Judge nonsuited them, with costs on the higher scale. Mr. Shaw, who represented the Board, obtained leave to appeal.

New Joint-Stock Companies.—The Homoil Trust has been registered with a capital of £150,000, in £1 shares, to acquire, deal with, and turn to account certain British patents relating to inventions for apparatus for carburetting "Homoil" (a substitute for petrol), for use in internal combustion engines, hardening steel, and illuminating and other purposes. Henry Ellison has been registered with a capital of £20,000, in £1 shares, to take over the business of a manufacturing chemist and tar and ammonia distiller carried on by H. Ellison at Cleckheaton. The issue is a private one.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

We have received from Mr. John S. Gibb, the Treasurer of the Edinburgh and Leith Corporations' Gas Commissioners, an abstract of the accounts for the financial year, May 16, 1908, to May 15, 1909; but it may be pointed out that this is still subject to official audit. Accompanying the abstract is the following statement by the Treasurer.

The balance carried to profit and loss account on the year's working is	£112,147
There has been paid during the year—	
For Edinburgh and Leith annuities	£31,491
„ Edinburgh-Portobello gas annuities	1,064
„ Amount transferred to sinking fund in respect of annuities redeemed	2,645
„ Do. in respect of mortgages redeemed	2,535
„ Interest on mortgages, &c.	40,766
„ Expenses of mortgages	807
	79,308

Showing a net balance on the year's working of £32,839
This is subject to the statutory minimum charges for the sinking funds, as follows:—

(1) For repayment of money borrowed (20s. per cent.)	£12,104
(2) For redemption of annuities (15s. per cent.)	6,890
(3) For reserve fund (Commissioners' Gas Order, 1902, section 9), $\frac{1}{4}$ per cent. on £490,283	1,226
And for the special contribution which, by instruction of the Commissioners, was included in the estimate of last year in order to reduce the book values of the disused works	10,000

30,220

Which leaves a balance of £2,619
at the credit of the profit and loss account, to be carried forward to next year, or added to the reserve fund, as the Commissioners may determine.

The whole costs of the Commissioners' Provisional Order of 1908 have been charged to revenue account; but as the amount set aside last year under "Law Expenses" and "Accidental Damages" accounts to meet the Commissioners' liability in the Brewery Well case, and for other contingencies, was not all required, the unexpended balance has gone to reduce the charges under these heads for the year now closed. A considerable proportion of the costs of the alterations and extensions at the offices and workshops at Waterloo Place and Calton Hill has also been charged against revenue.

The gas sold was 57 million cubic feet less than last year; but the revenue from gas is greater by £2840. The return from residual products has been less by £6471 than last year.

The present value of 1d. per 1000 cubic feet of gas is £7842 17s. 6d.

The stock capital now stands at £341,892; and the amount of yearly annuities at £32,553. As to the loan capital account, of the authorized sum of £1,400,000, the Commissioners still have power to borrow £109,716. There was no capital expenditure upon works in the past year; the sum now standing at £1,144,777—Granton being represented by an expenditure of £841,720. But £7233 of capital expenditure was incurred, including £1873 on meters and £5349 on heritable properties not embraced in the works. The capital account now stands, less deductions during the year to the amount of £1546, at £1,621,872. Since the Commissioners came into existence in 1888, sums amounting to £28,107 have been expended in the redemption of annuities.

In the revenue account, the total income is shown at £347,502, as compared with £351,063 in the preceding year. Gas sold amounted to 1,882,290,000 cubic feet, against 1,939,361,700 cubic feet; and the revenue from gas, £284,254, was an increase of £2840. Coke realized £30,747; tar, £12,778; and sulphate of ammonia (less working expenses), £18,730; the total receipts from residuals being £62,255, or a decrease of £6432. The quantity of coal carbonized was 180,620 tons, against 175,620 tons; and the price paid was £113,056, compared with £123,016. For oil for carburetted water gas there was an expenditure of £4642, against £4754. Salaries, wages, and charges at works for general purposes amounted to £12,628; wages for carbonizing amounted to £12,425; purifying materials and wages of purifier men cost £814; and repairs and maintenance of works and plant, tools and implements, and dismantling old works, cost £26,386. The total cost of manufacturing gas was £169,952, against £177,551. In the distribution of gas, salaries and wages of rental clerks, inspectors, surveyors, and fitters amounted to £11,751; repairs and maintenance of pipes and attendance at gasholders cost £8803; repairs and maintenance of meters, £5211; and the proportion of repairing and fitting-up gas-stoves £1845. The total charge for the distribution of gas was £27,610, against £25,322. Management cost £11,182; feu-duties and rents amounted to £630; and rates and taxes to £16,527. Allowances to old employees and to representatives of deceased employees came to £1473; accidental damages to £7; law and parliamentary expenses to £2019; and discounts and bad debts to £7352. The total expenditure was £235,354, compared with £248,056; and the balance carried to the profit and loss account is £112,147, against £103,007. The total invested sinking funds stand at £194,576. The reserve fund, invested in mortgages and on deposit amounts to £17,462.

In the gas-stove account, it is stated that the total purchases to May 15 last, came to £44,782; those sold being of the value of £13,822—leaving an amount of £30,960, off which has been written for depreciation £17,108. This leaves a net balance—representing stoves, &c., on hand or lent on hire at May 15 last—of £13,852.

PLYMOUTH GAS COMPANY.

Record Make—Reduction of Price—The Coalite Experiment.

The Annual Meeting of the Plymouth and Stonehouse Gas Company was held last Thursday at the works—Sir JOSEPH A. BELLAMY, the Chairman, presiding.

In the annual report, the Directors stated that the increased price of both coal and oil, referred to in the past two reports, having partially receded, they were enabled to reduce the price of gas from 1s. 11d. to 1s. 10d. per 1000 cubic feet, from September last, which allows the payment of a slightly increased dividend. The credit balance of profit and loss amounted to £26,282 7s. 1d., and the Directors recommended the payment of a dividend, for the half year ending March 31, at the rate of 6 per cent. per annum on the ordinary stock, 9s. 6d. per share on the additional shares, and 9s. per share on the new shares—less income-tax. This will absorb £9730 15s., leaving £16,551 12s. 1d. to be carried to the credit of the next account. The transference to George Street of the head offices and the show-rooms department had resulted in a convenience which was greatly appreciated by the customers and the staff. A start had been made with the production of coalite at the Company's works; and the gas was being delivered daily into the gas-holders upon the terms arranged between the British Coalite Company and the Gas Company.

From the statement of accounts, it appeared that the receipts from sales of gas were £94,979, as compared with £94,171 last year; and that the rentals of meters and stoves amounted to £6999, as against £6919. Residuals produced £20,615, as compared with £21,308. Show-room sales, rents, &c., brought the receipts up to £124,033, compared with £123,543 in 1908. On the expenditure side, the total was £95,201, as against £91,555 in the previous year; and the balance carried to profit and loss account was £28,832, as against £31,988. There was an increase under most of the heads of expenditure; and an additional item was one of £1501 for rents and purchase of lease, fixtures, &c., in connection with the removal of the offices and show-room. The manufacturing costs were as follows: Coal and oil, £61,490 (last year, £60,555); purifying materials, £1644 (£1551); salaries, £1496 (£1477); wages and gratuities, £8050 (£7999); repairs and maintenance, £6417 (£6421). Distribution cost £5834, as against £5614; and management, £5307, against £4881.

The CHAIRMAN thought that, on the whole, the figures were satisfactory. There was a slight increase in the cost of coal and oil, which was due to the higher price of the oil, which came into this year's working. Under the head of rents, rates, and taxes, they had an item of £1501, which included the cost of entering the new offices and show-rooms. The cost of insurance was increased from £174 to £396. It might be a surprise to the shareholders to know that until this year the works had not been insured against fire. Most gas-works had been in the same position. The insurance companies had asked premiums which gas companies as a rule thought they could not afford to pay, and insurance was, therefore, not carried out. But the last year or two, the insurance companies had adopted more moderate views; and some months ago the Directors decided that they ought to insure the works. They had now done so in a sum which would provide against loss should a fire take place. The sale of gas had been a trifle less than last year. The falling off was a little over $\frac{1}{4}$ per cent.; so that, practically, they were holding their own. They had added £3000 to the renewal fund account; and after deducting £1000, part of the cost of renewing the inclined retorts, there was £8654 to be carried forward. The Directors hoped to be in a position to contribute to the fund year after year, so as to strengthen the position of the Company. They were also putting aside a large amount for the maintenance and depreciation of the stoves and fittings. Some persons thought that in these matters the Directors took too pessimistic a view; but it had to be remembered that these were articles which wasted rapidly, and that with modern improvements they tended to become obsolete. In any case, a large amount of money had to be spent to keep them in repair. The Directors therefore did not think they erred on the side of too much caution in building up a very substantial reserve fund for the slot-meter business. Whether it was true that in Plymouth the working classes had less money to spend than those of other towns, he did not know; but it was a fact that the consumption of gas per head by slot-meters was low in comparison with other towns. They had 5000 slot installations which did not bring them a penny profit, because the consumers did not burn enough gas to pay interest on the capital outlay and the first cost of the gas supplied to them. They had also a shifting population—people continually changing houses. All these things had to be taken into account; and he thought that the cautious policy pursued would commend itself to the shareholders. The progress of the gas industry in the country had been satisfactory. Competition with electricity was very severe. In the able address which was delivered the other day by the President of the Institution of Gas Engineers, it was pointed out that matters of gas supply had to be adapted to the locality. They could not in the gas industry proceed by rule-of-thumb, or presume that what was good for Plymouth was good for another town, or *vice versa*. Each town had its own peculiar methods and requirements; and they had had this fact in view in the various alterations which had been carried out in connection with the undertaking from time to time. Their financial position justified the new departures they had made; and they might congratulate themselves that they had taken advantage of the geographical position of the town and of the works in regard to the getting of their coal supplies and developing the industry on the most economical lines. The high price of coal and oil had for the moment practically passed away. What the Eight Hours Act would bring about, they did not know. The Company, however, were in a very happy position, because, foreseeing possible complications, they contracted last year for practically the whole of their requirements until June, 1910. Whatever the effect of the threatened strike in Wales on the markets for gas coal in the North, they were safe. The Company's working expenses were reduced, and he was happy to say they had made a record output of gas per ton of coal—namely, 11,756 cubic feet. The credit for this was due to their Engineer (Mr. Hoyte) and the men who had been attending to the carbonizing. It had been

the intention of the Directors to reduce the price of gas, as from last Ladyday, from 1s. 10d. to 1s. 9d. per 1000 cubic feet; but before they had time to put their intention into effect, they received notice from the Rating Authority that their premises were to be reassessed. Since the last assessment of the undertaking in 1901-2, the volume of their business had increased by about 25 per cent. They had discussed the matter on many occasions in a friendly way with the rating expert employed by the Corporation. But he (the Chairman) was sorry to say that he was unable to convince him that the figures he suggested were excessive; and they received a demand note advancing their assessment to £10,000, as compared with only £5000 in 1901-2. In an interview which they had with the Rating Authority he put the case for the Gas Company, and a Sub-Committee was appointed to receive the explanation of the expert who had recommended the increase. As the result of these negotiations, they were informed that the Rating Authority declined to make any alteration. The Directors came to the conclusion that they would not be justified in accepting this large increase, and they had retained the services of well-known rating experts, who were dissecting the figures and had advised the Board to appeal. Sooner or later, therefore, the matter would come before the Recorder. Six months had been lost in the reduction of the price of gas; but the Directors felt justified in promising a reduction to 1s. 9d. per 1000 cubic feet from September next, so that the consumers would have the benefit of the lower price during the winter. In regard to the competition of the electric light, those who were connected with the municipal undertaking naturally wished to show a profit; and they put forth every effort to do so. While the gas undertaking was holding its own and had had an increased output year by year until the past year, there was no doubt that the competition of the electric light tended to prevent any great increase. He was justified in saying that, but for this competition, the price of gas to-day would have been nearer 1s. 6d. than 1s. 9d. Municipalities were in a cleft stick when they undertook to run an electric light undertaking against an existing gas company working on a sliding-scale. The more business they took away from the gas company, the more they made the consumer pay for his gas. If they made £500 profit at the expense of the gas company, 17s. in the pound of the profit would come out of the pockets of the ratepayers who were gas consumers, and 3s. in the pound from the company. He mentioned this because of its bearing on two matters which had recently come before the Town Council. When a suggestion was made that certain street lighting should be carried out with electricity, they wrote to the Corporation asking to be allowed to show what gas could do in comparison with electricity, and offering to do it at their own expense. This did not bring a satisfactory reply, for they were simply invited to point out how the gas lighting could be improved. He could do so in a few words; but it was not what they asked for. What could be done to improve the gas lighting of Plymouth was to use larger burners and mantles. The method adopted by the Lighting Committee was to employ smaller mantles for street lighting than were in use in any town of first importance in the country, and then, with economy run mad, they repeatedly trimmed the mantles until at last only half-a-mantle was left, though it was burning the same quantity of gas and giving practically no light. Many people thought the Company were responsible for the miserable result; but they had nothing to do with the mantles, and considered the system absolutely wasteful. Discussion had also recently taken place in the Council with regard to the lighting of schools. One school was taken as an example, and it was decided to substitute electric light for gas; the argument being, as he understood it, that the eyesight of the children was affected by gas and not by electric light. As against this contention, they had the authoritative statements of many eminent men. These opinions showed the millennium had not arrived, and that gas lighting was not going to take a back-seat. They would expect to hear something from him with regard to the coalite plant. As they were aware, the British Coalite Company entered into a contract to supply the Gas Company with 500,000 feet of rich illuminating gas per day, and to do certain other things, the Company to allow them to erect the necessary coalite plant upon their land. After the meeting, the shareholders would be invited to inspect the plant and stores put up by the British Coalite Company; and he felt sure they would agree with him that they were of a thoroughly substantial and permanent character. The compact nature of the plant for the quantity of gas manufactured was a very striking feature. Some thousands of tons of coalite had been made and sold; while the gas supplied had been of first-rate quality. By reason of many delays in the delivery of various materials from contractors, the coalite plant could not be completed till early this spring. This was, of course, disappointing, because people did not burn either coal or coalite in any quantity during the summer, and, indeed, the Gas Company did their best to persuade them to hire stoves and do the whole of their cooking by gas. The British Coalite Company had asked the Company to allow them to avail themselves of this slack period to carry out certain improvements in the coalite plant, which experience had demonstrated could be effected to give better and more economical results. This the Directors had readily agreed to; and they would therefore not draw their maximum quantity of gas from the coalite plant until the autumn, though they would receive in the meantime a daily supply of whatever gas was manufactured. He was glad to be able to say that coalite had been approved of by most of those who had tried it and reported upon it. They found it lighted readily, burned brightly, was clean and smokeless, and gave out a greater heat than coal. It was also decidedly economical, especially if burnt in slow-combustion grates. Where these were not fixed, a very inexpensive method could be adopted to make the existing open draught grates consume coalite economically. Their own Engineer, from the experience he had had of the coalite plant, expressed the opinion that all the advantages anticipated by their Company from the contract entered into would be fully realized. In conclusion, the Chairman referred to the excellent services of the staff, particularly mentioning the Engineer (Mr. Hoyte) and the Secretary (Mr. Heath), and eulogizing the workmen for the energy displayed on the occasion when the gas-works were in danger from a fire occurring in an adjacent timber yard. In answer to questions, the Chairman explained that the plant for making bricks from the waste products of gas manufacture had been

dismantled. The bricks were perfectly good, if used with care, and they had on the works some substantial buildings erected with them; but in some cases they did not give satisfaction, and the Directors decided to cease the manufacture rather than be worried with complaints. As to the slot-meter business, it paid very well on the whole; but there were some people too poor to use a sufficient quantity of gas to pay the Company, and they could not make them use more. They did not think it was right to refuse to give a supply to a man simply because of his poverty. They must supply all who could pay. As to the cookers and other fittings, all that was possible was done to induce the customers to use them with care, and they had appliances for effecting repairs cheaply; but there were some people who could not be by any means persuaded to be careful, especially with other people's property. In view of the danger arising from an outbreak of fire on adjoining property, it had been decided to raise some of the walls and put in additional fire-extinguishing appliances. They hoped by these means to lessen the risk to which they were exposed recently.

The report and accounts were then adopted, and the dividend recommended declared.

Mr. W. F. THOMAS moved a vote of thanks to the staff, and, as one experienced in the work of the retort-house, especially eulogized the work of the Engineer and foreman in producing so large a make of gas.

The resolution having been adopted,

Mr. HOYTE, in reply, said that the workmen rendered very good service and were most loyal.

Thanks were also accorded the Chairman and Directors.

After the meeting, most of the shareholders present went over the works, being particularly interested in the coalite plant. Of the three settings or batteries, they found only one in operation, another being stopped, and the third entirely dismantled with a view to rebuilding. Two of the three producers were in use. Another matter of interest was the building work in progress as a protection against fire. The end wall of the purifier-house nearest the boundary wall of the works, and therefore only a short distance from a neighbouring manufactory, is being raised considerably above the roof; and the wall, being a substantial structure of stone, it should prove to some extent a protection against fire.

GASLIGHT AND WEST HAM AMALGAMATION.

Approval of the West Ham Proprietors—Appreciation of the Market Value of the Stock.

In accordance with the Standing Orders of Parliament, an Extraordinary Meeting of the proprietors of the West Ham Gas Company was held last Tuesday, at the Liverpool Street Hotel, E.C., to consider and approve the Bill to authorize the acquisition by the Gaslight and Coke Company of the West Ham undertaking. Mr. J. LISTER GODLEE presided.

The SECRETARY (Mr. A. G. Snelgrove) having read the notice convening the meeting,

The CHAIRMAN said the meeting was called in accordance with the Standing Orders of Parliament, in order to ask the approval of the proprietors to the Bill promoted by the Gaslight and Coke Company, which had already passed through all its stages in the House of Commons, and was about to be introduced into the House of Lords, to authorize the acquisition by the Company of the undertaking of the West Ham Company, and for other purposes. So far as the West Ham Company were concerned, it was a Bill to carry into effect (subject to one or two alterations to which he would refer) the agreement for the amalgamation of the Company and the Gaslight and Coke Company, which was submitted to the general meeting of the proprietors in February last, at which meeting the action of the Directors in entering into the agreement was approved. Before making any reference to the alterations in the Bill, he would ask the Solicitor to read it as it now stood on leaving the House of Commons, or such parts of it as it might seem necessary.

The SOLICITOR (Mr. T. Godlee) read the sideheads and material parts of the measure.

The CHAIRMAN (proceeding) said it was his duty to move a resolution approving the Bill, subject to any modification that might be made in it during its passage through the House of Lords, with the approval of the Directors. He took it the main facts as to the Bill were, by this time, well known to the proprietors; and he would only be wasting their time if he went into them in any detail. He need only remind them that the proposal for the amalgamation came to the Company from the Gaslight and Coke Company, who—being in a stronger position than they were in a few years ago, and having manufacturing plant with which they were able to produce more gas than was required to meet the demands made upon them—found themselves with little or no unoccupied land in their district upon which they could expand their business, while the West Ham area still contained a great deal of such land. It would be remembered he told the proprietors that, while the Company were in a strong and healthy condition (the Directors would not have been able to obtain the terms they did had this not been the case), and while they were well able to meet the demands made upon them at present, yet the works at West Ham were getting filled up, and they would not be able much longer to manufacture there sufficient gas to meet the rapidly increasing demands of the district. Consequently, they would have been obliged very shortly to begin preparing for setting up manufacturing plant on the land at East Ham, with the view of establishing a second station there. The Directors were advised that the works necessary to enable them to start manufacturing at East Ham would take about four years to carry out, and would cost something like £250,000; while for a time the extra gas made there would be far from sufficient to provide the profit required to pay the dividend on the outlay, and that it was very probable the result would be a necessary increase in the price of gas, and a diminution of the dividend payable. He told the proprietors on the last occasion

that, under the circumstances, the Directors thought that, if they could obtain sufficiently good terms for the proprietors, employees, and consumers, the proposed amalgamation would be a proper thing for the Company to agree to. They had consented to the amalgamation upon the terms that there should be transferred to the various classes of proprietors in the Company similar stock in the larger Company to that now held by them to an amount that would give to the holders of preference and debenture stock the same dividends as they were receiving at present, and to the holders of ordinary stock a somewhat larger dividend than that which they were entitled to anticipate from this Company; that those of the staff of the Company who were not taken over by the other Company should receive proper compensation for the loss of their places; and that the price of gas over the whole district should be 2s. 8d. per 1000 cubic feet after the end of the present year. The details of the agreement were at that time laid before the proprietors; and they approved them by their votes. One or two modifications (to which he must refer) had been made in the Bill, in consequence of negotiations with certain parties who petitioned against it, and by the Committee of the House of Commons. In the original Bill, the price to be paid to the ordinary proprietors for every £100 of their holding was £118 ordinary stock of the Gaslight and Coke Company, which, at the price the Company were charging for gas when they met in March, would have entitled the proprietors to look for a somewhat larger dividend than that they were now receiving, with the standard price of gas of the other Company at 3s. 3d. per 1000 cubic feet. Before the Bill came before the Committee of the House of Commons, the Gaslight and Coke Company agreed to a reduction of their standard price from 3s. 3d. to 3s. 2d., which, of course, involved the reduction of the dividend payable on their stock when their gas was sold at 2s. 9d. To meet the smaller dividend which this would have provided for the ordinary stockholder, the Directors, after considerable negotiation, obtained a modification of the price to be paid to them; so that, under the Bill as it stood now, they would be entitled to £121 of stock of the larger Company, instead of £118 for every £100 of their present holding; and this increased price would place their stockholders in almost exactly the same position as to dividend as they were in under the original agreement. He believed this could not fail to be satisfactory to the ordinary proprietors. The additional £3 of stock was to be obtained by the purchase in the open market by the Gaslight and Coke Company of sufficient of their own stock to provide the amount required. Upon the application of the Corporation of West Ham, and for their protection, a clause was introduced by the House of Commons Committee, providing that the existing works at West Ham should not be closed for ten years from the date of the transfer, and that, during this period, the Company should continue the manufacture of gas at these works, and carry them on as a manufacturing gas-works, substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill. This clause met an objection felt by some of the proprietors; and their Company could really have no objection to it. He thought these were the only points to which he need refer in which the terms of the Bill as it stood, so far as it related to the amalgamation of the two Companies, differed from the terms of the agreement which was before the proprietors in February. People with money to invest had clearly shown their opinion of the proposed amalgamation by the still further increases in the price of the stocks which had taken place during the passage of the Bill through the House of Commons; and he could assure the proprietors that these were not merely nominal prices, but that very many large purchases had been carried out at these higher figures. Of the Bill, as of the agreement which preceded it, he could say that he believed it provided good terms for the proprietors, dealt fairly with the employees, and secured the interests of the consumers. He hoped, therefore, the proprietors would pass the resolution which he had to move approving the Bill, subject to such possible modifications as he had referred to. He moved—"That the proprietors of the West Ham Gas Company hereby approve the provisions of the Bill now before Parliament, intitled: 'A Bill to authorize the acquisition by the Gaslight and Coke Company of the undertaking of the West Ham Gas Company, to confer further powers on the Gaslight and Coke Company, and for other purposes,' subject to such alterations as may be made in the Bill by Parliament and approved by the Directors."

The DEPUTY-CHAIRMAN (Mr. H. C. Pelly), in seconding the motion, said the Bill embodied the agreement which was discussed and approved at the half-yearly meeting on Feb. 23 last, with one material alteration—viz., that the ordinary proprietors were to receive £121, instead of £118, of Gaslight and Coke Company stock for every £100 of West Ham Gas Company's stock, or 3 per cent. more than was in the original terms. The reasons for this the Chairman had explained. He thought it would be agreed that this was an improvement from their point of view, and a matter of satisfaction to the holders of the ordinary stock. With those of the proprietors who recalled a lifelong interest in the Company's affairs, regret would be felt at the prospect of the termination of its separate existence; but this was a consideration which must not be allowed to influence judgment on a matter advantageous to the Company and proprietors, as such he regarded the proposed amalgamation, and it would, he believed, commend itself to them. It had certainly met with the approval of the investing public, as was proved by the fact that the ordinary stock had appreciated in value by about 20 per cent., amounting to nearly £180,000, since the proposal was first announced. In this amalgamation, apart from the question of terms, most careful consideration had been given to the question of economical working in the future; and the Directors believed the proposed arrangement would operate in this direction in a special degree by saving heavy additional capital and establishment charges. From this point of view also, he believed that the proposed amalgamation was a sound business proposition, and distinctly advantageous to the proprietors.

The CHAIRMAN, replying to Mr. Andrews, stated that certificates would be handed to the ordinary proprietors at the rate of £121 for every £100 of West Ham stock held by them. The difference between the £100 and the £121 could not be drawn in cash.

Mr. TANNER said he was conscious of the fact that it would be useless to raise any opposition to the amalgamation. He, however,

still wished to say that he was of opinion that it was not to the advantage of the Company. He did not intend to move any resolution, or even to vote against the one proposed by the Chairman, because he did not wish to put the Company to the expense and trouble of a poll. He had heard nothing from the Chairman to alter the opinion he had held from the first, that this was a great mistake. He was, however, bound to say this, and it was consistent with his position, that some shareholders had kindly entrusted him with proxies.

The CHAIRMAN, in answer to Colonel STEWART, remarked that, assuming the Bill went through, the ordinary half-yearly meeting of the proprietors would be held as usual in August, so that this was not the last meeting of the proprietors.

The resolution was carried *nem. con.*

A vote of thanks to the Chairman and Directors and officers concluded the proceedings.

IMPERIAL CONTINENTAL GAS ASSOCIATION

And their Concessions.

The "Financial Times" last Saturday published the following statements, through Reuter's Agency, with regard to the supply of gas in Vienna and Frankfort-on-Main, in both of which places the Imperial Continental Gas Association have works.

The Imperial Continental Gas Association, an English Company supplying some of the suburbs of Vienna with gas, recently petitioned the City Council for a 25 years' extension of their concession, offering in return to reduce the price of gas and hand over the works and all their other property to the city at the end of the 25 years. The Municipality have refused the petition, and also an alternative proposal for the purchase of the gas-works in 1911 for a sum of nearly £1,500,000. The city prefers to build new gas-works, and refuses even to buy the English Company's mains, on the ground that the pipes must be altered.

The question of the supply of gas in Frankfort-on-Main, which has for many years past been affected by an English Company and the Frankfort Gas Company, is again receiving the prominent attention of the municipal authorities from the standpoint of either erecting works of their own or of concluding new agreements with the Companies. Two experts were recently invited to investigate the problem; and both of their reports are in agreement that the city could establish municipal works by April, 1911, when the existing arrangements will either fully or partly expire. On the other hand, proposals have been made for an extension of the agreements to 1939 or 1959. The subject has received the consideration of a Municipal Committee, the majority of whom are in favour of further negotiations with the Companies, with a view to arriving at a fresh understanding; while the minority approve in principle the erection of municipal gas-works. After discussion, the Municipal Council have postponed the consideration of the question until the next meeting.

PROTECTION OF MACHINERY USERS' INTERESTS.

The Annual General Meeting of the Machinery Users' Association was held at the Westminster Palace Hotel on the 16th inst.—Sir HENRY HOLLAND, the President, in the chair. The report presented by the Council contained the following references to matters in which our readers are interested.

During the year under review, ratepayers appear to have been somewhat more interested in, and affected by, the question of assessment to the income-tax and local rates than in some preceding years, with the result that a greater number of objections to unnecessary expenditure were made before the Local Government Board Auditors. It is noticeable that a large proportion of the objections related to extravagant expenditure by the guardians in connection with the re-valuation of properties for the purpose of the poor-rate. The Association were represented by their Solicitor at a recent audit of the Bermondsey accounts in support of objections taken by some large ratepayers to the extravagant fees paid to the valuers, with the result that the Local Government Board Auditor decided to surcharge the Guardians with a sum of £112. Further objections were taken in connection with the same matter in three other unions in the Metropolis, with the result that the guardians were surcharged with various sums in each case. It appears to your Council that most of the cases of this nature which have been brought to their attention have arisen from a want of due care and prudence in arranging the terms of the agreements which boards of guardians have entered into with their solicitors and valuers; and they feel that much greater care and forethought should be exercised in drawing up these agreements. . . . Your Council are of opinion that there are many objections to the same firm of valuers being continually employed without tenders being obtained from other valuers, and also to the system of the annual re-valuation of the same property, because such a system is not only unnecessary and harassing to the particular ratepayer affected, but because it involves the union in an expenditure which could easily be, and in most unions is, avoided. Your Council accordingly instructed their Solicitor to appear before the District Auditor of the Local Government Board to object to this procedure. The proceedings have not yet been finally completed; but your Council are glad to say that the objections which were made and the opinion which their advisers had formed were justified, as the Auditor has expressed the opinion that the expenditure is excessive, and that the guardians should obtain tenders from other valuers.

Your Council regret to say that this is not a solitary instance of the trouble to which members of the Association are often put, because a large ratepayer and member of the Association had recently to contest appeals from the Quarter Sessions to the House of Lords on a point of legal practice which was of no material importance, and one which, whatever the ultimate decisions might have been, would not have affected the rateable value of the property which was the subject of the appeal, or have settled any important question of principle. This case

arose out of the appellants following an established practice of giving short notice of appeal to the Quarter Sessions and of then applying to the Court that the appeal should be entered and adjourned to the next Sessions. This procedure has been adopted for upwards of a century, and obviously could not in any way affect or prejudice the Assessment Committee who objected thereto. Their action in so doing was therefore merely an attempt to prevent the appellants, by a purely technical objection, from obtaining a hearing of their appeal, which involved a rateable value of more than £60,000. Though the Quarter Sessions upheld the objection made to them, the company were successful in obtaining in the High Court a *mandamus* ordering the Justices to enter and adjourn the appeal, and were also successful both in the Court of Appeal and the House of Lords on the appeals which the Assessment Committee thought fit to lodge before these tribunals. Thus, upon a point of no importance, this Assessment Committee have expended in legal costs a sum which must approximately amount to £1500.

The attempt of the Metropolitan Water Board to charge for supplies of water to premises containing machinery upon the basis of 5 per cent. on the rateable value, has increased the necessity for strenuously resisting these attempts to rate machine tools. Reference was made in the last report to the excessive charges for water which the Board are seeking to enforce and to the dispute as to the construction of their Act for regulating their charges for water. Your Council have now to report that their advisers have been in constant communication with the Water Board during the twelve months which have elapsed, and that various meetings of manufacturers and others have been held with the view of bringing pressure to bear upon the Board, who have consequently adopted a more conciliatory attitude during the period under review, and have intimated their willingness to agree upon compromises in a great number of cases, with the result that several of them have been settled on terms which your Council's advisers have informed the member concerned that they considered should be accepted. In other cases, however, it has not been found possible to arrive at a compromise, and many are still outstanding, in some of which it is feared that it will not be possible to come to a settlement.

Your Council think that the fact that the Water Board are faced with a deficiency in the last financial year of approximately £78,000 requires the very serious consideration of all the consumers and ratepayers in the Board's area of supply, because before the Board was formed there were eight Companies supplying water within this area, each of which managed its own concern, and all were paying dividends varying from 5 to 10 per cent., as well as Directors' fees amounting to £30,000 per annum; but their charges for supplies to machinery users were far less than those now sought to be enforced. The consumers had been led to hope that by a centralization of administration there would have been some saving of the working expenses which would have enabled the Board to reduce the charges which had been made by the Companies; but, as this expectation is doomed to be disappointed, your Council think the public should call for a searching inquiry into the causes of the failure.

The CHAIRMAN, in moving the adoption of the report, said the Association had been in existence for twenty years, and the value of its services could not be better attested than by a reference to the ever-increasing membership. The Bill in which they were particularly interested—the Rating of Machinery Bill—had not yet passed into law, yet the spirit of it was being increasingly acted upon by the various Assessment Committees, almost without exception, throughout the country. In doing this, the Committees were taking a course which was not of advantage to manufacturers in their neighbourhood, but to their own advantage as the assessing authorities. When machinery users were deciding where to establish new factories, one question which they must ask themselves was, "Where shall we be best treated by the rating authority?" In making their choice, they were sure to avoid all localities which had a reputation for harassing machinery users unfairly; and, other things being equal, they would choose a district which had a record for treating them with fairness and consideration. The result must be a gain to the latter districts and a decrease in the volume of unemployment. Manufacturers very often suffered in their pockets owing to their lack of expert knowledge in regard to such questions as rating, depreciation of plant, income-tax, &c.; and it was for the purpose of supplying information upon these subjects that the Association existed. The new income-tax proposals might open a wider field for them if injustice were to be prevented in certain cases. The question of the super-tax was one in which the Association might come in useful.

The report was adopted.

Gas-Workers' Strike in Brazil.—A telegram through Reuter's Agency, dated last Wednesday, stated that the gas workers at Rio de Janeiro, to the number of 2500, had gone on strike, but that order had not been disturbed.

Newport's Unsatisfactory Electricity Undertaking.—Reporting on the past year's accounts of the Newport (Mon.) Electricity Department, Mr. H. C. Bishop, the Electrical Engineer, remarks that they do not make pleasant reading. Twelve months ago, when a suggestion was made that the prices should be increased, he thought that a year's trial should be given before making any alteration. The year had passed; and, as regards revenue, the result was bad. "I therefore," he adds, "now consider that I should recommend an increase in the rates charged in various departments." The revenue from lighting is actually £150 less than the year before, and that for power only slightly better. The total revenue is £848 more, which is not nearly enough to make up for the increased interest and sinking fund charges. In going through the accounts, he found that by putting in Osram lamps 429 consumers had reduced their accounts by no less than £1318, as compared with the year previous. Mr. Bishop then proceeds to indicate the "temporary increases" which he thinks should be made in the prices of electricity, in order to deal with the net deficit at present shown. He concludes with the hope that the Committee will not consider his suggestions too drastic, and says he trusts the consumers will see that "it is only right that they should share with the Corporation the benefit derived from the advent of the Osram lamp."

OSSETT GAS-WORKS RESULTS.

Small Falling Off in Consumption.

The report of Mr. A. E. Mottram, the Gas Manager, which was adopted at the monthly meeting of the Ossett Town Council, stated that during the year to March 31 there had been made 116,027,000 cubic feet of gas, of which 107,275,400 feet (or a decrease of 880,400 feet) were sold. The proportion unaccounted for—7½ per cent.—was the same as the preceding year. The make per ton was 10,910 cubic feet, compared with 10,903 feet. The gross profit was £7159; while the interest and sinking-fund charges amounted to £6535, and there was paid off the slot fittings account £624. The price of gas was reduced 3d. per 1000 cubic feet as from Oct. 1, which made a difference of about £700. Owing to the general had trade, the consumption by trade consumers was from 3 to 4 million cubic feet less than in the previous year; but three-quarters of this was made good by increased consumption on the part of small customers. Coal cost less; but this was counterbalanced by a fall in the price of tar. The coke market had been good. The ordinary consumers number 3784, and the slot-meter users 3421—a total of 7205, or an increase during the year of 160. The price of gas is 2s. 9d. and 3s. per 1000 cubic feet.

In moving the adoption of the Gas Committee's minutes, the Chairman (Mr. H. Robinson) said that, taking everything into consideration, the Manager's report was most satisfactory, notwithstanding that it was the first time in the history of municipal control of the works that there had been a decrease of consumption. It was somewhat gratifying that the cause of the decrease was not anything over which they had any control. There had been the same enthusiasm and devotion on the part of the Manager and staff, and no less appreciation of the value of the commodity which they produced; there had been no more competition than usual in the town; and yet they were reporting a decrease. They had distinct and direct evidence that bad trade was responsible for it all, and more than it all. They had proved that, if normal trade conditions had existed throughout the year, they would have reported an increase quite as large as that of any previous year. The price of gas had been reduced 3d. per 1000 cubic feet; and it would be agreed that this was done at the earliest possible moment. They conceded by this decrease in price £875, and only received in coal concessions £200. In addition to this, they had remedied the strange and anomalous inequalities which existed as between the slot meters and ordinary meters satisfactorily to all parties. They had introduced eight-hour shifts among the stokers, and given substantial relief to the engine-men, who were working excessive hours, especially during the winter months—both of which were highly appreciated by the men, and working satisfactorily to the Manager. They had also put in a new set of retorts, which were giving the best results. It was proposed to put in another set, which he hoped would be done each year, so as to keep the works at a high standard of efficiency. He hoped that before long the works would bring some relief to the rates.

Several other members of the Council referred to the satisfactory condition of the undertaking; but the feeling was pretty generally expressed that it would be better to still further reduce the price of gas than aim at making profits for the relief of the rates.

TYLDESLEY-WITH-SHAKERLEY GAS UNDERTAKING.

Reduction in Price.

In his second annual report to the Gas Committee of the Tyldesley-with-Shakerley Urban District Council (dealing with the year to March 31 last), Mr. H. R. S. Williams, the Manager, states that the gross profit for the year is £2595, which, after deducting £2299 paid for interest and sinking-fund charges, leaves a net profit of £296, which has been added to the reserve fund, which now amounts to £1322. The capital charges are at the rate of 1s. 1d. per 1000 cubic feet sold. The amount of loan capital still owing at the commencement of the year was £23,262, of which £1542 was paid off during the year, leaving a loan capital still owing of £21,720. The gross profit is at the rate of 11·14 per cent. on the capital employed.

There have been 76 new services laid, and 103 repaired. As to consumption, 42,339,000 cubic feet of gas were accounted for—an increase of 565,600 cubic feet, which is nearly accounted for by the increased public lighting. The ordinary meters in Tyldesley show a decrease of 247,100 cubic feet; while the prepayment meter consumption has increased by 110,100 cubic feet. In Astley there has been an increase in all departments except public lighting, which shows a decrease of 10,200 cubic feet. The consumption has been set back owing to the cotton strike; but the undertaking has not suffered as much as some towns in the district. For cooking and power purposes an increase of 325,100 cubic feet is shown; the total number of cookers now fixed being 333. The amount collected from prepayment meters was £1256 an increase of £37. In 1900, the amount received was only £302. The gas unaccounted for has reached the high figure of 8·4 per cent., though every effort has been made to locate and repair leakages immediately. For this, the large amount of subsidence which has taken place during the year, and which has done so much damage to the mains, must be held largely responsible. Coal cost 2·4d. per ton more than last year, or a total increase of £110; but against this coke brought in an increased amount of £45. Tar and liquor realized £46 less, due to the heavy drop in the price of tar. The assessment of the works for rating purposes has been reduced from £1182 to £932. For a long time the works have been one of the highest rated for their size in the kingdom. This reduction (equivalent to ¾d. per 1000 cubic feet of gas sold) places them on a more equitable footing.

In conclusion, Mr. Williams says: A question frequently asked is: "Why cannot you sell gas at the same price as Widnes?" Apart from all considerations of difference of capital charges (nearly 11d. per 1000 cubic feet), and the scale of the operations, a large factor is the consumption per head. In Widnes, this amounts to a total of 11,405 cubic feet per annum; while in Tyldesley the consumption is only

2191 cubic feet per head of the population. Widnes is, of course, an exception; but the average consumption per head of eleven towns in Lancashire is 5583 cubic feet, or more than double that of Tyldesley. This means that all the distribution expenses are reduced largely, and mains, services, and meters earn far more than in our case. Our hope for the future lies in the increased use of gas per head for lighting and cooking; and the step you have taken in reducing the price is one well calculated to foster this.

In explanation of the final sentence, it may be explained that the Council have decided to lower the price of gas 3d. per 1000 cubic feet from July 1—the first reduction for lighting purposes that has taken place for a good many years past.

TAUNTON GAS COMPANY AND THE TOWN COUNCIL.

The following letter in reference to local lighting questions has been sent to the Taunton newspapers by Mr. A. Edwards, the Secretary and Manager of the Taunton Gas Company.

The attention of the Directors of the Taunton Gas Company has been called to the statement made in the report of the Lighting Committee presented at the last meeting of the Town Council, that the Committee had failed to come to terms with the Company to replace flat-flame gas-burners with incandescent gas-burners in the public-lamps, on account of the exorbitant charge. The Directors request that you will permit them to make the following statement: On Nov. 17, 1899, the Directors resolved to offer to substitute in Albemarle Road new incandescent gas-burners and lanterns for the existing flat-flame burners, at the cost of the Company. This offer was submitted to the Corporation; and the Town Clerk replied suggesting that, as Albemarle Road may shortly be lighted with electric light, the Company should, for the purpose they mentioned, take Holway Lane and Road, or one of the streets on the Priory Estate. To this the Gas Company replied renewing their offer to fix in Albemarle Road, and undertaking to remove the lamps whenever requested to do so—adding that to fix these lamps in any less frequented street would not afford sufficient opportunity for testing the value of the experiment. The Town Clerk replied that his Committee could not see their way to vary their suggestions. The experiment (which would have cost the Council nothing, and would have continued only during their pleasure) was consequently never made. In November, 1905, the Borough Surveyor asked for an estimate for lighting three lamps in Cleveland Street; and considering this an opportunity to get improved gas lighting adopted there, the Gas Company quoted for modern lanterns with incandescent burners, including service-pipes, the sum of £9 for the three lamps, which was less than cost. The Company also quoted £3 per lamp for 2800-hours' lighting per year, including the supply of mantles and cleaning and maintenance of fittings by the Company. The Company were requested to allow the offer to remain in abeyance, which was done. It was, however, never accepted or rejected; and the street continued to be lighted with oil-lamps until, in March, 1907, a request was received from the Town Council to supply flat-flame gas-burners, which request was complied with.

The Directors wish it to be clearly understood that these two attempts made on the initiative of the Gas Company are the only instances of any proposals to substitute incandescent gas-burners for flat-flames in public lamps, and, further, that the Town Council have never made any application to the Gas Company for the conversion of any gas-lamps whatever to incandescent gas lighting. The Directors consider that they have ground of complaint that a quotation given in a special case for a limited number of lamps should now be advanced as a pretext for not having made a general conversion, which the Council themselves admit would have been to the advantage of the public. The Directors refrain from entering in detail into the general question of the substitution of modern gas lighting, for either flat-flame gas lighting or electric lighting of any kind, further than to state that persons who desire to know whether modern gas-lamps will burn in any weather out of doors can find many scores of them in Taunton upon which to make observations.

The adoption of such lamps for the lighting of the town would result in an improvement in lighting and the saving of nearly £1000 a year in cost over the present system of patchwork, which, though costing over £2500 a year, leaves the bulk of the town in darkness for one-half the night. The Directors are, however, of course, aware that the adoption of this course is absolutely precluded to the Town Council by the financial position in respect of their electrical undertaking into which they have drifted.

MUNICIPAL ELECTRICITY VERSUS GAS.

A discussion took place at the last monthly meeting of the Plymouth Town Council, on the recommendation of the Education Committee that the gas lighting of the Corporation Grammar School and the Regent Street Intermediate School should be improved in accordance with the estimates of the Superintendent of Street Lighting, and that this gentleman should examine and report on the lighting of the whole of the schools of the town.

Mr. Anthony, the Chairman of the Electricity Committee, moved as an amendment, that, instead of the gas lighting being improved, the electric light be installed in the Regent Street School. He said he took this course as a member of the Education Committee, and not as Chairman of the Electricity Committee. For educational purposes the electric light would be better than gas. It was infinitely more healthy than gas. It was rapidly becoming clear among the public generally that the electric light was the best illuminant; and if the Corporation used electricity, it would be their own, while gas would have to be purchased from a private company. Mr. Willes opposed the amendment, and said the work of altering the gas supply had already begun. The cost of installing the electric light would be

£170, while the gas lighting could be improved for £54; and then the cost of electricity would be more than that of gas. If the Education Committee were to be overruled in a matter like this, he did not see the use of their passing any resolution on the matter. Mr. Page hoped the Council would reject the amendment. It was clear the Chairman of the Electricity Committee wanted to make a little profit; but it meant that the ratepayers were to be mulcted in the extra cost. Sir C. Radford, a former Chairman of the Electricity Committee, supported the amendment, which he said was in the interest of the health and efficiency of those who were being educated in the school. There was no comparison, he said, between the two lights; and those who could afford it would not hesitate as to which they would have. As the educational authority, they should certainly be able to have the healthiest and best light. It was not true that the work had already begun; it awaited the sanction of the Council. Mr. Jacobs opposed the amendment, which he said would cause an unnecessary expenditure of money. The object was to bolster-up the electric light undertaking in the interest of so-called municipal trading.

Mr. Sayers asked if shareholders in the Gas Company could vote on the question. Mr. Jacobs said they were all shareholders in the electrical works. The Town Clerk ruled that persons interested directly or indirectly in the Gas Company could not, in his judgment, vote on this question. In regard to the electricity undertaking, the case was quite different. The Corporation and the ratepayers owned this, and members of the Council were not disqualified.

On a division, 19 voted for the amendment and 12 against; so that the amendment to substitute electricity in the school was carried.

ELECTRIC STREET LIGHTING IN MAIDSTONE.

A Protest by the Gas Company.

Mr. George Marsham, the Chairman of the Maidstone Gas Company, has addressed a letter to the Mayor, protesting, on behalf of the Company (who are the second or third largest ratepayers in the borough), against a proposal to convert 158 of the public gas-lamps to electricity.

In the course of his communication, Mr. Marsham says that this appears to be an unnecessary step viewed from the standpoint of efficiency, and a costly one viewed from the standpoint of economy. Comparison between the double Osram lamps and the ordinary gas-lamps in the immediate neighbourhood shows that the gas-lamps are at least equal in efficiency; and the proposed new single Osram lamps will be of less illuminating power than the existing gas-lamps. In regard to the cost, the revenue to be derived by the electricity undertaking from these 158 public lamps is computed by the Electrical Engineer at £474 per annum (at £3 per lamp), as compared with £485 17s. (or £3 1s. 6d. per lamp), which has been the price charged by the Gas Company for many years past. In the figure of £474, only 1½d. per unit is allowed for the current consumed; and this price is about ¾d. below actual cost price, as analysis of the borough accounts for 1908 seems to show. In order to effect this problematical saving of £11 17s. per annum, an outlay of £2050 is to be incurred in laying cables, purchasing the standards, and converting them into electric lamps. It has been stated that the present proposal will enable the Committee to reduce the current price of 363 Nernst lamps, now charged at £3 10s. per annum, to £3 per lamp. This cannot be done on a business basis; and if the Highways Committee are charged only £3 a lamp, there must be a loss to the Electricity Committee. As showing the effect of electric lighting, attention is called to the following figures: For the last two years preceding the introduction of electric lighting, the average cost of public lighting was £2338 per annum. For the year ended March 31, 1908 (as shown in the printed Maidstone Corporation accounts), the cost was £3337—an increase of almost exactly £1000 a year, or over 42 per cent. "There has," says Mr. Marsham, "certainly been no improvement in public lighting at all commensurate with this increased expense." In conclusion, the letter urges that the matter of public lighting should be treated on business lines—namely, that the Corporation, on behalf of the ratepayers, whose money they are expending, should buy their illumination of the streets of the town in the cheapest market, consistent with efficiency.

COST OF ELECTRICITY AND GAS AT CHICHESTER.

Chichester has lately been celebrating the inauguration of an installation of plant for the supply of electricity in the city. This achievement is the result of the advocacy, for some years past, of electric lighting by Mr. Aylmore, a prominent member of the Council; and at the luncheon given on the occasion above referred to he offered, in compliance with a request by the Chairman (Mr. Horace Boot, the Consulting Engineer to the Chichester Electric Light and Power Company, Limited), a few remarks, in the course of which he referred to the cost of electric lighting. He stated, according to the report in a local paper, that on the night of a recent demonstration "he had a 100-candle power lamp, two 50's, and ten 25's going for 2½ hours, and the consumption of electricity was only 1½ units, which cost him 10½d." Such a statement was not likely to escape the notice of Mr. T. E. Pye, the Engineer and Manager of the Gas Company, who replied to it in the next issue of the paper. He said particulars of this kind were exactly what Chichester had been asking for for months past. They now had it upon unimpeachable authority that electric lighting of 450-candle power going for 2½ hours, with the latest types of lamps, all brand-new, cost 10½d.; in other words, 450 candles for 4½d. per hour. Mr. Pye asked the Editor's permission to supplement this information somewhat, and render it more complete; and he did so in this way: "Seven Bland burners, of which hundreds are in use in Chichester, together yield 480 to 500 candle power lighting, with about 23 to 24 feet of gas per hour, or say 490 candle power lighting for just under

rd. per hour. Similarly, 1 Omar lamp (100 candles), 2 Bray 'C' burners (120 candles), and 10 Bijou burners (250 candles) give—they are now giving in Chichester—an aggregate of not less than 470-candle power lighting with 2½ feet of gas per hour. Again, 470 candles for just under 1d. per hour." Mr. Pye asked Mr. Aylmore what he meant by the word "only," towards the close of his remarks. Did he expect the cost of lighting during one bright evening in May to be more than 10½d.? How much, then, would it cost for every evening in autumn or mid-winter? Yet Mr. Aylmore stated in the course of his remarks that "practically for fourteen years he had been connected with the subject of electricity;" so, of course, he knew.

METROPOLITAN WATER BOARD.

The Annual Estimates.

The First Meeting of the Metropolitan Water Board after the Whitsuntide recess was held on the 18th inst.—Mr. E. B. BARNARD, M.P., the Chairman, presiding.

The CHAIRMAN, before proceeding to the business on the agenda, said the Board had just completed the fifth year of its control of the water undertakings. During the past year they had collected the water-rates under the new Charges Act; and he thought the members would hear that the innuendo that the Board had been over-charging and had had an overwhelming income would be altogether shattered.

Lord WELBY (the Chairman of the Finance Committee) then made his statement. Dealing with the accounts for the year 1908-9, he said they estimated the income at £2,852,000 and the expenditure at £2,930,000; showing a probable deficit of about £78,000. He was happy to say the actual result was much more favourable. The income realized was £2,877,000, and the expenditure defrayed £2,905,000; the actual deficiency therefore being £28,000, or in round figures £50,000 less than the estimate. Their income proved to be £25,000 above and the expenditure £25,000 below the estimates. After analyzing the income and pointing out that the water-rental account under the head of "domestic rates" showed a total increase over the estimate of £22,000, his Lordship said the past was the first year's working of the new Charges Act, and it was interesting to note that the net water-rental only differed from the actual receipts by £12,000, or less than 0.5 per cent. When the Act passed, they estimated that the charges then made would at that time have caused a decrease in the water-rental somewhat exceeding £27,000. They could now compare the actual net water-rental received in 1908 with the corresponding figure for 1907-8; and it was fairly satisfactory to report that it showed an increase of £22,000. On the expenditure side, the Finance and Works Stores Committees each spent £12,000 less than their estimate. With regard to the estimates for the current year, they calculated the net water-rental at £2,789,000—an increase of £14,000 over the year 1908-9. In the last five years of the Companies' rule, the average yearly increase of gross rental was £67,000; while in the first five years of the Board's control it had been £54,000. The reduction arose mainly from the exodus to districts outside the Board's area. The estimated expenditure for 1909-10 showed an increase of £45,000 over that for 1908-9. The expenditure of the five Executive Committees apart from the Finance Committee was taken at £801,000, an increase of £8000 over the actual expenditure of 1908-9—viz., £793,000. They had estimated the expenditure of the Committee at £2,150,000—an increase of £37,000 over the actual expenditure of 1908-9. They had estimated the expenditure of 1909-10 at £2,951,000, and the revenue at £2,888,000; leaving an estimated deficit of £63,000. If, however, unforeseen contingencies did not arise, and if the Committees continued their careful control over the expenditure as it proceeded, the result would be a smaller deficit than that which now appeared on the face of the estimate. Dealing with capital expenditure, his Lordship said the Engineer estimated that it would this year amount to £888,000. They anticipated, however, that the actual demands would be approximately £500,000. The Finance Committee proposed to meet it as far as necessary by temporary loan and the issue of water bills. The further capital expenditure to which the Board were practically committed and had in contemplation amounted at March 31 last to about £2,078,000, which would be spread over four or five years; but new demands were constantly arising. In conclusion, his Lordship said that up to March 31 last there had been equilibrium in their finance. Their surpluses had somewhat more than balanced the deficiency of last year. These surpluses had from time to time been actually invested or set aside towards the redemption of the debt created by the acquisition of the Companies' undertakings. The deficit of 1908-9 would therefore remain an item for which provision would have to be made in the rates. It would not, however, become a legal deficit until so declared by the Auditor some time hence. No action, therefore, was required at present. But £28,000 was equivalent to a rate of about half-a-farthing in the pound; and the Board would probably not think it desirable to ask a charge on the rates for so small a sum. In that case, the deficit would remain temporarily a charge upon their balances. It might be noted that the deficit of £28,000 was practically covered by the provision which they were rightly obliged to make for the redemption of debt, amounting in 1908-9 to £29,000. Thus, apart from this, they would have just paid their way. But he feared their period of surpluses had passed away, and that henceforward the Water Board would yearly impose upon the rates a greater or less charge. The members would, he thought, agree that this prospect enjoined a firm control over, and a careful administration of, their finance; for they must expect that the ratepayers, when the Board sent in their bill, would demand proof that their deficits were unavoidable.

The estimates were passed.

It was recently stated at the Greenwich Police Court that the South Metropolitan Gas Company last year were robbed of over £1000 in coins from automatic meters, and lost a similar sum in damage to meters. About 80 per cent. of the robberies were from empty houses.

ALTERING A FIRELESS COOKER TO A GAS-RANGE.

At the Annual Meeting of the New England Association of Gas Engineers, one of the questions upon which information was sought was: "What can fireless cookers do for the gas-range?" An answer was given by the New London (Conn.) Gas and Electric Company, who furnished the following particulars.

The cooker was constructed by placing one wood box inside another; the space between the inside and outside boxes (an average of about 2 inches) being packed with loose asbestos. The box had a false bottom made from an asbestos board with a hole cut in it large enough to fit a star-shaped gas-burner. A cover, packed with asbestos, was made to fit over the top of the outfit. A tin pail, holding 15 quarts of water, was used for the tests. The star-burner was regulated for a flow of 15 cubic feet of gas per hour. The tests were made under three different sets of conditions: (1) The water was heated on top of the range, exposed to the air; (2) a hole was cut in the bottom of the oven large enough to admit the star-burner, and the water was heated over this burner in the closed oven; (3) the water was heated in the fireless cooker over the burner. Tests were also made with the cooling of the water—one when in the cooker, the other when on top of the range. The quantity of gas consumed was 15 cubic feet per hour; and the temperature of the cold water was 56° Fahr.

Test on Top of the Range.

Time in Minutes.	Temperature, Deg. Fahr.	Gas Used, Cubic Feet.	Cost at \$1.35 (5s. 7½d.) per 1000 Cub. Ft. Cents.
5	80	1'25	0'168
10	100	2'50	0'337
15	114	3'75	0'506
20	132	5'00	0'675
25	148	6'25	0'843
30	168	7'25	0'978
35	174	8'75	1'18125
40	186	10'00	1'350
45	196	11'25	1'518
50	204	12'50	1'687
55	212	13'75	1'856

Test of the Oven.

5	80	1'25	0'168
10	100	2'50	0'337
15	114	3'75	0'506
20	132	5'00	0'675
25	148	6'25	0'843
30	168	7'25	0'978
35	174	8'75	1'18125
40	186	10'00	1'350

Test of Fireless Cooker.

5	78	1'25	0'168
10	102	2'50	0'337
15	122	3'75	0'506
20	152	5'00	0'675
25	174	6'25	0'843
30	190	7'25	0'978
35	202	8'75	1'18125
40	212	10'00	1'350

Water Cooling.

In Fireless Cooker.		On Top of Range.	
Time.	Cooling Temp. Deg. Fahr.	Time.	Cooling Temp. Deg. Fahr.
—	212	—	212
15 minutes	198	15 minutes	180
30 "	180	30 "	152
45 "	168	45 "	140
1 hour	158	1 hour	130
1 h. 15 m.	150	1 h. 15 m.	122
1 h. 30 m.	142	1 h. 30 m.	116
1 h. 45 m.	138	1 h. 45 m.	110
2 hours	132	2 hours	106
2 h. 15 m.	128	2 h. 15 m.	102
2 h. 30 m.	124	—	—
2 h. 45 m.	121	—	—
3 hours	118	—	—
3 h. 15 m.	116	—	—
4 h. 30 m.	104	—	—
5 hours	104	—	—

Twentieth Anniversary of the Gas Workers' Union.—Last Sunday week, at East Ham, the Gas Workers' Union, under the chairmanship of Councillor Jones, met to celebrate the twentieth anniversary of the foundation of the organization. In the course of his remarks, the Chairman said the Union had never been defeated, though they had met with temporary reverses, which had led to their ultimate improvement. Mr. Will Thorne said the meeting that afternoon reminded him of the words used by the Engineer at the Beckton Gas-Works when the Union was started. He said it would be impossible for anyone to organize the gas workers; and that the Union could not last more than two or three weeks. They had been in working order for twenty years; and he thought that anybody who had read about the history of Trades Unionism would agree that they had done as much on behalf of the workers as any organization in the country. They had 350 branches in the United Kingdom, and a membership of about 40,000. At the same time, the organization was not so strong as it should be; and had those members who signed the books remained in the Union, it would now be 100,000 strong. What was the condition of the men in the gas-works of London twenty years ago? Twelve hours a day, and often eighteen hours on Sunday. Now they were enjoying an eight-hour day, and in some cases were getting 5s. a week more than when they worked twelve hours a day. This had only been obtained by the power of organization; and yet, in spite of this, the great majority of the men were too cowardly to be members of the Union.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts, summarized in another column, of the Edinburgh and Leith Gas Commission, show a decline in the volume of business to the amount of over 57 million cubic feet of gas. As yet no one has essayed to give an explanation of the decrease in the demand for gas. This will come at another time. Meanwhile, one or two reasons may be ventured. One is the great advance that has been made in the adoption of incandescent gas lighting, which in many cases has led to a diminution in the number of burners to the extent of one half. Then the Corporation of Edinburgh have greatly reduced the quantity of gas consumed in the public lamps—in the first place, by the complete conversion of the scheme of lighting into an incandescent one; and, in the second place, by extinguishing every second lamp at midnight, and in the summer months only lighting one half of the lamps at any time. These causes would account for a great diminution of demand; and it is evident that the day consumption has not yet been sufficiently developed to make up for the lessened consumption due to improved methods of lighting. The increased cost of gas, which has been 3s. per 1000 cubic feet for the whole year, may be responsible for some of the decrease. On account of the higher price, the revenue from gas—£284,254—is greater by £2840 than it was in the previous year, when the price from May to October was 2s. 9d. The revenue from gas was, as matter of fact, the highest which has ever been earned by the Commission. This is an indication that the demand has not gone so very far back. The gas sold was, in fact, higher than in any preceding year, except the last two. Compared with ten years ago, it was 237 million cubic feet better. The revenue from residual products is £6472 down, due, no doubt, to coal being more moderately priced, but is £3065 better than two years ago. The total revenue is £3561 less than it was a year ago; but is £22,280 better than it was two years since. On the expenditure side, on a lessened consumption of coal to the amount of 15,000 tons, there was a diminished cost of £10,960. Oil for carburetted water gas cost £111 less. Salaries and wages at works were £250 down; but carbonizing wages were £260 up. Repairs and maintenance cost £2483 more. Purifying materials and wages cost £21 less. The total expenditure in the manufacture of gas was £7599 less than a year ago. The cost of distributing the gas was £2288 more, largely due to heavier outlay in the repair and maintenance of meters. Management cost £198 more; feu-duties and rents, £65 less; rates and taxes, £1343 more; pensions and allowances, £112 less; accidental damages, £6552 less (the expenses of the action relating to the pollution of a brewery well having fallen upon the previous year); law and parliamentary expenses were £686 less; and discounts, abatements, and bad debts were £115 less. The total expenditure of £235,354 was £12,702 less; and brought out a balance to the profit and loss account of £112,147, which was £9140 more than the balance a year ago. The capital

outlay for the year (£7233) was remarkable for the small sum (£10) spent on main and service laying. Of the total capital outlay, £5350 was expended in the purchase of properties required in the extension of the head offices. The capital account also shows a decided change in the method of dealing with the indebtedness of the Commission. Three years ago, there was money borrowed on deposit receipt, at 3 and 3½ per cent., to the amount of £206,631. This has now been reduced to £7460; the debts having been placed on the more stable basis of loans on mortgage, which have, in three years, risen from £899,556 to £1,202,950. Almost nothing was done in the redemption of annuities during the year; only £4 having been extinguished, at a cost of £114. Probably more will be done in this way in the year now current, under the Provisional Order of last year. The gas-stove account appears to be in a healthy condition; but I fail to see in it, or anywhere else, any statement of the revenue derived from the hire of stoves. Probably it was applied in depreciation upon stoves, which is entered at £1168.

An article was published in the "Dundee Advertiser" yesterday giving an account of what has been done in connection with the erection of the new gasholder at Arbroath, and then it went on to say: "Arbroath is fortunate in its Gas Manager. Since Mr. Young entered upon the managership in 1902, he has practically remodelled the works, and to-day these will compare most favourably with the most up-to-date establishment in existence. The remodelling process has certainly involved a heavy expenditure. It will, however, be interesting to know that practically the whole of the money required has been taken from revenue, instead of being placed to capital; and while this has been done, the price of gas has at the same time been steadily reduced. When Mr. Young went to Arbroath, seven years ago, the price was 4s. 4½d. per 1000 cubic feet; to-day the price to the ordinary consumer is 2s. 8½d. The whole work connected with the erection of the new holder is being carried out under the supervision of Mr. Young."

It was reported at the annual meeting of the Muirkirk Gaslight Company, Limited, on Monday, that during the year 136,000 cubic feet more gas had been made than in the previous year. A dividend of 7½ per cent. was declared.

At an extraordinary general meeting of the Leven and Methil Gaslight Company, Limited, this week, it was resolved to raise the nominal share capital of the Company, which at present stands at £2000, to £4000, by issuing one additional share of £1 for each share of £1 at present held. This step, it was stated, had been found to be necessary in respect that a sum of more than £2000 has from time to time been spent in extensions of the works, and has been provided for out of revenue.

This summer the Dregbhorn Gaslight Company have had a new gas holder installed at their works. Both new holder and tank have been erected by Messrs. R. Dempster and Sons, Limited, of Elland.

At the last meeting of the Stewarton Town Council a letter was read from the Secretary to the Gas Company, asking for how long a period the Council proposed to hold the Company liable for damages which might have occurred to sewage pipes through a recent escape of gas and explosion. The Sanitary Inspector informed the Council that they

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might not be exposing the pipes for a considerable time, and might not for several years discover any damage which might have been done, unless the ground subsided in consequence of the leakage. It was agreed to inform the Gas Company that they would be held responsible for any damage which might be discovered within a year.

The Dundee Corporation Water Department had a revenue last year of £53,504, and an expenditure of £55,370—resulting in a deficit of £1866. The main cause of the deficit was that sales of water by meter were estimated at £20,000, and only realized £19,013. The Committee recommended that the domestic water-rate be raised by 1d. in the pound, increasing it to 9d. They estimated, inclusive of the deficit of last year, an expenditure of £58,466 during the current year. On the revenue side they anticipated that the domestic rate would realize £18,408; the public rate, at 1d. in the pound, £4772; and special rates, including supplies by meter at 7d. per 1000 gallons (an increase of 1d.), £35,460—a total of £58,646. These estimates were adopted yesterday; and the rates fixed as recommended.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, June 26.

In the early part of the week, demand was well sustained, and there was a further slight improvement in values. At the close, however, the month's requirements being fairly well covered, the market is quieter, though prices are maintained. The closing quotations are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. to £11 5s. per ton f.o.b. Liverpool, and £11 7s. 6d. per ton f.o.b. Leith. For delivery ahead, the situation is unchanged; for although there continues to be good inquiry, the volume of first-hand business has not been large. For delivery up to the end of the year, £11 10s. per ton f.o.b. is quoted; and there are buyers at £11 7s. 6d. per ton. For delivery over the spring months, makers are still quoting £11 15s. per ton f.o.b. good ports, without finding buyers.

Nitrate of Soda.

This market is rather easier; the spot prices now being 10s. 3d. per cwt. for 95 per cent., and 10s. 6d. for refined quality.

Tar Products.

LONDON, June 28.

Markets for tar products have been steady throughout the past week, and pitch has maintained its firmness, though there has not been any actual improvement in price. Continental buyers are still to a large extent holding off the market. But there should be no cause for apprehension, seeing that the English manufacturers are well sold, and have only to wait in order to obtain their prices. Creosote is steady, though there are not many inquiries in the market. The majority of

manufacturers are very well sold, and are under no obligation to contract at present. Benzol is steady, and prices are slightly harder all round, owing to the possibilities of its use as a motor fuel. Toluol is quiet, and there is not very much inquiry for it. Solvent naphtha is rather easier all round. Carbolic acid is decidedly weak, and business has been done in 60's at 11½d. on the east coast.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., ex works. Pitch, London, 28s.; east coast, 27s. 6d. to 28s.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d. to 6½d.; North, 5½d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 8½d. to 8¾d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¾d. to 3½d.; North, 3d. to 3½d.; solvent naphtha, casks included, London, 10¾d. to 11½d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2½d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11d. to 11½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been steady throughout the past week, and prices have improved to the extent of 1s. 3d. to 2s. 6d. all round. The Gas Companies maintain their quotation of £11 10s.; and though they cannot do business at this figure just now, there are signs that before very long they may be able to effect sales. The ordinary London, on Beckton terms, is still offering at £11 to £11 2s. 6d.; but business at 2½ per cent. terms, £11 3s. 9d. to £11 5s. In Hull, the market is dull. The prices are poor, as the shipping facilities are bad from this place. In Liverpool, £11 3s. 9d. to £11 5s. is the price; while in Leith £11 6s. 3d. has been paid, and nothing under £11 7s. 6d. would now be considered.

Gas and Water Profits at Hull.—The City Accountant of Hull, in submitting the accounts of the water and gas undertakings for the year ended March 31, at the last meeting of the Water and Gas Committee, stated that the income on the water undertaking had been £63,731, and the expenditure £27,616; the gross profit being £36,115. Of this amount, an annuity of £2600 had been allocated to the city fund, and £11,387 was ear-marked for interest charges; £12,000 was used in relief of the rates; and the amount transferred to the reserve fund was £7159. The working balance at the 31st of March amounted to £9441. The revenue from the gas undertaking was £12,288, and the expenditure £11,600; the profit for the year being £688. The balance on the net revenue account amounted to £2658 14s. 8d.; and the reserve fund stood at £4285.

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COAL TRADE REPORTS.

Northern Coal Trade.

There has been a good delivery of coals, remembering that the chief local holidays have been taking place; but the forward business has been kept back until rather more likelihood of the settlement in other coalfields was apparent. In the steam coal trade, the demand has been good for prompt cargoes, but lower prices have prevailed, though irregularly. Best Northumbrian steams are now quoted at about 11s. 9d. per ton f.o.b., second-class steams from 10s. 6d. to 11s., and steam smalls vary from about 5s. to 6s. In the gas coal trade, the tone has been steadier than for steams. Durham gas coals vary, according to quality, from about 9s. 9d. to 11s. per ton f.o.b. for the usual classes; and up to 11s. 6d. for "Wear specials." The output at the collieries has been full, and it has been well taken up on the whole, though the home consumption is about at its lowest. Another contract for coal which used to be placed in Durham has gone to foreign pits—that of the quantity for the needs of Louvain. The amount is about 14,000 tons; and it has been given chiefly to German collieries at prices below those of the local tenders. Coke seems a little easier; and gas coke is moderately steady at between 12s. 9d. to 13s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The crisis in the coal trade is making the market active; traders being anxious to get orders fulfilled before a stoppage of work takes place, should matters reach that length. There are hopes of a settlement before the extreme step is taken. A meeting between representatives of the masters and the men is to be held to-day; and in view of that meeting the masters have, in order to not create friction, agreed to postpone meantime issuing notices of the reduction they claim. Prices are quoted at: Ell 9s. 9d. to 11s., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 348,591 tons—an increase of 26,676 tons as compared with the previous week, and of 36,003 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,688,968 tons—an increase of 506,200 tons upon the corresponding period.

The Board of the Gas, Water, and General Investment Trust.—The "Financial Times" states that a circular, signed by Mr. J. B. Braithwaite, the late Chairman of the Gas, Water, and General Investment Trust, has been issued to the shareholders of the Company announcing that, after due consideration, the entire Board recently placed their resignations in the hands of Lord St. Davids, leaving him to nominate a fresh directorate. This he has now done; and the following gentlemen, all of whom have consented to act, will constitute the new Board of the Company: The Hon. Arthur Stanley, M.P. (Chairman), and Messrs. Claude E. S. Bishop, Percy Cross, Frederick Hill, and M. B. Snell. These gentlemen, either in their own right or on behalf of others, represent some very important City interests.

Tendring Hundred Water Company's Assessment.

At a Special Rating Appeal Sessions at Mistley, last week, the Tendring Hundred Water Company appealed against an assessment for poor rate of pipes and mains in the parish of Tendring. For the appellants, Mr. C. E. Jones said that the Company supplied eighteen or nineteen parishes. In this particular instance, the assessment had been raised from £40 to £140; and though it was admitted that, owing to extensions of mains, some increase was to be expected, such a jump was regarded as altogether out of reason. The £140 worked out at £31 2s. 2d. per mile of main. Mr. N. W. Jackson, the Secretary of the Company, said that for the year to Dec. 31, 1907, the total revenue from water rates and rentals was £10,068; and for 1908, £10,318—an increase of £250. In 1907, they had 1½ miles of 6-inch main in Tendring; the main being laid from Wix Cross to Tendring Workhouse. This was put in at the request of the Guardians, who guaranteed to pay £130 a year. Half of the main was laid in the parish of Wix. In the same year, the Company laid a 9-inch main from Tendring to Thorpe. Of this, 2 miles 1467 yards was in the parish of Tendring; and until February of this year there had not been any consumer supplied from the main. In February, however, Tendring Vicarage was connected. For the Assessment Committee, Mr. Page submitted that the £140 was more than justified. Mr. G. F. Jones, Assessor for the respondents, said he had fixed the assessment 30 or 40 per cent. too low. It should really have been £194; but he determined to be well within the mark, in case the Company thought fit to appeal. If he had to advise the Committee again, he should recommend them to put it higher. After a brief adjournment, the Chairman said the appeal would be dismissed, with costs, which had been fixed at 20 guineas.

Ravensthorpe Gas Suffocation Case.—A Ravensthorpe gas stoker named Dixon, who is stated to have been "on the spree" for several days previously, was found on Friday in his bedroom dead, with the place full of gas. He was seated in a chair, with his shoulders covered entirely by a rug; and the tap of the gas-bracket used in the place was turned full on.

Devonport Gas Undertaking.—Speaking at a meeting last week at which he reviewed the progress of the municipal undertakings, Alderman Tozer, the Chairman of the Devonport Gas Committee, said that six months ago, when a change was made in the constitution of the Committee, the gas undertaking was in a decaying condition. The profit last year was £740, while this year it was £1612. They had stopped fixing slot-installations, in consequence of a desire for a new arrangement with Messrs. Willey and Co. He had every reason to believe that at an early date an arrangement in the interests of the ratepayers and agreeable to Messrs. Willey and Co. would be arrived at. The new arrangement, by which all goods should be openly tendered for, only came into operation on April 1. He was convinced that on this alone they would save from 5 to 50 per cent.

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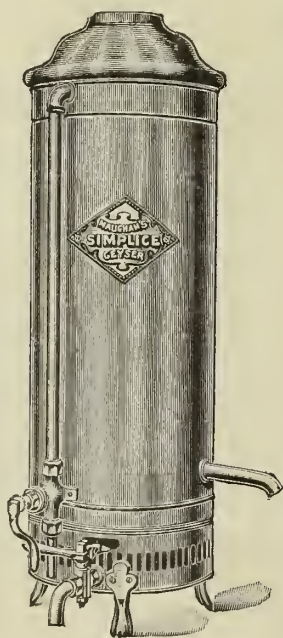
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West's Stoking Machinery.

Contracts have recently been placed with the West's Gas Improvement Company, Limited, for the supply of their stoking machinery for several gas-works in Europe. The firm have made arrangements to supply a complete installation of their compressed-air driven machinery to the gas-works at Karlsruhe (Germany); the compressed air in this case being supplied by an electrically driven air-compressor. They have also in hand an installation of stoking machinery for the gas-works at Savona (Italy), including a complete installation of coal-handling plant; and in this case also the stoking machinery and the coal-plant will be electrically driven. They have recently secured a contract for supplying a complete installation of stoking machinery with coal and coke handling plants for the Sundby Gas-Works of the Copenhagen Municipality, the whole of the machinery to be electrically driven. When the work is finished, the whole of the four gas-works belonging to the Municipality will be equipped with West's stoking machinery and coal and coke handling plants. Messrs. West have also in hand a complete installation of stoking machinery, including extensions to the coal and coke handling plants, for the Aarhus Gas-Works (Denmark); this being an extension of the machinery in the retort-house erected by the firm some few years ago.

Destructive Electricity in Manchester.

Havoc on a scale that would be expected from a severe earthquake over a very limited area is depicted in photographs of the Victoria Arcade, Manchester, taken just after an explosion on the 14th inst. The cause of the damage was a fault which occurred on the service-wires laid into the Victoria Arcade at the point where they are jointed on to the distributing cables laid along St. Mary's Gate under the foot-path. The defective jointing was the primary cause of the disaster. It was a very old service, laid in 1896; and the method of attaching the service cables to the distributing mains is not the one adopted to-day. Before the accident, there were indications of derangement of the circuit; but the most careful search failed to discover what was wrong. "There are in St. Mary's Gate," says the "Manchester Guardian," "five electric cables laid side by side in bitumen troughs. The first effect of the fusing of the cables would be to melt the bitumen and liberate bitumen gas, which is highly explosive. Close by are four 2½-inch gas service-pipes, which were also fused; and the coal gas and the bitumen gas together seem to have made their way into the cellars. They exploded, when mixed with the requisite proportion of air, probably by a spark from the fused cable." The explosion took place at about half past two o'clock in the morning, and its terrific nature caused quite a panic among the guests and staff at the Victoria Hotel; but fortunately (no doubt owing to the time at which it occurred) there were no personal injuries. The damage to property was, however, of an extensive character. Our contemporary states that windows were smashed by hundreds, offices dismantled, and wreckage blown across the street and through shop windows many yards distant. Blocks of solid concrete from the pavement of the arcade were hurled in every direction; and St. Mary's Gate became strewn with fragments of all descriptions. The door of the Union Bank of Manchester was shattered; and with it the whole of the bank front, except the stonework, was smashed. The bank premises, even to the cellars, were entirely exposed to the gaze of the public. The premises of Messrs. Hailwood's creameries, on the opposite side of the arcade entrance from the bank, also suffered considerably from the explosion. The two large windows facing St. Mary's Gate were blown out, and carried completely away; while the window overlooking the arcade was wrecked. The shop fittings were badly damaged; and on the opposite side of St. Mary's Gate the front of Messrs. Burgon's grocery establishment was smashed in pieces. Inside the arcade, which contains a large number of shops, was a scene of ruin; and hundreds of panes of glass in the roof had been shattered—in fact, hardly one was left intact.

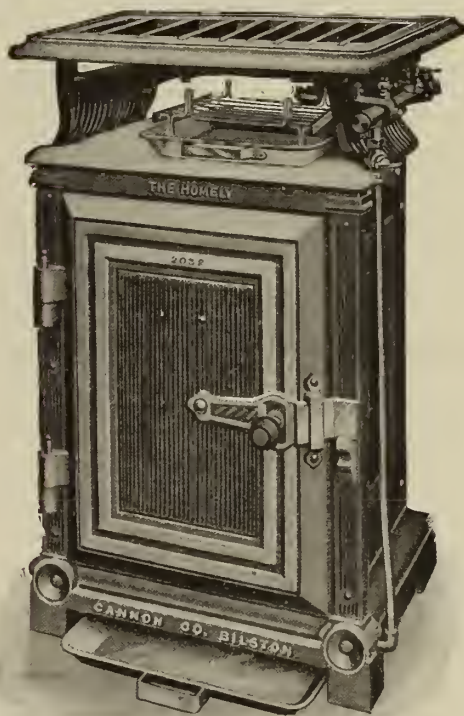
A Loss on the Year's Working at Oldham.—At the fortnightly meeting of the Oldham Gas Committee, Mr. Arthur Andrew, the General Manager, reported that there had been a loss on the year's working of the undertaking, which was anticipated. The result, however, was not unsatisfactory. They would have a different state of affairs, he thought, this year. The strike last October accounted for a good deal of the loss. There was a decrease of 40 million cubic feet in the consumption of gas in the mills and workshops of the town; but there had been an increase to the extent of 10 million cubic feet in the gas consumed for lighting in dwelling-houses and shops.

Proposed Extensions at Wantage.—Mr. C. R. Clement, the Chairman of the Wantage Gas Committee, in presenting the annual financial statement of the undertaking for the fifteenth consecutive year, remarked that the position had steadily improved, until the balance in favour of the works was now the record one of £1517, with a net balance on the year's work of £158. The receipts from gas had been somewhat less, owing to a reduction in price. The time had now come for them to consider what should be done to meet the yearly increasing demand for gas. They hoped to get through the coming winter with the existing retorts; but the productive power would have to be increased next summer. They would have to decide whether they would erect new works or enlarge the present ones. The latter scheme could be accomplished during the next two years without borrowing anything; and at the end of this time a large reduction could be made in the price of gas. The building of new works, however, would mean greatly increasing the capital and retaining the price of gas at about its existing figure. His suggestion was to spend £220 on new purifiers, £250 on retorts, and £100 on enlarging the house of the Manager (Mr. Gordon Walker); and this could be easily paid for out of the net profits in two years, and the instalments of loans that had no longer to be met, owing to the fact that two large loans would be paid off—one this year, and one next. After these improvements were paid for, if the conditions remained the same, it appeared that a reduction to all customers of 1s. per 1000 cubic feet could be made. The scheme for altering the works was adopted.

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Shoebury and its Gas-Works.—The question of the value to the town of the gas-works formed the principal topic of discussion at the meeting of the Shoebury Urban District Council last Tuesday. Alterations in the method of keeping the accounts having been suggested by the Auditor, an accountant was engaged to go specially into the matter. His report was duly presented; and Mr. Talmage moved that it be handed to the Press for publication. He remarked that from the report, and the figures as they stood, the loss on the gas-works was a serious one. They had been congratulating themselves on their profit of £900, and thought what a glorious thing the gas undertaking was; but they were now faced with the true accounts, and had a deficiency of £469 instead of a profit. The deficiency, instead of getting less, grew greater. Mr. Brooks said none of the ratepayers' money had ever been spent on the gas-works. Mr. Leaney, as one of those who voted for the reduction in the price of gas, wished to say that everything was going on very well indeed. If they kept an eye on the expenditure, the undertaking would prove a most valuable asset to the town. The Chairman (Mr. J. Glasscock) considered that it would be unwise to publish the report at the present time; and on the motion being put, this proved to be the opinion of the majority of those who took part in the voting.

Messrs. James Milne and Son, Limited, announce the appointment of Mr. G. D. Bidwell to be the Manager of their London branch. Mr. Bidwell has been for the last seven years with Messrs. Falk, Stadelmann, and Co., and therefore enters upon his new duties with the advantage of a wide and varied experience.

It is stated that a contract has been let by the Great Yarmouth Water-Works Company to Messrs. J. Cochrane and Sons for the construction of a tunnel under the Yare, to receive mains between Great Yarmouth and Gorleston, in place of existing pipes laid in the river bed. By this means, all risk of interruption in the water service under the river will be prevented; while the increase in the size of the pipes which will be rendered practicable will improve the supply.

To cope with the increased output of their manufactures generally, extensive additions have been made by the Richmond Gas Stove and Meter Company, Limited, to their Warrington works. The laboratories have been added to by the further equipment of the latest scientific instruments for testing purposes. The department for the production of their patent natural draught furnaces and for their blast-furnaces has been considerably enlarged; and additional furnaces have been erected for producing their patent "Porcellanite" enamelled gas-fires, which are increasing in demand every season.

Writing from Bombay on June 5, a correspondent sends us the following news extracted from the "Times of India" and "Bombay Gazette" newspapers, from which our readers will observe that the customs of the old country are enthusiastically witnessed and eagerly competed for even in tropical climes: "Under the auspices of the Bombay Gas Company's Social Club, a successful afternoon's sport was witnessed by a large crowd of spectators at the First Annual Sports held on Saturday, May 29, on the Club's tennis ground at the gas-works. Mr. A. R. Burch, the Company's Engineer and General Manager, and Mr. A. E. Cromarty officiated as judges, Mr. W. T. Lane as starter, and Messrs. Challice and Murray as stewards. The prizes were kindly distributed by Mrs. W. T. Lane. From a total of 301 entries received, confined to the employees of the Company, 252 competitors turned out for the twelve events.

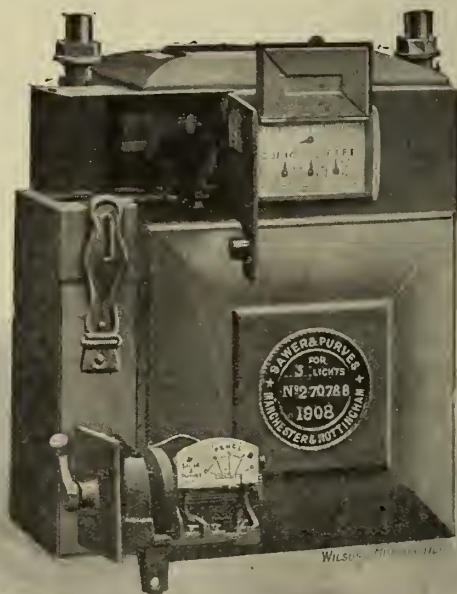
APPLICATIONS FOR LETTERS PATENT.

- 13,886.—PULLEYN, R. B., and G. D. WEBSTER AND SON, LTD., "Composition for gas-stoves," June 14.
 13,893.—SMITH, F. C., "Gas-fire," June 14.
 13,940.—BERGER, M., "Gas-stoves," June 14.
 13,964.—HOWORTH, A., "Gas-fittings for new or existing domestic ranges," June 15.
 13,982.—FARQUHAR, W. B., "Retort mouthpieces," June 15.
 13,997.—STEWART, J. G., "Jointing of pipes," June 15.
 14,013.—HERVEY, A., "Mantle protector," June 15.
 14,020.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires," June 15.
 14,030.—OWEN, A., "Supporting articles on gas-stoves," June 15.
 14,035.—HUTCHINSON, C. H. & B. G., "Inverted incandescent gas-lamp," June 15.
 14,041.—BONNA, A. J., "Pipe-joints," June 15.
 14,080.—SUTTON, C. J., and RUDD, J., "Anti-vibrator," June 16.
 14,115.—KELLER, H., "Conveying and compressing gases," June 16.
 14,139.—HUTCHINSON, J., "Coal-tar compounds," June 16.
 14,145.—AKTIEBOLAGET ESKILSTUNA SEPARATOR, "Three-way cocks or valves," June 16.
 14,157.—SPONG, J. O., "Gas-stoves," June 16.
 14,167.—HARDY PATENT PICK COMPANY, LTD., and SMITH, G., "Band conveyors," June 16.
 14,176.—NEMEROVSKY, J. M., EVERETT, L. C., and NEMEROVSKY, F., "Inverted mantles," June 16.
 14,200.—HALL, E. L., "Purifying gas," June 17.
 14,233.—CALVERT, J. G., "Pumping or propelling liquids and gases," June 17.
 14,267.—PACE, P. C., "Petrol lighting and heating," June 18.
 14,282.—LYNDE, F. C., "Delivering air or gas," June 18.
 14,323.—SCHWIEGER, A., "Gas-burners," June 18.
 14,334.—GALLACHER, J., "Water-heating and softening apparatus," June 18.
 14,384.—SUTHERLAND, W. C., "Connection of flexible diaphragms to gas-meters," June 19.
 14,408.—GREEN, R., and HILL, J. F., "Acetylene generators," June 19.
 14,411.—MASTERS, E., and HANSFORD, J., "Charging gas-retorts," June 19.
 14,418.—BECHER, R. A., "Supplying water or other liquids from tanks, reservoirs, or the like." A communication received from A. A. Biggs. June 19.

SAWER & PURVES,

FOR

Prepayment Meters,
 Ordinary Meters,
 Pressure Gauges,
 Main Taps,
 and Brasswork,
 of every
 Description.



THE POSITIVE PREPAYMENT METER.

(With Attachment Detached)

Miles Platting,
 MANCHESTER.

Radford Road,
 NOTTINGHAM.

Agent for Scotland:

JNO. D. GIBSON, 93, Hope Street, GLASGOW.

One of the most attractive exhibits at the Lifeboat Demonstration at Burton-upon-Trent last Saturday was furnished by the Corporation, who sent two drays calling attention to the general utility and advantages of gas by such signs as "Cook by Gas," "Gas the Housewife's Friend," &c. One dray was divided by a partition, so as to make it like two kitchens—one with a dirty, smoky fire, blackened walls, and a sooty-faced maid of all work, and the other fitted up with a Wright cooking-stove, in which were seen cooking a joint of beef and a pie. The two sides of the dray represented the two post-cards issued by John Wright and Eagle Range, Limited. On the other dray were

samples of large cooking-stoves which are being supplied free to consumers of gas by prepayment meter in Burton. These were presided over by a smart young *chef* in the orthodox white suit, who was preparing joints of beef and mutton for cooking. Around the dray were representations of the Richmond Gas Stove and Meter Company's *chef* advertisement, and in front was a large 300-light meter with a small 2-light meter on the top of it. Two lamplighters with collecting-boxes in the form of small street-lamps on the top of long sticks, and two gas-fitters with money-boxes shaped like gas-meters, accompanied the drays on their tour of the town.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

ENGINEER AND MANAGER. Bury St. Edmunds Gas Company. Applications by July 14.
RETORT-HOUSE FOREMAN. No. 5111.
CANVASSER. No. 5114.

Situations Wanted.

MANAGER OR ASSISTANT. No. 5112.
SECRETARY, MANAGER, OR ACCOUNTANT. W. B. Mimmack, St. Paul's Cray.
SULPHATE LEANWORK. Leadburner, 117, Gallaway Road, Shepherd's Bush.

Correspondence Classes.

CORRESPONDENCE COLLEGE COMPANY. Department B., Cambridge.

Patent Licences.

EXTRACTION OF AMMONIA FROM DISTILLATION GASES. Haseltine, Lake, and Co., Chancery Lane, W.C.

Plant, &c. (Second-Hand), for Sale.

PURIFIERS, &c. Sutton Gas Company.
STATION METER. T. G. Marsh, Manchester.
GAS ENGINE AND PUMPS. Water Works Lighting and Power Investment Corporation, Cannon Street, E.C.

Plant (Second Hand) &c., Wanted.

STATION METER AND GOVERNOR. 5113.

Meetings.

EUROPEAN GAS COMPANY OFFICES. July 13, 2.30 o'clock.

Stocks and Shares.

ENFIELD GAS COMPANY. July 13.
HARROW GAS COMPANY. July 13.
HERTFORD GAS COMPANY. July 13.
WARE GAS COMPANY. July 13.
WEST KENT GAS COMPANY. July 13.

TENDERS FOR

Coal and Cannel.

ACCRINGTON GAS AND WATER BOARD. Tenders by July 6.
BARRY GAS DEPARTMENT. Tenders by July 12.
PEMBROKE DOCK'S GAS COMPANY. Tenders by July 15.
STRETTON GAS COMPANY. July 10.
WINSFORD GAS DEPARTMENT. Tenders by July 5.

Pipes, &c.

CLACTON URBAN DISTRICT COUNCIL. Tenders by July 7.

Tar and Liquor.

LONGTON CORPORATION. Tenders by July 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 957.

Issue	Share.	When ex- Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
590,000	10	Apl. 16	7	Alliance & Dublin 10 p.c.	174-18	..	5 11 1	195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
298,955	10	"	7	Do. 7 p.c.	124-13	..	5 7 8	561,000	Stk.	Feb. 25	10	Liverpool United A.	226-228	..	4 7 9
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	94-100	..	4 0 0	718,100	"	"	7	Do. B.	168-170	..	4 2 4
200,000	5	"	6	Bombay, Ltd.	54-52	..	5 12 7	306,083	"	June 25	4	Do. Deb. Stk.	103-105*	..	3 16 2
40,000	5	"	6	Do. New, £4 paid.	44-42	..	5 18 10	75,000	"	June 11	6	Malta & Mediterranean.	44-44	..	6 3 1
50,000	13	Feb. 25	14	Bourne- 10 p.c.	283-24 1/2	..	4 15 9	560,000	100	Apl. 1	5	Met of 5 p.c. Deb.	100-102	..	4 18 0
51,810	10	"	7	mouth Gas B 7 p.c.	164-17	..	4 2 4	250,000	100	"	4 1/2	Melbourne 4 1/2 p.c. Deb.	101-103	..	4 7 5
53,200	10	"	6	and Water Pref. 6 p.c.	152-154	..	3 15 7	541,920	20	May 27	3 1/2	Monte Video. Ltd.	124-13	..	5 7 8
380,000	Stk.	"	12 3/4	Brentford Consolidated	252-255	..	4 18 1	1,775,892	Stk.	Feb. 25	4 1/2	Newcastle & G'tesb'd Con.	1064-107 1/2	..	4 3 9
300,000	"	"	5 1/2	Do. New	194-146	..	4 16 11	518,795	Stk.	Dec. 30	3 1/2	Do. 3 1/2 p.c. Deb.	93-94	..	3 14 6
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	15,000	10	Feb. 25	10	North Middlesex 10 p.c.	194-20	..	5 0 0
206,250	"	June 11	4	Do. 4 p.c. Deb.	100-102	..	3 18 5	55,940	10	"	7	Do. 7 p.c.	13-13 1/2	..	5 3 8
220,000	Stk.	Mar. 12	10 3/4	Brighton & Hove Orig.	212-214	..	5 0 6	300,000	Stk.	Apl. 29	8	Oriental, Ltd.	137-139	..	5 15 1
246,320	"	"	7 1/2	Do. A Ord. Stk.	154-156	..	4 19 4	60,000	5	Mar. 31	8	Ottoman, Ltd.	6-6 1/2	..	6 8 0
460,000	2 1/2	Apl. 16	10	British	42 1/2-43 1/2	..	4 12 6	31,800	53	Feb. 25	13	Portsea Island A.	137-139	..	4 19 0
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	119-121	..	4 19 2	60,000	50	"	13	Do. B.	129-131	..	4 19 3
165,700	"	"	4 1/2	Do. B 3 1/2 p.c.	89-91	..	4 18 11	100,000	50	"	12	Do. C.	119-121	..	4 19 2
82,278	"	"	5 1/2	Do. C 5 p.c. do.	108-110	..	5 0 0	114,809	50	"	10	Do. D and E.	101-103	..	4 17 1
5,000	"	June 25	3 1/2	Do. 3 1/2 p.c. Deb.	88-90*	..	3 17 9	398,490	5	May 13	7	Primitiva Ord.	64-7	..	5 0 0
500,000	10	May 13	34	Buenos Ayres (New) Ltd.	13 1/2-14 1/2	..	4 18 3	796,580	5	Jan. 28	5	Do. 5 p.c. Pref.	54-5 1/2	..	4 10 11
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	92-94*	..	4 5 1	488,900	100	June 1	4	Do. 4 p.c. Deb.	94-96	..	4 3 4
100,000	10	"	—	Cape Town & Dis. Ltd.	4 1/2-5	..	—	1,000,000	10	Apl. 29	8	River Plate Ord.	143-15 1/2	..	5 4 11
100,000	13	"	—	Do. 4 1/2 p.c. Pref.	54-6	..	—	312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	93-95*	..	4 4 3
50,000	5	May 3	6	Do. 6 p.c. 1st Mort.	48-49	..	6 2 5	250,000	10	Mar. 31	8	San Paulo, Ltd.	14-14 1/2	..	5 10 4
100,000	Stk.	June 25	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	78-80*	..	5 12 6	62,500	50	"	6	Do. 6 p.c. Pref.	113-124	..	4 18 0
157,150	Stk.	Feb. 25	5	Cbeester 5 p.c. Ord.	109-111	..	4 10 1	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	564-514	..	4 17 1
1,493,280	Stk.	Mar. 12	5 1/2	Commercial A p.c. Stk.	108-110	..	4 14 6	135,000	Stk.	Mar. 12	10	Sbeffield A.	236-238	..	4 4 0
560,000	"	"	3	Do. 3 1/2 p.c. do.	103-105	..	4 15 3	269,984	"	"	10	Do. B.	233-25	..	4 5 1
475,000	"	June 11	3	Do. 3 p.c. Deb. Stk.	81-83	..	3 12 3	523,500	"	"	10	Do. C.	233-235	..	4 5 1
800,000	Stk.	"	5	Continental Union, Ltd.	96-98	..	5 2 0	70,000	10	June 11	10	South African.	134-14	..	7 2 10
200,000	"	"	7	Do. 7 p.c. Pref.	137-139	..	5 0 9	6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122-124	..	4 6 0
492,270	Stk.	"	4	Derby Con. Stk.	121-123	..	4 1 4	1,895,445	"	Jan. 14	3	Do. 3 p.c. Deb.	85-86	..	3 9 9
55,000	"	Mar. 31	5	Do. Deb. Stk.	103-105	..	3 16 2	209,823	Stk.	Mar. 12	8	South Shields Con. Stk.	152-154	..	5 3 11
148,995	"	Jan. 28	12	East Hull 5 p.c. Ord.	100-102	..	4 18 0	605,000	Stk.	Feb. 25	5 1/2	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 10 2
486,090	"	"	12	European, Ltd.	244-24 1/2	..	4 17 0	60,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8
354,060	10	"	12	Do. £7 10s. paid.	184-19	..	4 14 9	117,058	"	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124-126	..	3 19 4
15,161,545	Stk.	Feb. 11	4/10/8	Gas 4 p.c. Ord.	103-104	..	4 7 0	502,310	Stk.	May 13	5	Southampton Ord.	110-112	..	4 9 3
2,600,000	"	"	3 1/2	light 3 1/2 p.c. max.	88-89	..	3 18 8	120,000	Stk.	Feb. 25	6 1/2	Tottenham A 5 p.c.	132-134	..	5 0 9
3,799,735	"	"	3 1/2	and 3 1/2 p.c. Con. Pref.	105-107	..	3 14 9	423,940	"	"	5 1/2	Do. B 3 1/2 p.c.	111-113	..	4 12 11
4,193,975	"	June 11	3	Coke 3 p.c. Con. Deb.	94-16	..	3 9 9	149,470	"	June 25	4	Edmonton 4 p.c. Deb.	99-101*	..	3 19 3
258,740	Stk.	Mar. 12	4 1/2	Hastings & St. L. 3 1/2 p.c.	93-95	..	5 0 0	182,380	10	June 11	8	Tuscan, Ltd.	9-9 1/2	..	8 8 6
82,500	"	"	6 1/2	Do. do. 5 p.c.	118-120	..	5 4 2	149,900	10	Jan. 5	5	Do. 5 p.c. Deb. Red.	101-103	..	4 17 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17 1/2-18	..	6 2 3	236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	109-111	..	4 10 1
123,570	Stk.	Mar. 12	6 1/2	Iford A and C	140-142	..	4 11 7	255,636	Stk.	Feb. 25	6 1/2	Wands-1 B 3 1/2 p.c.	139-141	..	4 12 2
65,783	"	"	5	Do. B	106-108	..	4 12 7	79,416	"	June 25	3	Do. 3 p.c. Deb. Stk.	73-75*	..	4 0 0
63,000	"	June 25	4	Do. 4 p.c. Deb.	100-102*	..	3 18 5	895,872	"	Feb. 25	5 1/2	West Ham 5 p.c. Ord.	121-123	..	4 5 4
4,940,000	Stk.	May 13	8	Imperial Continental	179-181	..	4 8 5	210,000	"	"	5	Do. 5 p.c. Pref.	126-128	..	3 18 2
473,600	Stk.	Feb. 11	3 1/2	Do. 3 1/2 p.c. Deb. Red.	95-97	..	3 12 2	253,300	"	June 25	4	Do. 4 p.c. Deb. Stk.	105-107*	..	3 14 9

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Resists 4500° Fahr. Best for GAS-WORKS.
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See Advertisement on p. 998.
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Naphtha, Sulphate of Ammonia.

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Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL,
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FOR list of Installations, see "Journal,"
May 18, p. 1, of Centre.

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Limited), Glohe Meter Works, OLDHAM, and
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THE MAXIM PATENT CARBURETTOR.

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PROOF STRONG BOX.**

See illustrated advertisement, June 8, p. 1, of Centre.
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HOLLOWAY, N.

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See Illustrated Advertisement June 22, p. 763.

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J. E. C. LORD, Ship Canal Tar Works,

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Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid,
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SULPHURIC ACID for Sale, specially

suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, WAKEFIELD, AND SUNDER-
LAND.

TO Gas Managers, &c., Wanted, Old

Condemned GAS-METERS, from 1-light to 1000-
light, for destruction to re-claim Metals. Write for
Prices, Stating Quantities and Sizes, and if Wets or
Drys. Scrap Metals, Drosses, Metal Shop Sweepings,
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SULPHURIC ACID.**SPECIALLY prepared for Sulphate of**

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SULPHURIC ACID.**SPECIALLY prepared for the Manu-
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BLUE WATER GAS, CARBURETTED WATER
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struction, see Advertisement in the "JOURNAL" for
June 22, p. 784.

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25, Victoria Street, Westminster, LONDON, S.W.
Telegraphic Address "Dellwik, London."

**OXIDE OF IRON FOR GAS PURIFI-
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Please Address Inquiries for Analysis and Prices to the

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The One Machine which Discharges and Charges
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Contractors for Complete CARBONIZING
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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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Agents, 70 & 72, Chancery Lane, London, W.C. Tele-
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Construction, Practical Mathematics, Steam, Mechanics,
&c.
CORRESPONDENCE COLLEGE Co., Dept. B., 26, Green
Street, CAMBRIDGE.

MR. W. B. MIMMACK, for many years
Secretary, Manager, and Accountant of the Crays
Gas Company (111 Millions), now in Amalgamation,
seeks APPOINTMENT in any or all of these Offices.
St. Paul's Cray, KENT.

APPLICATIONS for Appointments
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Recipients. Numerous unsolicited Testimonials. Write
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PLUMBER of Great Experience. Worked at Beckton,
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Work. Day or Contract.
LEADBURNER, 117, Galloway Road, Shepherd's Bush,
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WANTED, by an Engineer (Age 29)
Situation as MANAGER or ASSISTANT.
Trained in Large Works, and held position of Manager
of Small Works. Thoroughly familiar with duties
appertaining to Works and Offices.
Address No. 5112, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

CANVASSER required by a Suburban
Gas Company. Must be competent to Estimate
for all kinds of Fitting Work and be thoroughly Con-
versant with the most Modern Systems of Lighting by
High and Low Pressure, Heating, &c., and be capable
of Fighting Electrical Competition.
Commencing Salary, 35s. per Week.
Apply, stating Age, Experience, and enclosing copies
of Testimonials, to No. 5114, care of Mr. King, 11,
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RETORT-HOUSE Foreman required in
a London Gas-Works. Three Millions daily.
Must have had good Experience of Gibbons Single-Fire
Regenerator Settings and be a thoroughly good Car-
bonizer. Previous Experience as Foreman absolutely
necessary. One engaged in large Works making big
makes per Ton preferred. Good recent Testimonials
required. Eight hours. Wages, 45s. to 47s. 6d. weekly,
according to abilities.
Apply, by letter, to No. 5111, care of Mr. King, 11,
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BURY ST. EDMUND'S GAS COMPANY.
THE Directors of the above invite
APPLICATIONS for the Position of GAS EN-
GINEER AND MANAGER to the Company.
Salary, £250 per Annum.
Applications, stating Age and Experience, to be sent
to the Secretary, endorsed "Engineer and Manager,"
not later than the 14th of July next.
ALEX. MITCHELL,
Secretary.
Gas-Works, Bury St. Edmund's,
June 25, 1909.

WANTED, a Second-Hand Station
METER, 10,000 feet per Hour, with Valves and
Bye-Pass. Also a Second-Hand 10-inch or 12-inch
STATION GOVERNOR, with Valves and Bye-Pass.
State full Particulars and lowest Price to No. 5113,
care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FOR Disposal, in excellent condition
and recently Dismantled and Replaced by more
powerful Engine and Pumps, 16 H.P. OTTO GAS-
ENGINE by Crossley Bros., complete; also Set of
Three-Throw PLUNGER PUMPS, also by Crossley
Bros., complete with Shafting. This Pump was used in
conjunction with above Engine.
Further Particulars Apply, WATER-WORKS LIGHTING
AND POWER INVESTMENT CORPORATION, 99, CANNON
STREET, E.C.

FOR SALE—Square Station Meter,
10,000 feet per Hour (New Drum by Braddock),
Replaced by larger size Rotary Meter.
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gate, MANCHESTER.

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hauled Second-Hand PLANT FOR SALE:—
GASHOLDER (Two-lift), 50 ft. by 18 ft., in BRICK
or NEW STEEL TANK.
GASHOLDER (Two-lift), 50 ft. by 16 ft., in NEW
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GASHOLDER (8500 cub. ft.), in NEW STEEL
TANK (and smaller in stock).
Annular CONDENSERS, 8-in., 12-in., and 18-in.
diameter Connections.
Water-Tube CONDENSERS (set of Three), 6-in.
Connections.
Morris & Cutler CONDENSER, 8-in. Connections.
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Clapham's WASHER-SCRUBBER, 6-in. Con-
nections.
Tower SCRUBBERS, 7 ft. by 55 ft., 4 ft. by 16 ft.,
3 ft. 6 ins. by 16 ft., &c.
EXHAUSTERS and ENGINES (Single and Com-
bined) 2000 to 60,000 cub. ft.
PURIFIERS, 6 ft., 8 ft., 12 ft., and 20 ft. Squares.
In sets of 2's or 4's.
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Governors, 4 ins. to 10 ins.
TAR and LIQUOR PUMPS, for Hand Working
and Steam Power.
BOILERS, TANKS, VALVES, and all Requisites
for Gas-Works.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Thornhill, Dewsbury, YORKS.

TENDER FOR COAL.
THE Directors of the Pembroke Docks
and Town Gas Company invite TENDERS for
the Supply of 3000 Tons of Best Screened GAS COALS
or NUTS for the Year ending Aug. 31, 1910, to be
delivered at the Great Western Railway Jetty, Hobbs
Point, Milford Haven. Steamboats of 400 to 500 Tons
burden can be discharged at this pier in from Two to
Three Days.
Sealed Tenders, endorsed "Tender for Coal," to be
addressed to the Secretary, 4a, Lion Street, Brecon, on
or before July 15, 1909.
Further Particulars can be obtained from the under-
signed.
A. HORACE BROOKMAN,
Manager.

Gas Offices, Pembroke Dock,
June 21, 1909.

ACCRINGTON DISTRICT GAS AND WATER
BOARD.
THE Board are prepared to receive
TENDERS for the Supply and Delivery of
Screened and Unscreened GAS COAL and of GAS
NUTS at their Accrington and Great Harwood Works,
in such Quantities, and at such times, as the General
Manager may require.
Sealed Tenders (on own Form), addressed to the
Chairman, must be in my hands not later than Tuesday,
the 6th of July.

By order,
CHAS. HARRISON,
General Manager.
Offices of the Board,
Willow Street, Accrington,
June 14, 1909.

CLACTON URBAN DISTRICT COUNCIL.
THE above Council are prepared to re-
ceive TENDERS for the Supply and Delivery of
about 50 Tons of British CAST-IRON PIPES and
CONNECTIONS.
Copy of Specification and Form of Tender may be
obtained from the Council's Engineer, Mr. Sydney
Francis, Assoc. M.I.M.E., Town Hall, Clacton-on-Sea.
Sealed Tenders, endorsed "Tender for Pipes," to be
delivered to the undersigned not later than noon on
Wednesday, the 7th of July, 1909.
The Council do not bind themselves to accept the
lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, June 25, 1909.

BARRY URBAN DISTRICT COUNCIL.
TENDERS FOR GAS COAL.
TENDERS are invited for the Supply
of GAS COAL (up to 17,000 Tons), to be delivered
in such Quantities, and at such times, as the Engineer
and Manager may require during One Year from
August, 1909.
The Tenders must state the names of the Pits from
which the Coal will be raised, the names of the Gas-
Works at which it is used, and the Price per Ton de-
livered into the Council's Siding at the Gas-Works,
Barry, and must be accompanied by a Copy of the
Analysis of the Coal.
Any person whose Tender is accepted must enter into
a Contract in the Form required, also a Bond with
approved sureties for its due performance.
Further Particulars may be obtained from Mr. T. E.
Franklin, Engineer and Manager, Gas-Works, Barry.
Sealed Tenders, endorsed "Tender for Gas Coal,"
must be sent to the undersigned on or before the
12th of July, 1909.
The lowest or any Tender not necessarily accepted.
T. B. TORDOFF,
Clerk.
Public Offices, Barry,
June 22, 1909.

BOROUGH OF LONGTON.
THE Gas and Electricity Committee
invite TENDERS for the Surplus TAR produced
at these Works during the Year ending June 30, 1910.
Further Particulars may be obtained on Application
to the undersigned.
Tenders, endorsed "Tender for Tar," to be sent in
addressed to the Chairman of the Gas and Electricity
Committee not later than Tuesday, July 20, 1909.
W. LANGFORD,
Engineer and General Manager.
Gas and Electricity Works,
Longton.

STRETTFORD GAS COMPANY.
THE Directors of the Stretford Gas
Company invite TENDERS for the Supply of
Unscreened GAS COALS, NUTS, SLACK, and
CANNEL, to be delivered at the Gas-Works, Stretford,
on the Bridgewater Canal, or at Stretford Station
(M. S. J. & A. Railway) during the next One, Two, or
Three Years, in monthly Quantities as may be required,
commencing Aug. 1, 1909.
The Tenders must state:
Price per Ton in Waggon at Pit.
Railway or Canal Rate to Stretford.
Wagon or Boat Hire to Stretford.
Tenders to be delivered to the Gas-Works, Stretford,
not later than noon on Saturday, the 10th of July, 1909,
endorsed "Tender for Coal, &c.," and addressed to the
Chairman of the Company.
The Directors do not bind themselves to accept the
lowest or any Tender.
Forms of Tender can be obtained on Application to
the undersigned.
By order of the Board,
BENJAMIN HAYNES,
Secretary.
Stretford, June 19, 1909.

WINSFORD URBAN DISTRICT COUNCIL.
THE above Council are prepared to re-
ceive TENDERS for the Supply of CANNEL and
Best Screened GAS COAL and GAS NUTS, to be de-
livered at the Cheshire Lines Station, Winsford, or the
Over and Wharton Station of the London and North
Western Railway, or at the Council's Wharf on the
River Weaver at Winsford. The Material is required
for a term of Twelve Months ending Sept. 1, 1910.
The Probable Quantities required will be about 400
Tons of Cannel and about 2800 Tons of Gas Coal, which
must be Freshly-Wrought, Well Screened, and free
from Sulphurous Pyrites and other objectionable matter;
but the Council reserve the right of reasonably in-
creasing or decreasing the Quantities named. The
person whose Tender is accepted will be required to
enter into an Agreement with the Council for the due
performance of the Contract.
Sealed Tenders, stating Price per Ton delivered as
above, are to be received by the undersigned on or
before the 5th day of July, 1909, and endorsed "Gas
Coal Tender."
The Council do not bind themselves to accept the
lowest or any Tender, and reserve to themselves the
right to divide the Contract as they think fit.
Forms of Tender and further Particulars may be had
on Application to the Gas Manager, Mr. F. Sidwell,
Winsford, or from
JNO. H. COOKE,
Clerk to the Council.
Council Offices, Russell Street,
Winsford, Ches., June 24, 1909.

THE GASLIGHT AND COKE COMPANY.
NOTICE is Hereby Given, that the
TRANSFER BOOKS of this Company, so far
as they relate TO CAPITAL STOCKS, WILL BE
CLOSED at Four o'clock p.m., on Tuesday, the 6th
day of July next, and WILL BE RE-OPENED im-
mediately after the HALF-YEARLY ORDINARY
GENERAL MEETING of the Company to be held on
Friday, the 6th day of August next.
By order,
HENRY RAYNER,
Secretary.
Chief Office: Horseferry Road,
Westminster, S.W., June 24, 1909.

EUROPEAN GAS COMPANY, LIMITED.
NOTICE is Hereby Given, that the
ANNUAL GENERAL MEETING of the Share-
holders will be held on Tuesday, the 13th day of July
next, at 2.30 p.m. precisely, at the Offices, Finsbury
House, Blomfield Street, London, pursuant to the Regu-
lations of the Company.
The Directors who retire by rotation are H. C.
Smith, Esq., and R. Hesketh Jones, Esq., and the re-
tiring Auditors are J. Reeson, Esq., and A. T. Eastman,
Esq., who, being eligible for re-election, offer themselves
accordingly.
E. F. White, Esq., having resigned his seat on the
Board, the Directors, pursuant to the regulations of
the Company, have filled up the Vacancy, and have
nominated R. S. Gardiner, Esq., as a Director, subject
to confirmation by the Shareholders at the said General
Meeting.
The Accounts to be submitted to the Shareholders
will be open for inspection at the Company's Offices
on and after the 9th of July next.
NOTICE IS ALSO GIVEN, that the TRANSFER BOOKS
WILL BE CLOSED from the 14th to the 30th of July
next, both days inclusive.
By order of the Board,
W. WILLIAMS,
Secretary and General Manager.
Finsbury House, Blomfield Street,
London, E.C., June 25, 1909.

In accordance with Clause 12 of the Company's Regu-
lations: "The Bearer of a Share Warrant may, on
depositing his Warrant at the Chief Office of the Com-
pany in London not later than 48 hours before holding
any Meeting of the Company, be present and vote at
any such Meeting in respect of the Shares or Stock in-
cluded in such Warrant."

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of William Hohbs, decd.; the Administrator of Mrs. Adelaide Overell, decd.; and other Owners.

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THE Proprietor of the Patent No. 15,646 of 1905, for "IMPROVEMENTS IN AND RELATING TO THE EXTRACTION OF AMMONIA FROM DISTILLATION GASES," is desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its full Development and Practical Working in this Country.

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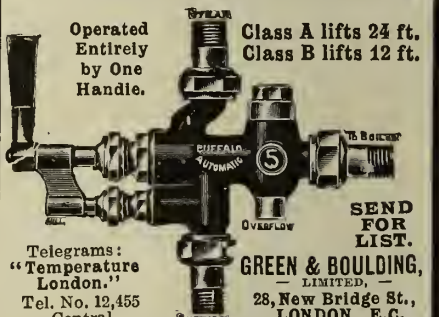
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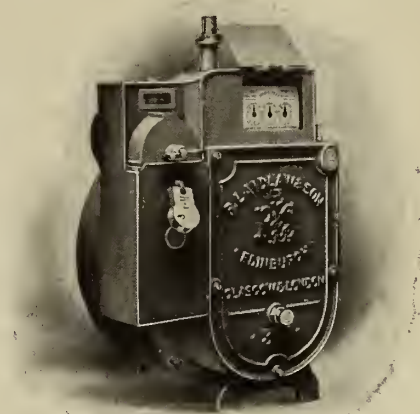


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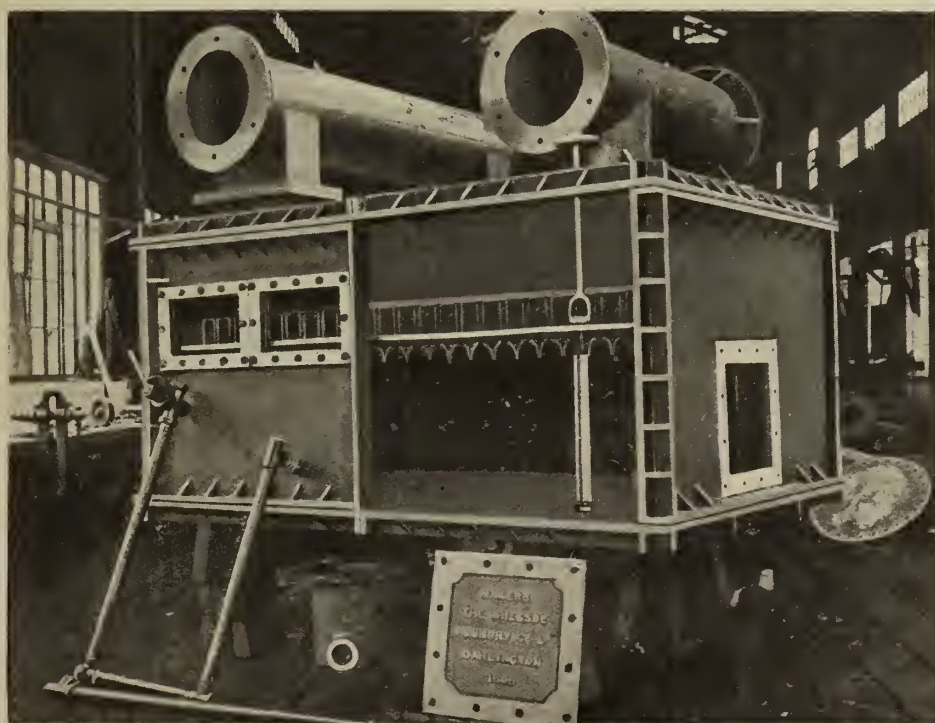
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A HISTORY OF THE INTRODUCTION OF GAS LIGHTING.

BY CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers. Author of "Gas Lighting," which forms the Third Volume of Groves and Thorpe's "Chemical Technology."

As a frontispiece the book has a photographic reproduction of the portrait of William Murdoch in the Edinburgh Art Gallery. There are also portraits of the Hon. Robert Boyle, F.R.S., James Watt, Philippe Lebon, Frederick Albert Winsor, &c.; a reproduction of the picture of "Scientific Celebrities in 1800," in the National Portrait Gallery, in which James Watt, Boulton, and Wm. Murdoch are included; and numerous illustrations of various apparatus used in the early Manufacture of Gas, &c., with three folding plates.

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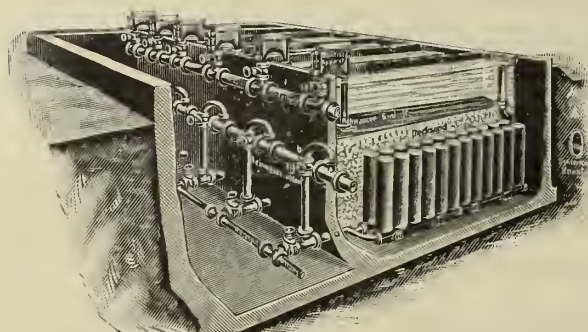
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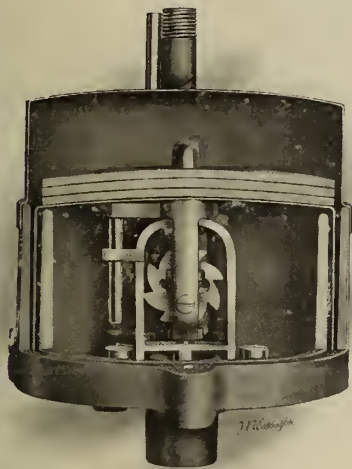
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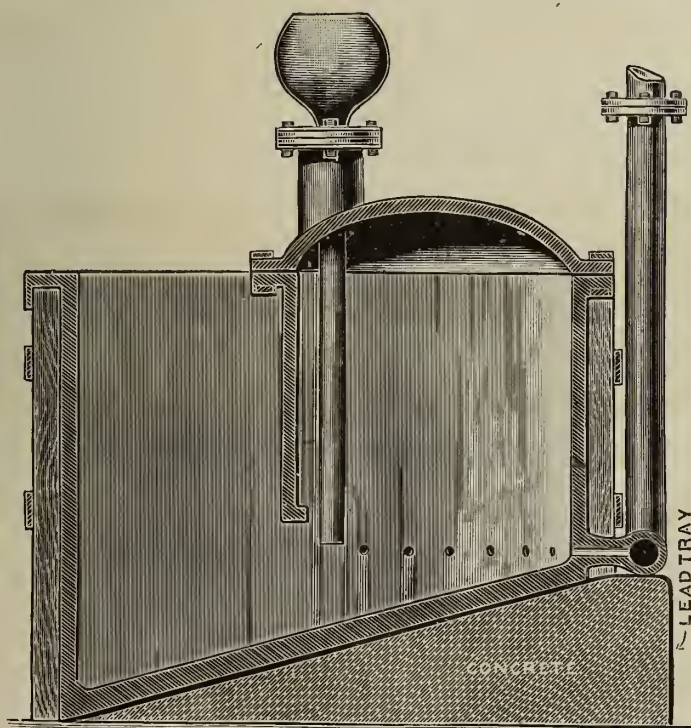
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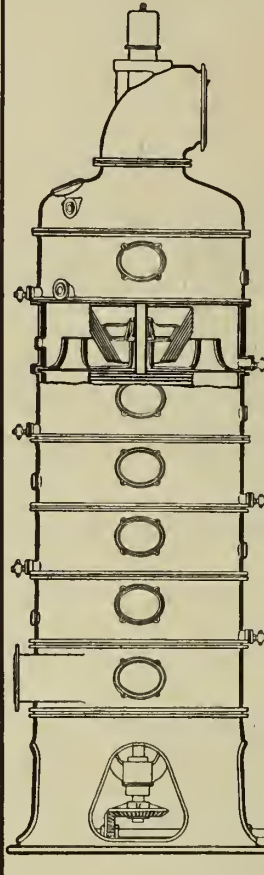
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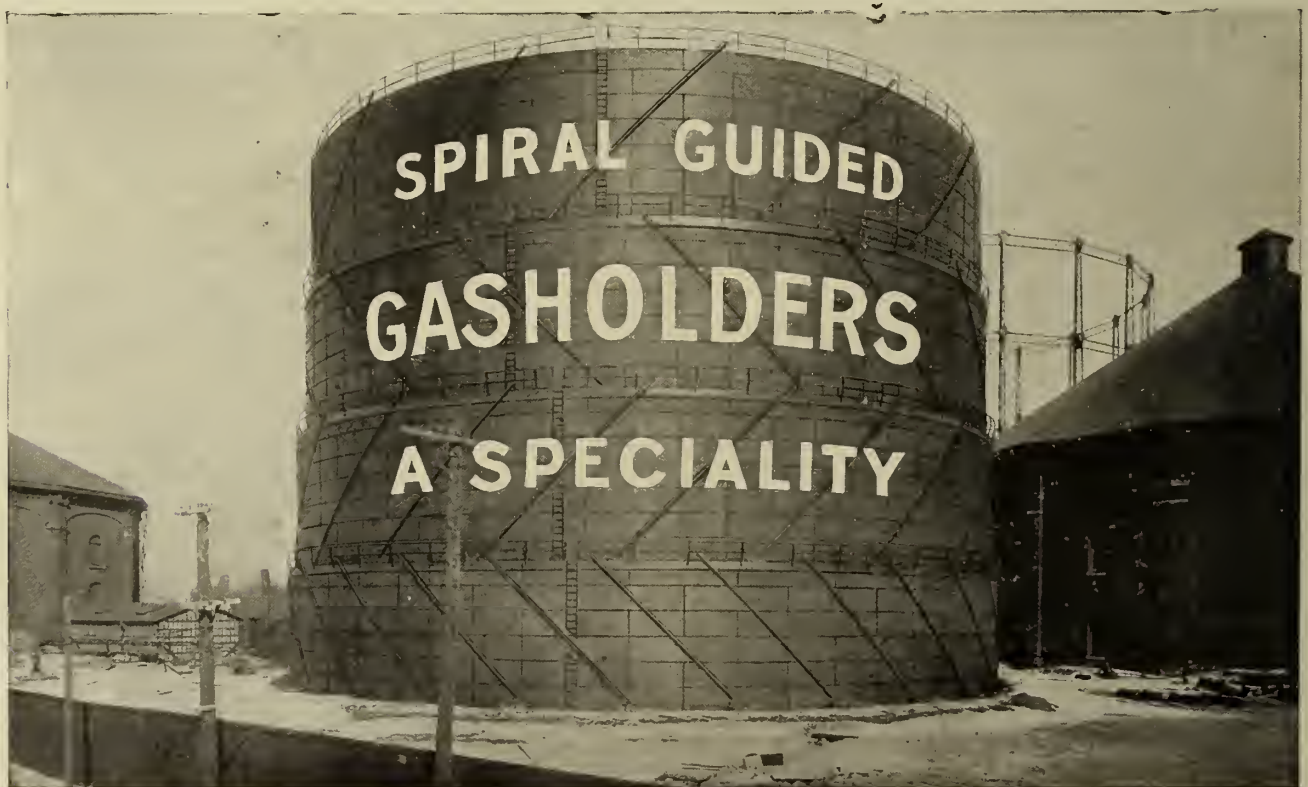
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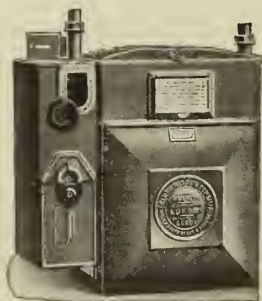
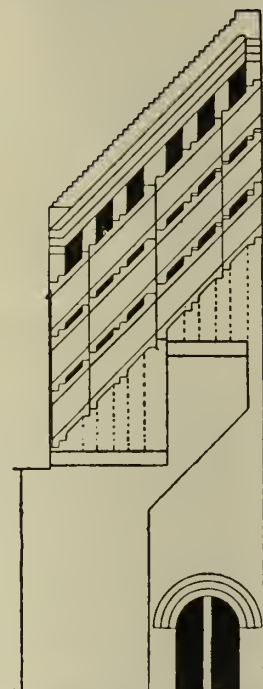
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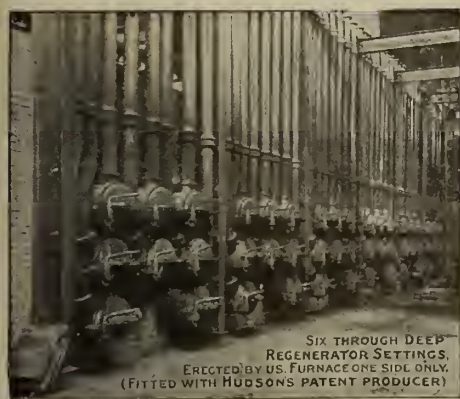


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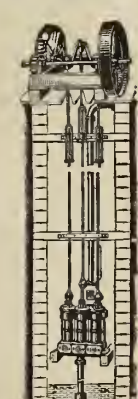
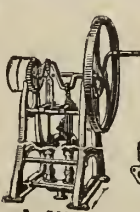
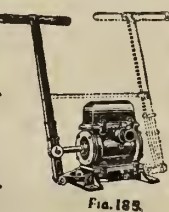
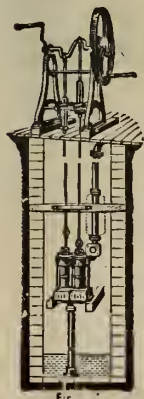
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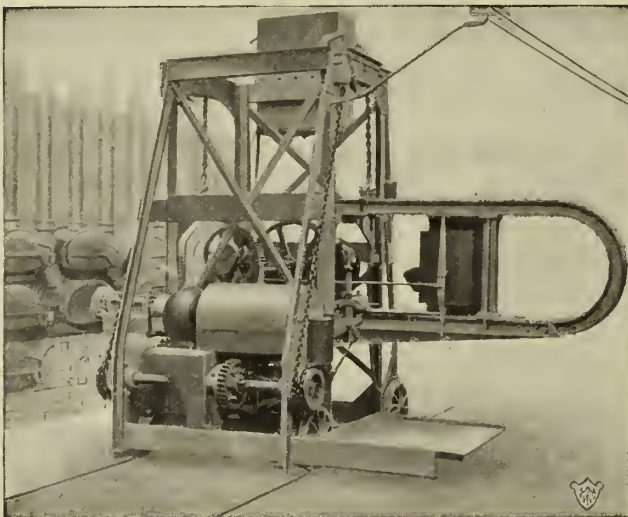
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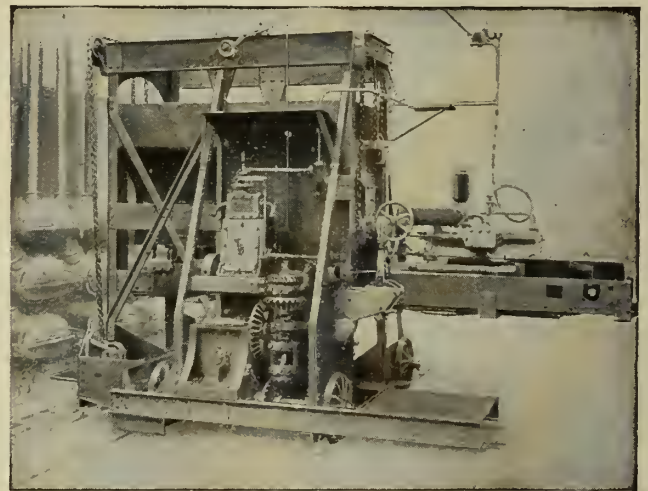
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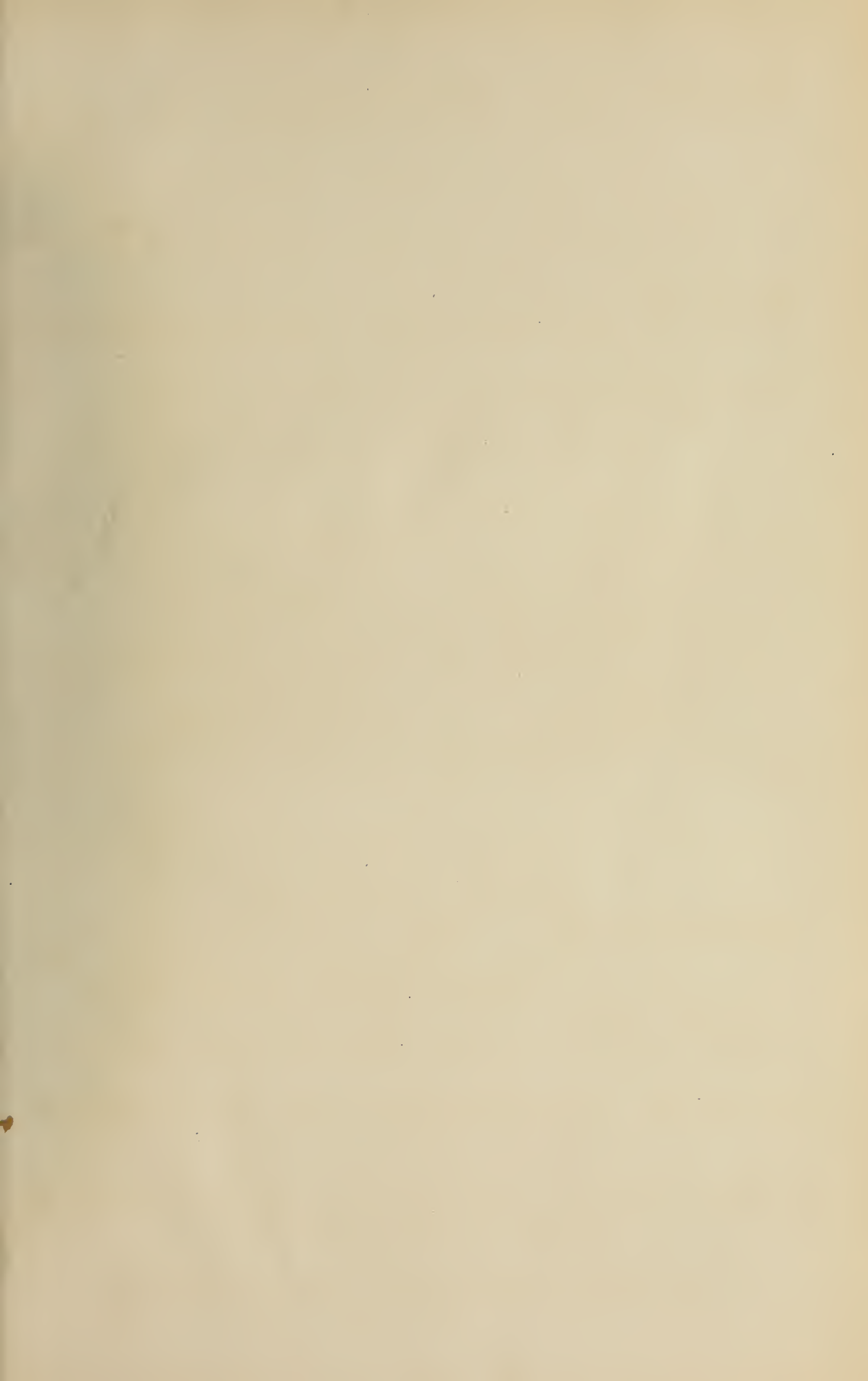
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